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Traffic Congestion and Noise Pollution around Petrol Station in Ibadan North Local Government Area, Ibadan, Nigeria

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Abstract

In Ibadan, Nigeria, as in other developing countries there were astronomical increase in the number of petrol stations in recent times and their poor locations had some inherent problems in Ibadan North Local Government Area. Some of which are traffic congestion and noise pollution around petrol stations. A cross sectional study design was adopted. Environmental monitoring of traffic density and noise pollution were carried out. A sound meter was used to determine noise levels around PS. Only 25% (14) of the total population of 58 petrol stations were used in this study. The mean vehicular traffic density was 464±84.9 vehicles per hour. Cars as a means of mobility had the highest mean density of 1348 per day followed by buses with 1182 vehicles per day during the 12 hour assessment period for one month. Noise monitoring study revealed a mean noise level of 92.4± 3.9 dBA which was higher than NGL standard of 90dBA for eight hours duration per day. Petrol stations were number one contributors to traffic congestion and noise pollution in Ibadan North LGA. Traffic density was lower compared to similar cities of the world. Noise level was higher than WHO/ FEPA standard of 90 dBA for eight hours duration per day.

Introduction

Petrol stations are among essential landuses in virtually all urban communities where petroleum products such as premium motor spirit (PMS), kerosene and diesel are marketed. However, their proliferation and indiscriminate siting is of growing public concern due to the associated environmental and social hazards. The problems associated with this incongruous development of petrol stations is enormous as most of them are located so close to each other with little or no regard to existing planning

standards and regulations. There were cases where by petrol stations are either sited in wrong locations or closely sited contrary to the required distance of 300m to each other (Adeniyi 1984). This becomes more appalling in view of the seeming lack of effective disciplinary measures to bring deviant developers to justice. The Inter-organisational Committee on Guidelines and Principles for Social Assessment (Ana et al., 2009) defines social impacts as 'the consequences to human populations of any public or private actions that alter the ways in which people live, work, play, relate to one another, organize to meet their needs, and generally cope as members of society'.

Social impacts are the effects of developmental interventions on human environment. The impacts of development interventions take different forms such as profit maximization, supply of petroleum products and employment generations which form the core of what could be described as desirable social impacts. In other words, benefits that flows in from different development actions. There is also a need to identify and evaluate the negative externalities associated with development actions such as traffic congestion and noise pollution around petrol station described as undesirable social impacts. There is the need for identification and measurement as well as management of undesirable social impacts in such a way that the positive externalities are maximized and the negative externalities are minimized.

The continued astronomical growth of sub-standard and poorly located petrol stations in Ibadan, their social implications, the inability and incapacitation of the existing planning regulations both to curb the ugly trend and to penalize defaulters who cause traffic flow problem and noise pollution are responsible for the basic pervading issues that forms the basis for this study. This study is only attempting to indentify the social impact of traffic congestion and noise pollution with regards to siting and operation of petrol stations.

Materials and Methods

This study went through proper required institutional review board procedures at the College of Medicine, University of Ibadan prior to its initiation. Informed consent was obtained from participating study petrol station operators.

Study area

Ibadan, the capital city of Oyo State is located approximately on longitude 3°5[1] North of the equator at a distance of about 145Km north east of Lagos and 659km Southwest of Abuja, the nation's capital city. It is an inland city with an altitude of 780 feet (237.7m) above sea level. This is a nodal city, and this made it an ideal trading center. In the past (1950s and 1960s) Ibadan was the capital of the former Western Region of Nigeria. It is now one of the most important cities in Nigeria. The location of some federal establishments and institutions as well as research institutes in Ibadan has attracted many people to the city for employment and education. The city of Ibadan is noted for its achievements, it accommodates the premier university in Nigeria established in 1948 (University of Ibadan) and its teaching hospital (University College Hospital). The first television station established in Africa in 1959, which is now called Nigerian Television Authority, is located in Ibadan. In addition, Ibadan, which Ibadan north LGA is it heart provides socio-cultural activities like schools, hospitals, markets, and places of worship. The strategic location of the LGA, its easy accessibility by a network of highway converging from different parts of the country and by railway made the LGA in Ibadan a nodal-point for transport and communications.

