ENVIRONMENTAL IMPACT OF COMMERCIAL MOTORCYLES IN KATSINA METROPOLIS: IMPLICATIONS FOR ENVIRONMENTAL SUSTAINABILITY

Abstract

The pattern globally nowadays is to reduce environmental pollution by all means as part of sustainable development goals. However, daily increase in the number of commercial motorcycles in Nigeria does not help in achieving this objective. It is for this reason, the present study assessed the environmental impact of commercial motorcycles in Katsina metropolis with special emphasis on air and noise pollution. A structural questionnaire and interviews were formulated, stratified random sampling technique was used in obtaining data. Ten (10) wards were selected from the twelve (12) wards of the local government area from which 150 completed questionnaires were received from randomly selected households. Also, the study used a structured interviews to collect relevant data from fifty (50) households respondents, (5) respondents in each of the ten (10) wards.

Additionally, a noise dosimeter was used to detect noise pollution in five (5) selected locations within Katsina metropolis namely; Katsina central market, Kofar kwaya round about, Batsari round about, a long Kofar Soro road and Kofar Marusa road. A descriptive analysis and dosimeter readings were used to present the results. The findings revealed that 72% of the respondents reported commercial motorcycles as a source of air pollution and the level of pollution in the area is very high, only 1% of the respondents indicated low air pollution. In terms of noise pollution, 78% of the respondents reported very high noise pollution. Results of noise dosimeters showed that Katsina central market location recorded 89.7dB (highest), while Kofar Soro road recorded 84.1dB (lowest). The result in central market location is higher than 55dB maximum permissible limit set by NESREA Act, 2007 and closer to 90dB permissible limit set by World Health Organization (WHO). The findings of the study has important implication on environmental sustainability in Nigeria.

Keywords: Environment, Impact, Commercial motorcycles, Katsina metropolis, Environmental sustainability.

INTRODUCTION

Commercial motorcycle popularly known as "Achaba" in the north and "Okada" in the South, is one of the cheapest mode of transport system in Nigeria. The popularity and wide spread acceptance of commercial motorcycle over other modes of transport is for its ability to reach areas where commercial vehicles may not reach due to bad road. In fact there is no road that is too narrow and there is no area too remote for motorcycles to reach. Unlike motor cars, they are able to take passengers to their door steps because of their capability to maneuver their way (Oladipo, 2012:233). Beyond all these, commercial motorcycles consumes less fuel than motor vehicles, cheaper to maintain and readily available spare parts than other forms of commercial transport. Another important factor that contributed to wide spread use of commercial motorcycles was the unfriendly socio-economic policies which manifested in the rate of urban unemployment, poverty and decayed social infrastructure in the area of public transport system (Micheal et al. 2013:206).

Over the years there have been some research into commercial motorcycles as a means of public transportation system in Nigeria. Extant literature associated commercial motorcycles operation with positive and negative implications: income (Arosanyin et al., 2011; Ogunrinola, 2011; Yakubu, 2012, Yahaya et al. 2017); accident predisposition (Oluwadiya et al., 2009; Solagberu et al., 2006; Iribhogbe and Odai, 2009; Morenikeji and Umaru, 2012, Joel, 2013); socio-economic characteristics of drivers (Olvera et al., 2012; Mahlstein, 2009; Beekers, 2009); public passenger traffic (Ogunsanya A. and Galtima A.,1993); poverty (Isiyaka and Wahab, 2014); criminality (Micheal et al., 2013). However, many of these studies felt short of identifying the environmental impact of commercial motorcycles, and concomitant effect on environmental sustainability. It is therefore the intention of this study to establish whether commercial motorcycles have any negative environmental impact in Katsina metropolis. Oladipo (2012:237) supports this effort by arguing that "the emission from bikes is adding to the pollution of the environment and suggested for the need of scientists to conduct research to measure the actual effect of this pollution. The life expectancy in Nigeria is put at 46/47years compared to over 70years in Britain and America and even over 80years in Canada. The pattern globally nowadays is to reduce environmental pollution by all means. Daily increase in the number of commercial motorcycles in Nigeria does not help in achieving this objective" (Oladipo, 2012:237).

