Traffic Control by Traffic Wardens in Minna, Niger State, Nigeria

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Abstract

Traffic control by traffic wardens on three at-grade interactions in Minna, Northern Nigeria has been analysed. During the morning peak periods, it was observed that with traffic warden control, none of the approaches of the intersections operated beyond level of service E. However, when the wardens did not control traffic, the approaches operated at level of service, F, which has been shown in studies to be unacceptable to most drivers. Taking other factors like stability of electricity supply, motorists' behaviour and society's acceptance of innovations into consideration, it has been concluded that for now, there is no alternative to the traffic warden in traffic control in developing cities.

Keywords

Traffic control, Traffic wardens

Introduction

The invention of the motor vehicle meant that roads were no longer meant for pedestrians and animal – drawn carts alone. The invention called for improvement of the state of the roads, which led to increased speeds and danger to road users. This then called for a proper control or channelization of traffic to increase efficiency of the roads in traffic performance. It is quite clear that the earliest controllers of traffic were people, private or

employed by the town authorities. Definitely there were conflicts at intersections that needed to be resolved as man is limited in his judgement and stamina. The first traffic signal was installed in London in 1868 and used semaphore 'arms' together with red and green gas lamps. This, however, exploded, in 1918. The first three coloured light signals were installed in New York and in 1925, they started to he used in Great Britain. Traffic signals are now used throughout the world, at intersections to reduce conflicts to a minimum by time-sharing of right of way. This reduces the capacity of the intersection, but greatly enhances safety. There are about 64 potential conflict points at a four – leg intersections with two way traffic flows at which all crossing and merging movements are permitted. The essence of traffic control is to reduce this number of potential conflicts from 64 to zero [1].

When two or more traffic flows are competing for the same road space at a junction, some form of control – or set of rules is needed to minimise delays and the risk of accidents. Due to the fluctuating nature of electricity supply and at times total black outs experienced in some developing cities, operation of traffic signals has become an onerous task. The use of traffic wardens is a welcome idea, to replace existing but non-functional traffic signals. The research question then is how effective are these traffic wardens in controlling traffic? This paper therefore aims at highlighting the problems encountered by the traffic warden in his quest to control traffic as well as proffer some measures to assist authority in traffic management especially during peak hours.

Traffic Management

This is concerned with short- term measures to improve the efficient and safe movement of both pedestrians and vehicular traffic on the existing road network. The function of a street or highway is to serve the travelling public [2]. One of the most fruitful applications of traffic management lies in the improvement of highway intersections. Minor improvements can be carried out which will reduce accidents and improve highway safety:

- 3-way intersections: [3] and [4] carried out extensive work on accidents at rural 3-way intersections. The results showed that 25 percent of accidents were the result of collisions between vehicles turning right from the main road and vehicles travelling in the same direction on the main road (for left hand drives). This could be extended to right hand drive to mean vehicles turning left and those travelling in the same direction on the road. They also found out that the frequency of accidents is proportional to the square root of the product of the flows and not to either addition or product of the flows.

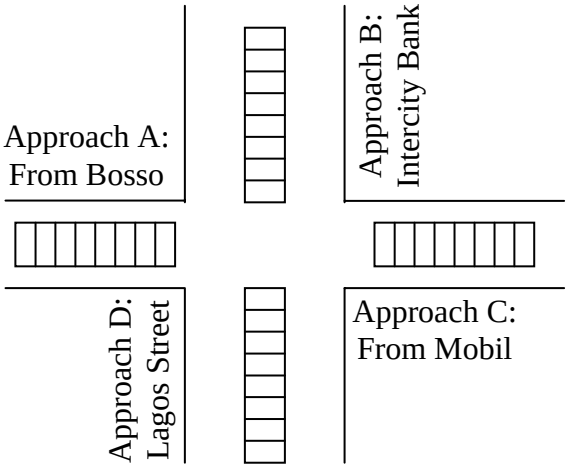
- Roundabout: [5], working in London on a study of 500 accidents at conventional roundabouts found out that for one-vehicle accidents, 22 percent were caused by vehicles entering the roundabout, 20% by those on roundabout and 7% by those leaving. For two-vehicle accidents, 8% were caused by both vehicles entering, 17% by one entering and one on it, 3% by one entering and one leaving, 17% by both on the roundabout, 11% by one on the roundabout and one leaving and 2% by both leaving. The priority rule 'Give way to the vehicle from the right' was found to have reduced accidents by about 40%.
- 4-way intersections: These have been found to be more dangerous than the 3-way junctions. Study [6] show that 'YEILD' signs can be an effective way of reducing accidents at low volume intersections.