However, the types of economic activities undertaken by the people of Ibadan north LGA varies from one area to another. For example, people in the urban area engage mainly in trading while their rural counterparts are engaged in farming. Public service employment is not very common among the rural people. Overall,

trading is the most common economic activity in the Ibadan North LGA. The population of Ibadan North LGA according to the 2006 census figure put the population at 306,795. This comprises 153,039 males and 153,756 females (Brown 2009). In-town transportation comes in a variety of forms. Modes of transportation include, taxis, taxi-vans commonly called *danfos*, private cars that are hired out by the day with a driver, personal family cars, scooters, and walking. All fares are negotiable depending upon the number in the person and the distance to be traveled (Burkey 1980).

Study Design

The study was a descriptive cross-sectional survey involving environmental monitoring of traffic density and noise pollution for selected petrol station. Each petrol station geographic coordinates was specifically recorded from the centre of the petrol stations.

Study Population

The study population consists of 14 petrol stations representing 25% of the (58) total population.

Determination of traffic density around petrol stations

A hand-held, battery-powered factory calibrated GPS was used to determine the geographic coordinates of the PS locations. Traffic density was done by manual counting of the number of vehicles around selected PS was also determined for 12 hours period i.e 7am – 7pm for a period of 31 days.

Noise assessment in petrol stations

Environmental sound quality of participating petrol stations was determined using Sound Meter Model CA832 manufactured by Aemc Instruments, set at the slow response mode with A-weighted decibels (dBA). The measurements were conducted in the morning7am, afternoon 3pm and evening 7pm. Measurements were performed in front of the PS for a period of 31 days. These were based on previous study on location of petrol station (Adeniyi 1984; FGN 2007). Informed consent was obtained from petrol station operators before the study commenced.

Statistical Analysis

The data were analysed using both inferential (ANOVA, t-test) and descriptive statistics (mean, standard deviation, and frequency distribution) findings of the study were summarised and presented in tables and charts.