LITERATURE REVIEW

Critics of commercial motorcycles have argued that the business has indeed increased the number of road accidents, leading to the loss of lives and in many cases permanent disabilities to victims. For example, in Ile-Ife, Osun State of Nigeria, Olabode et al. (2013) used simple percentages to examine the socioeconomic challenges of road accidents among motorcyclists. Simple random sampling technique was used to select 1,000 motorcyclists as the sample size. The results showed more than 70% of the respondents have at one time or the other involved in road traffic accidents. Similarly, in Lokoja, Nigeria, Aderamo and Olatujoye (2013) applied Ordinary Least Squares (OLS) model in the form of multiple regression analysis and examined the trends of motorcycles accidents from the period 2000-2009. The results revealed a significant relationship between the number of accidents, number of injuries, number of deaths and the increasing number of registered motorcycles in the city. Still on accident, Joel (2013) in Makurdi, Nigeria, used data obtained from the police, hospitals and commercial motorcyclists that were involved in accident as well as personnel of traffic law enforcement agencies. The findings revealed an average of 284 commercial motorcycles accidents per year occurred in Makurdi metropolis, resulting in an annual average of 224 deaths, and 188 injuries. Recklessness of commercial motorcyclists accounted for 28 percent of accidents and 30 percent of deaths, over speeding accounted for 27 percent of accidents and deaths respectively, non-adherence to traffic rules accounted for 18 percent of accidents and 16 percent of deaths, obstruction on the path of riders accounted for 17 percent of accidents and 16 percent of deaths. In Igbo-Ora community of Oyo state, Nigeria, Owagen, et al (2005) used Chi-square and logistic model to examine the incidence of accidents and pattern of non-fatal injury among 299 commercial motorcyclists. The outcome showed that 45% of the respondents had involved in road accident for at least once. In Calabar, Nigeria, Micheal et al. (2013) used simple percentage and Chi-square test to examine the abolition of commercial motorbikes in the metropolis and its implications on transportation and criminality. The findings revealed factors such as upsurge in criminal activities, rise in traffic accidents, traffic congestion and recklessness on the part of the operators of commercial motorcycles among others account for the abolition of motorcycles as a means of transportation.

However, despite the problems and challenges of commercial motorcycles, the business has impacted significantly on the Nigerian economy and society in many ways. One important positive impact is the provision of employment for millions of unemployed people. Hassan et al. (2017), in Gombe metropolis, Nigeria used simple percentage and Chi-square test to appraise the socio-economic impact of commercial motorcycle. The findings showed that commercial motorcycle business is dominated by youth, majority of them are in the age bracket of 21-30, and 74% of them rely on the business to sustain their families. In Abeokuta and Adede local governments of Ogun state, Nigeria, Adenike et al (2012) applied simple percentage and t-test on 100 randomly selected respondents to examine the effect of socio-economic survival of commercial motor cyclists (Okada riders). The finding shows that majority are engaged in the business because of the pressing need to survive and sustain their families. Oladipo (2012) also, pointed out commercial motorcycle (Okada) business has impacted positively on the society in many ways. One important positive impact is the provision of employment for thousands of unemployed people. According to him, many unemployed youths and retired people have found gainful engagement in the commercial motorcycle business. Furthermore, even those who are employed in the government service still engage in the business either as owners or riders to augment their regular income. Commercial motorcycle operators have also contributed to government revenue generation. For example, in Lagos and Ogun states of Nigeria, Oluranti (2011) applies descriptive statistics and Ordinary Least Square (OLS) method to examine the roles of commercial motorcycles towards generating self-employment and income for the two states. The results shows commercial motorcycle is one of the major sources of revenue and employer of young school leavers.

Over the years, there has been some research into socioeconomic impact of commercial motorcycles in Nigeria as highlighted in the above literature, but there has been little research into the environmental impact, particularly from environmental sustainability perspective. It is therefore the intention of this study to establish whether commercial motorcycles creates air and noise pollution in Katsina Metropolis.