Evaluation Criteria

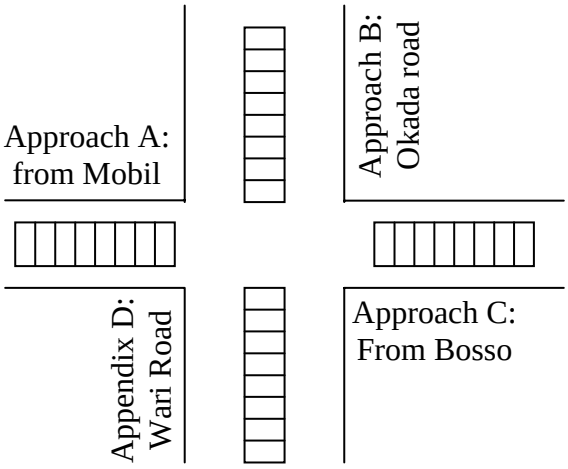
Evaluation of the efficiency of the traffic police was done against established standards of traffic management. The manner traffic is handled to ease delays and the levels of service so obtained. The number of conflicts or near conflicts was looked into. Finally, the performances of the traffic wardens were compared with advantages of the traffic signal to see whether their continued use is warranted.

Materials and Methods

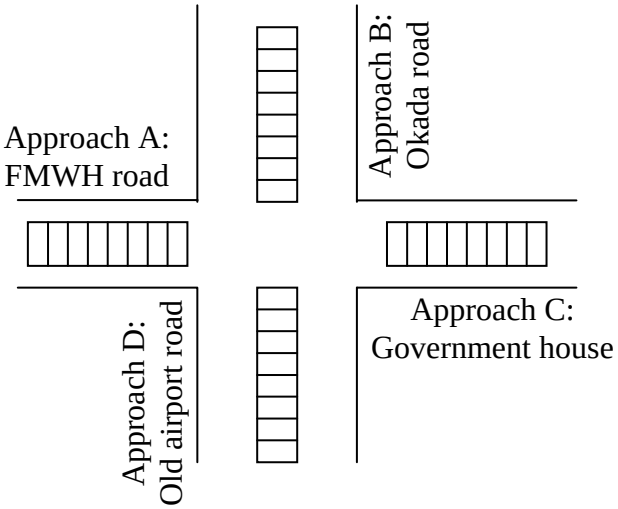
Traffic and intersection layout are carried out. Three busy four-legged intersections in Minna, named Dutse-Kura, Central Mosque and Central Garage were chosen for this study. Minna lies within Latitude 9°30′N and Longitude 6°30′E in the Guinea Savannah Region of Nigeria. They all have approaches on level terrain and visibility of at least 40 meters. Sketches are presented in Figure 1. They all have divided arterials for all approaches. Traffic studies were carried out for a week and critical volumes presented in Table 1. Peak traffic occurs between 7-8 am, 1-2 pm and 6-7 pm respectively. Delay studies were carried out at the peaks and a summary of results presented in Table 2. Levels of service have also been calculated and presented in Table 2.



Dutse Kura Intersection



Central Mosque Intersection



Central Garage Intersection

Fig. 1. Sketch layout of Intersections

Table 1. Summary of Average Daily Traffic Volume (vph) at 4-way intersection

Intersection	Dutse - Kura				Central Mosque				Central Garage			
Approach	A	B	C	D	A	B	C	D	A	B	C	D
7-8 am	669	599	637	831	1742	113	1175	318	165	351	1791	323
8- 9 am	643	580	602	822	1631	119	1692	301	1702	319	1728	305
9-10 am	628	553	591	792	1592	119	1604	289	1689	208	1710	272
10-11 am	600	547	583	768	1438	102	1587	215	1502	202	1626	259
11 -12 am	599	532	505	743	1337	199	1521	199	1500	197	1497	244
12- 1 am	651	562	587	801	1574	110	1723	317	1699	298	1718	310
1-2 pm	658	573	622	817	1688	112	1768	320	1724	350	1763	321
2-3 pm	604	480	538	680	1532	97	1628	218	1666	290	1697	289
3-4 pm	582	479	532	682	1478	104	1519	215	1609	284	1385	236
4-5pm	553	466	519	604	1397	102	1386	206	1438	260	1432	234
5-6pm	638	556	583	799	1609	107	1738	309	1721	320	1766	311
6-7pm	631	577	623	827	1702	115	1769	316	1755	339	1759	322

Table 2. Summary of Delay Studies and Level of Service at 4-way intersections

Intersection	Dutse –Kura				Central Mosque				Central Garage			
Time/Approach	A	B	C	D	A	B	C	D	A	B	C	D
Total delay (sec)	600	450	525	750	234	90	2010	495	2115	270	2250	210
Average delay per stopped vehicle (sec)	67	41	66	63	73	45	59	62	92	90	64	35
Average delay per approach vehicle (sec)	50	27	38	44	46	30	44	38	40	34	33	16
Level of service (Los)	E	D	D	E	E	D	E	D	D	D	D	C

During the evening peak periods when traffic was left uncontrolled, the data obtained for the average delays and level of service is presented in Table 3.