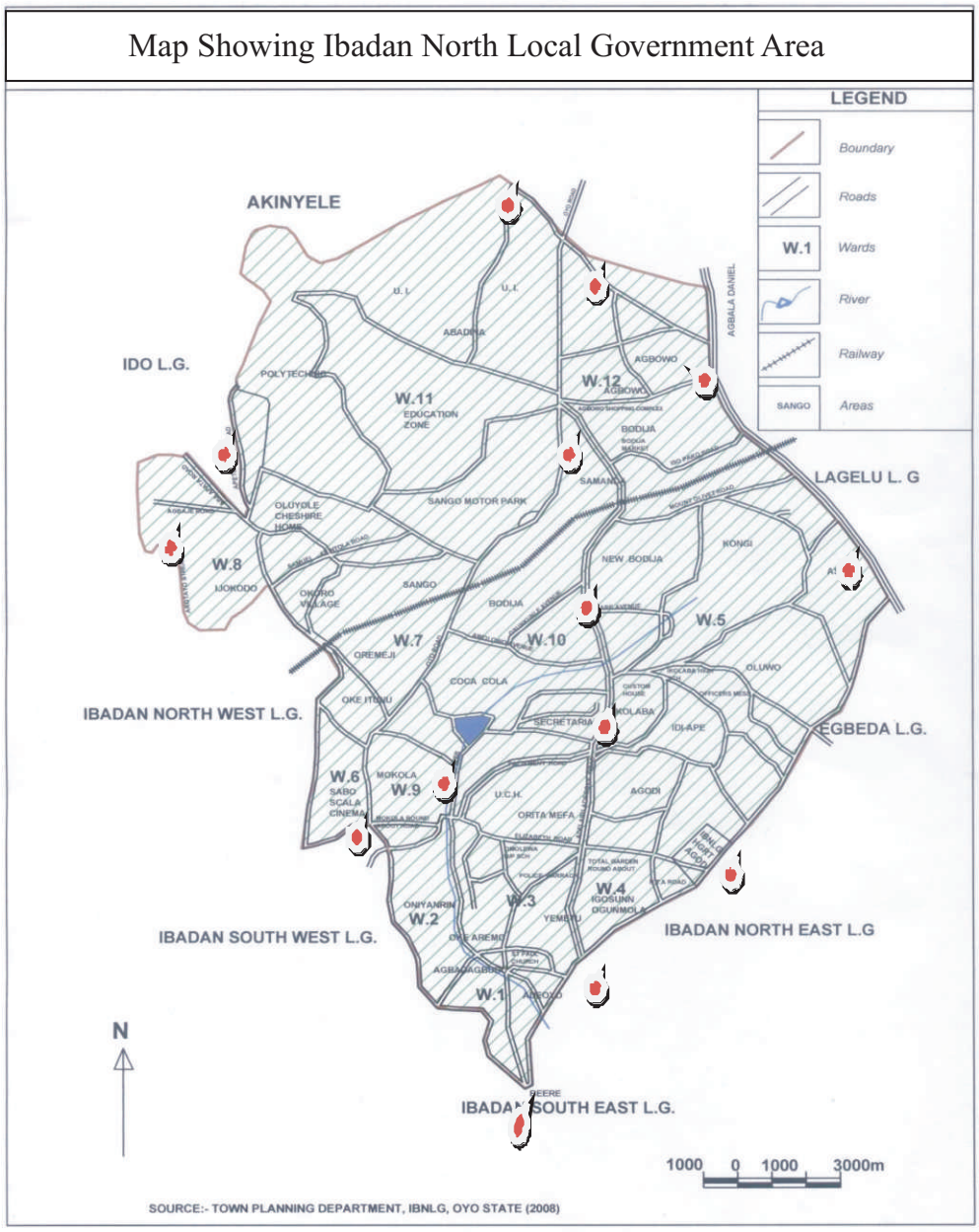

Figure 1: Street Map of Ibadan North LGA showing locations of PS along the streets
Key: Participating petrol stations

Results

Traffic density

Traffic density (i.e manual counting) of the number of vehicles around selected petrol station was determined for 12 hour i.e 7am – 7pm daily for a one month period. Presented below is the overall mean value of manual counting of vehicles within study area conducted in 14 petrol stations representing 25% of the total population of petrol stations in the study area. The mean vehicular traffic density was 464±84.9 vehicles per hour. Cars as a means of mobility had the mean highest density of 1348 per day followed by buses with

1182 vehicles per day during the 12 hour assessment period. Movements of vehicles were observed to be high between the hours of 8am – 10am as well as between 2pm – 4pm. This was observed to be high (Adeniyi 1984; WHO 2000; WHO 2010). These periods were associated with work and school resumption hours and closing hours for school and some offices. Traffic density for all modes were higher between the hours of 7 – 9am and 2 – 6pm, these periods are considered as peak periods when most people move around for purposes such as school/ work resumption time and the closing hours when people start returning to their homes.(See Table 1 and Fig. 2 – 7).