STUDY AREA

Katsina is located between the latitude 12.24^{0}C W-70.12^{0}C E and longitude 6’25’^{E}-9’2^{E}. Katsina metropolis is the local government headquarter and capital of Katsina state. It shared border with four local government areas, among which are Rimi to the east, Batsari at west, Batagarawa

to the south and Kaita to the North. The 2015 projected population put Katsina local government at 452,065. In the recent times, the area has experienced a lot of developmental activities which include building of two universities, road dualization, ring road, housing estates and a modern stadium. The spade of development in the city has increased human activities given rise to more number of commercial motorcycles movement from one location to another.

METHODOLOGY

A structural questionnaire and interviews were formulated to assess the environmental impact of commercial motorcycles transportation in Katsina metropolis. Stratified random sampling technique was used in obtaining data. Ten (10) wards were selected from the twelve (12) wards of the local government area from which 150 completed questionnaire were received from randomly selected households. Each questionnaire was checked for errors to ensure completeness and readability of the data. Also, a structured interviews were used to collect the relevant data from fifty (50) households respondents, (5) respondents from each of the ten (10) wards. Ethical clearance was sought from Katsina Local Government Council Chairman and Commercial Motorcycle Association. Respondents were assured that all the information they provided is for the purpose of the study and it will be confidential. Respondents were told they have right of refusal to participate in the survey, and can withdraw at any point during the survey. Additionally, a noise dosimeter was used to detect noise pollution in some selected areas of Katsina metropolis namely; Katsina central market, Kofar kwaya round about, Batsari round about, a long Kofar Soro road and Kofar Marusa road. A descriptive analysis and dosimeter readings were used to present the results.

FINDINGS

Demographics

Table 1 below showed that 78% of the respondents are males and 22% are females. This has indicated more males responded to the studies. This is partly due to the fact that males dominated all activities in the area.

Table 1: Gender of respondents

Gender	Frequency	Percentage (%)
Male	117	78
Female	33	22
Total	150	100

Source: Field Survey, 2013.

According to table 2 below, 76% of the respondents are married and 24% are single.

Table 2: Marital status of the respondents

Marital status	Frequency	Percentage (%)
Married	114	76
Single	36	24
Divorced	-	-
Widowed	-	-
Total	150	100

Source: Field Survey, 2013.

As noted in table 3 below, 37% of the respondents were in the middle age group while 32 % were in the age group between 31- 39 and only 3% are below 18 years. This indicated that middle age dominated the study.

Table 3: Age category of the respondents

Age group	Frequency	Percentage (%)
Below 18 years	5	3
19-24	9	6
25-30	33	22
31-39	48	32
40 and above	55	37
Total	150	100

Source: Field Survey, 2013.

Respondents were asked in table 4 below to indicate whether commercial motorcycles (Kabu-kabu) augment the inadequate mode of commercial transportation within Katsina metropolis. 46 % indicated to some extent commercial motorcycles augment transportation while 32% of the

respondents said commercial motorcycles have augmented transportation. 22% reported that commercial motorcycles does not augment inadequate transportation in the area. Implying that there is a positive impact

Table 4: Means to augment inadequate mode of transportation

Augment in adequate mode of commercial transportation	Frequency	Percentage
Yes	48	32
No	33	22
To some extent	69	46
Total	150	100

Source: Field Survey, 2013.

Respondents were asked whether commercial motorcycle is a convenient mode of transportation.

Table 5 below showed that 44% of the respondents were of the view that commercial motorcycles are not a convenient mode of transportation and 41% have agreed to some extent while 15% have indicated, it is a convenient mode of transportation.

Table 5: Level of convenience

Convenience	Frequency	Percentage
Yes	23	15
No	66	44
To some extent	61	41
Total	150	100

Source: Field Survey, 2013.

Respondents were asked to indicate whether they use commercial motor cycles in a situation of traffic congestion to fasten their movement, 80% of the respondents agreed they use it as means of transport in the situation of congestion. 20% said to some extent and none of the respondents disagree. This is an indication, despite the inconveniences, people use commercial motorcycles to ease their movement as shown in table 6 below.

Table 6: Motorcycle and fast mobility in situation of traffic congestion

Permits fast mobility	Frequency	Percentage
True	120	80
False	-	-
To some extent	30	20
Total	150	100

Source: Field Survey, 2013.