Table 3: Summary of Delay Studies and Level of Service when traffic was not controlled

Intersection	Dutse –Kura				Central Mosque				Central Garage			
Time/Approach	A	B	C	D	A	B	C	D	A	B	C	D
Total delay (sec)	720	480	630	900	360	210	1995	510	1800	465	1590	525
Average delay per stopped vehicle (sec)	90	60	75	90	82	50	120	125	150	58	99	53
Average delay per approach vehicle (sec)	60	45	50	65	61	46	70	72	86	52	72	44
Level of service (Los)	F	E	E	F	F	E	F	F	F	E	F	E

Traffic Warden Performance

The performance of the traffic warden was analysed based on his ability to control traffic and minimise conflicts and the total time spent at the intersection. Table 4 gives a summary of this analysis.

Table 4. Total Working Hours of Traffic Wardens at Intersections

Intersection	Dutse -Kura	Central Mosque	Central Garage
Time resumed duty (Average)	6.30 am	7.10 am	7.00 am
Expected Time Closed for the day	5-30 pm	5.30 pm	5.30 pm
Total hours worked	11	10.3	10.5
Average time domain was left uncontrolled	1.04 hrs	1.56 hrs	3.13 hrs
Total hours wasted in 12 hrs	2.04 hrs	3.26 hrs	5.08 hrs.

During the periods of control, data were collected for the number of vehicles obeying traffic orders, those not obeying and the conflicts caused, as well as during the hour when traffic was not being controlled. Results are presented in Table 5.

Table 5. Motorists' Behaviour at Peak periods at the Intersections

Intersection	Dutse -Kura				Central Mosque				Central Garage			
Approach	A	B	C	D	A	B	D	B	A	B	C	D
No of Vehicles	669	599	637	831	1742	113	1775	318	1765	351	1791	323
No not obeying traffic laws	200	105	50	100	50	3	50	5	-	1	8	2
Conflicts when traffic was not controlled.	12 crossing, 6 diverging and 6 merging				10 crossing, 7 diverging and 8 merging				14 crossing 8 diverging and 10 merging.			
Conflicts during control	2 crossing, 4 diverging and 2 merging.				3 crossing, 5 diverging and 3 merging.				4 crossing, 3 merging and 6 diverging.			

Discussions

Traffic Control

The traffic wardens worked mostly for 10 hours on the average every day. Their mode of traffic control is based on intuition and queue length. Traffic is supposed to be controlled in a city like Minna, for at least 16 hours of a 24-hour day. During their control of traffic especially at the peak periods the levels of service of each intersection leg ranged between C and E. Level of service C describes operations with delay in the range of 15.1 to 25.0 sec per vehicle. At level of service D, delays per vehicle get to between 25.1 and 40.0 sec. The influence of congestion became more noticeable. At level of service E, delays per individual vehicle get to 60 sec. This is the limit of acceptable delay. When traffic was left uncontrolled at the evening peak hour of 6 to 7 pm it was found that all approaches to the intersections operated at levels of service between E and F, which is unacceptable to most drivers as has

been shown in studies carried out by the Transportation Research Board and presented in [7]. This is an indication that the traffic wardens are still needed beyond their 5.30 pm closing time.

Traffic Warden Behaviour

The warden's control of traffic was mostly queuing dependent making it quite difficult to follow a clear - cut cycle length for all approaches. He was also seen some of the time to be influenced by the approach of service / force and administrative vehicles. These could be considered as emergency vehicles and were accorded priority. This explains why at a particular instance an approach could be operating at a level of service C, while the adjacent approach operates at level of service E during the same sequence of control.

Motorists' Behaviour

The conflicts shown in Table 4 and the total number of motorists flaunting traffic rules is an indication of the helplessness of the traffic warden in the control of traffic or motorists with poor behaviour. These conflicts could have resulted in major accidents. At such times, the warden is at a loss because his own directing might have resulted in the conflicts.

Conclusions

From all indications the wardens are doing a good job but they must be advised to work beyond the expected 12 – hours they are doing presently.

The installation of traffic signals would have been a welcome idea but in a society like ours, if motorists still flaunt traffic warden's directives, one could expect a worse behaviour with inanimate objects like traffic lights.

The cost of installing traffic lights may be less than cost of maintaining a traffic warden, but their continuous use is a welcome development in a society like ours where electricity supply is epileptic.

Traffic wardens should undergo refresher courses on traffic control regularly to improve on their mode of control.

Traffic wardens can easily interrupt heavy traffic at given intervals in order to permit other vehicles and pedestrians to cross speedily and in safety, something that is absent in the control with signals.

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