Table 1: Traffic Density Assessment

Monthly Mean Values for 14 of selected Petrol Filling Stations.									
Time	Pedestrians	Bicycle	Motor Bikes	Tricycles	Cars	Buses	Trucks	Trailers	Total
7-8am	58	6	90	48	121	102	56	17	498
8-9am	72	7	99	51	105	98	63	29	524
9-10am	71	21	92	54	149	124	42	29	582
10-11am	47	12	87	12	61	98	24	17	358
11-12noon	43	12	54	34	92	100	36	8	379
12-1pm	51	13	59	23	52	97	46	34	375
1-2pm	49	2	78	12	101	99	28	21	390
2-3pm	89	5	100	1	200	169	32	14	610
3-4pm	102	4	110	102	102	54	39	12	525
4-5pm	23	3	80	93	151	78	43	9	480
5-6pm	21	1	110	84	103	109	6	5	439
6-7pm	45	2	76	120	111	54	9	3	420
Total	671	88	936	733	1348	1182	424	198	5580
Mean &SD	55.7±24.2	7.3±6	78±29.8	61.9±37.6	112.3±40.1	98.5±30.3	35.3±16.9	16.5±10.0	464.6±84.9

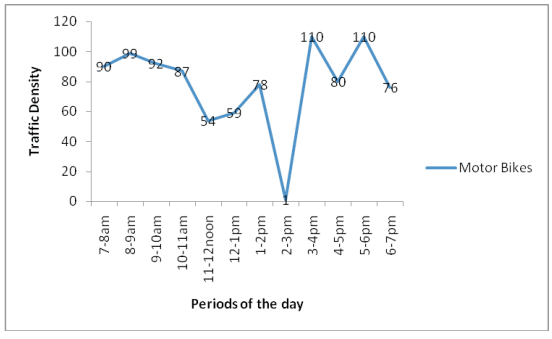

Figure 2: Motor bikes monthly mean traffic density in selected petrolstations in Ibadan North LGA.

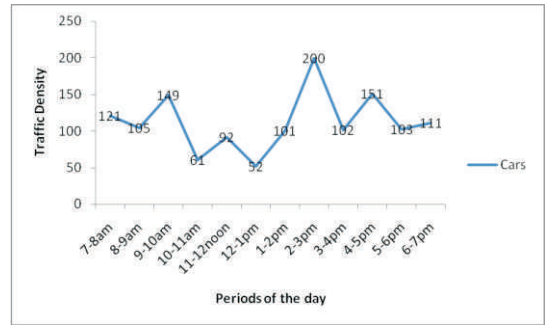

Figure 4: Cars monthly mean traffic density in selected petrol stations inIbadan North LGA.

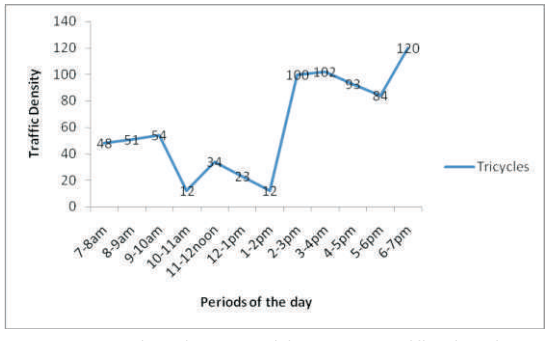

Figure 3: Tricycles monthly mean traffic density in selected petrolstations in Ibadan North LGA.

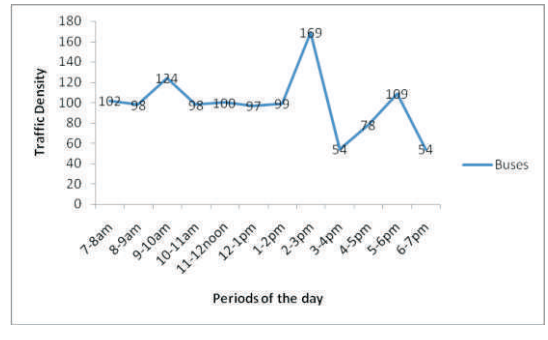

Figure 5: Buses monthly mean traffic density in selected petrol stationsin Ibadan North LGA.

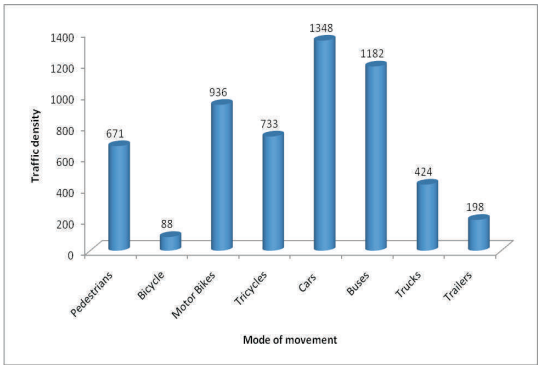

Figure 6: Total monthly mean traffic density for all categories in selectedpetrolstations in Ibadan North LGA.

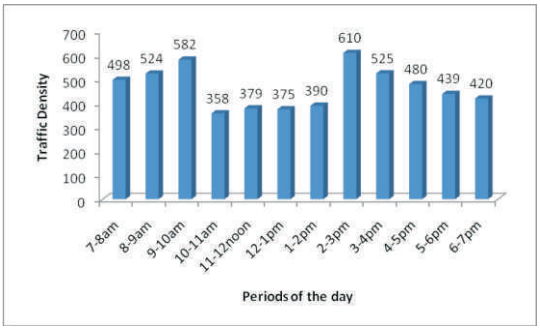

Figure 7: Total monthly mean traffic density by period of the day in selected petrol stations in Ibadan North LGAfor all categories

Noise monitoring

Noise monitoring study revealed a mean noise level of 92.4± 3.9 dBA which was higher than NGL standard of 90dBA for eight hours duration per day. (See Fig 8) Mean noise levels were higher in the morning and evening observation periods in most stations monitored except a few cases such as in stations 5 where the afternoon noise level (93.5 dBA) was higher than the morning and evening mean noise levels (See fig 9). In station 9 the evening mean noise levels (92.2 dBA) was higher than both morning and afternoon mean noise levels. (See fig 10). And in station 14 the morning mean noise levels (94.8 dBA) was higher was higher than the afternoon and evening readings. (See fig 11).

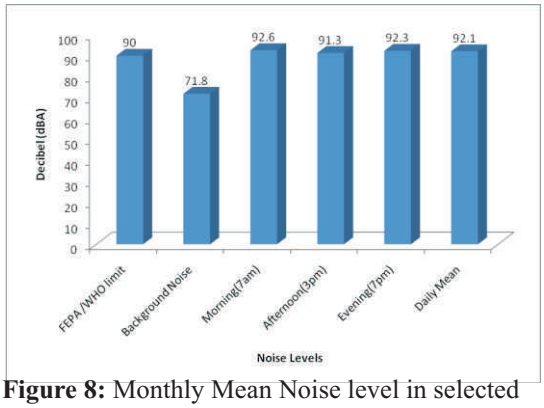

Figure 8: Monthly Mean Noise level in selected petrol stations in IbadanNorthLGA compared with National guideline limit (NGL)

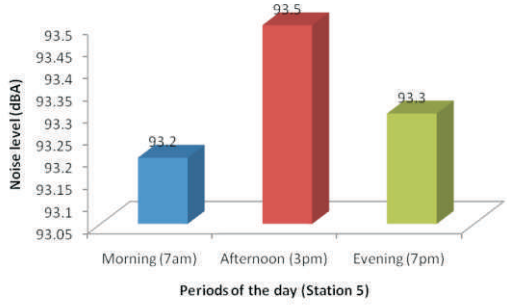

Figure 9: Variation in monthly mean noise level in station 5 by periods of the day

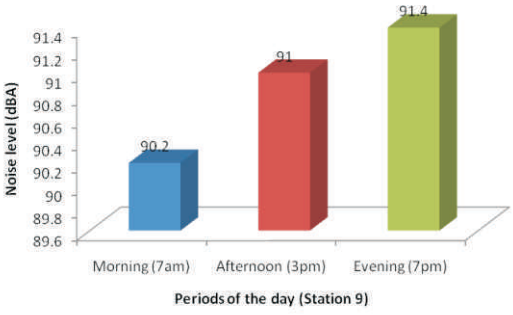

Figure 10: Variation in monthly mean noise level in station 9 by periods of the day

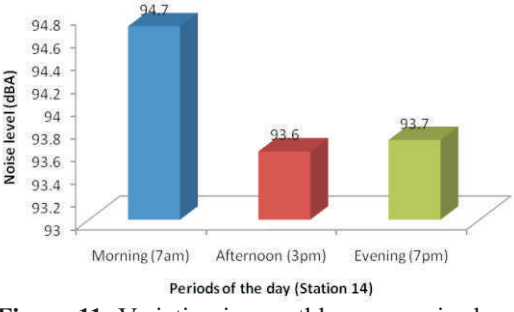

Figure 11: Variation in monthly mean noise level in station 14 by periods of the day

Discussion

Impact of traffic around petrol stations

Transport and in particular road traffic is the main cause of human exposure to ambient noise. Children chronically exposed to loud noise show impairment in reading skills, decline in attention and problem-solving ability. Noise can interfere with mental activities requiring attention, memory and the ability to deal with complex analytical problems. Adaptation strategies (tune out/ignore noise) and the efforts needed to maintain performance have been associated with high levels of stress hormones and blood pressure. There is emerging evidence of an association between hypertension and ischaemic heart diseases and high levels of noise (Keeble 1969).

Mean traffic density was 464.6±84.9 vehicles per hour which indicated high traffic flow literatures have confirmed it can cause social isolation and limit interpersonal networks of support, factors which have been found to be associated with higher mortality and morbidity in the elderly. Children who have the opportunity of playing unhindered by street traffic and without the presence of adults have been found to have twice as many social contacts with playmates in the immediate neighbourhood as those who could not leave their residence unaccompanied by adults due to heavy traffic. The fear of accidents is reported by parents as being the main reason for taking children to school by car. This hinders the development of children's independence and reduces their opportunities for social contact. It also has an influence on children's attitudes towards car use and personal mobility in adulthood. The lack of physical activity, including walking and cycling, is associated with mental ill health, including depression (NNPC 1991).

Findings in this study were contrary to studies by (Raji 2002) which saw petrol station as a nuisance and fire risk to the neigbhours. Petrol stations according to him are site for selling petroleum products, oil, other lubricants, and carrying our minor repairs such as mending punctures to regular servicing and motor body care including panel beating.

Impact of noise around petrol stations

Noise monitoring study revealed a higher noise level of 92.4± 3.9 dBA which is higher than NGL standard of 90dBA for duration of 8 hours per day. Increased noise level from traffic and generator noise could be responsible for increase rate of annoyance experienced by workers and residents within PS. This was in agreement with (Wikepedia 2010) who opined that petrol stations are noisy. Not only do they sell petrol, but many of them also provide maintenance and repair services. They are rather noisy because they attract vehicles. The location of some of these petrol stations caused traffic jams and emission of pollutant substances to the environment. Also, the location of some petrol stations can cause vital accidents, most especially in the built up areas. But despite all the problems, its importance to the economy cannot be overemphasized.

This study also collaborate findings that the relationship between noise and health is neither clear nor straightforward. Excessive noise can have a wide range of effects on individuals, ranging from disturbance to increased stress, loss of sleep, increased blood pressure, headaches and permanent damage to hearing. Studies of the effects of noise on health and well-being indicate that the outdoor level of noise should not exceed a daytime 65 dB(A). Residential/inhabited areas exposed to noise levels between 55 dB(A) and 65 dB(A) are undesirable from the health stand point and exposure to noise levels above 75 dB(A) is unacceptable because it can cause loss of hearing (Keeble 1969).

Conclusion

This research has carefully studied the traffic congestion and noise pollution around petrol stations as an undesirable social impact of petrol stations in Ibadan North Local Government

Area, Ibadan, Nigeria. The study concluded that petrol stations were number one contributors to traffic congestion and noise pollution in Ibadan North LGA.

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