Respondent were asked whether it is one of the causes of air pollution. 72% of the respondents indicated that the air pollution tendency of commercial motorcycle is high, 27% indicated it is moderately high and only 1% indicated very low as in table 7 below.

Table 7: Air pollution caused by commercial motorcycle

Air pollution	Frequency	Percentage
Very high	108	72
Moderately high	40	27
Very low	2	1
Total	150	100

Source: Field Survey, 2013

In terms of noise pollution, table 8 below shows 78% respondents have indicated that the rate at which commercial motor cycle caused noise pollution is very high.

Table 8: Noise pollution caused by commercial motorcycle

Noise pollution	Frequency	Percentage
Very high	117	78
Moderately high	33	22
Very low	-	-
Total	150	100

Source: Field survey, 2013.

RESULTS OF IN-DEPTH INTERVIEW

This study used triangulation in order to cross-validate data obtained from the respondents. The main purpose of triangulation is to enhance the credibility of the data by providing multiplicity of perspectives from respondents.

In the present times, many people embrace commercial motorcycle business due to economic down turn and financial difficulties to make ends meet. Katsina state being second poorest state in Nigeria, having poverty level of more than 70% (NBS, 2013), many people are into the business to augment a meager compensation earned from employers while some youth are into it due to unemployment. Recently, politicians often buy motorcycles in hundreds and distributed to their supporters to gain patronage. These motorcycles are in turn used for commercial purposes. Housewives also purchase and convert them into hire service in order to improve their living status. All these contributed into an upsurge of motorcycles used for commercial transportation in Katsina metropolis and has direct bearing on human and environment.

A structured interview with 50 respondents was carried out with a view to acquire more information to support the information earlier obtained.

As earlier mentioned, the popularity and wide spread acceptance of commercial motorcycles over the other modes of transport in Nigeria is because of its ability to reach areas where commercial vehicles may not reach due to bad road and take passengers to their door steps.

When asked about these advantages, one of the respondents has this to say;

Traffic congestion is presently very high in the metropolis, and there are quite number of areas that do not permit free movement of cars or other bigger vehicles, therefore people in need fast mobility usually ride on commercial motorcycles.

This assertion corroborated findings in Table 5 and 6, that to many people, commercial motorcycle mode of transport is convenient, fast, and eases transportation challenges, especially for people living in the areas that are difficult to access by cars and bigger vehicles due to poor urban and regional planning in the developing countries.

Part of environmental hazard of a road usage is the vehicular air pollution. Exhaust fumes from motorcycles are major source of atmospheric pollution. The fumes which are emitted contains four main types of pollutants namely; carbon dioxide, unburnt hydrocarbons, aldehydes and other gaseous.

Respondents lamented,

The thick smoke and other gaseous emissions being noticed is from commercial motorcycle which tend to emit more than other vehicles and one find it very difficult in breathing and sometimes pain in the eyes.

Another respondent corroborated,

The reason for the thick smoke emitted by commercial motorcycles is that, the motorcyclists are in the habit of mixing engine oil with fuel. Their belief is, it permits greater lubrication of the engine and also help to economize the fuel usage.

Table 7 agree with this assertion that commercial motorcycles creates a high level of air pollution.

Added to the above hazard is the noise pollution. Noise pollution is also a major environmental problem caused by traffic, especially in urban areas. Environmental noise pollution has been defined as an unwanted or harmful out door sound created by human activities. This includes noise emitted by means of transport and from sites of industrial activities (Anomohanram et al., 2008:2). According to Leventhall (2003), low frequency noise and sound are similar acoustic waves carried on oscillating particles in the air. In a nut shell, noise is sound that is too loud or that is unpleasant or disturbs the listeners. The noise levels can also disturb domestic life like sleeping and relaxation and may well affect the hearing of people. Motorcycles noise disturb people through blowing of horns and sound of engines.

Respondents have shown concern on the high level of noise pollution caused by motorcycle especially on the road, around roundabouts, and hold ups.

Respondents pointed out that,

The frequency of noise pollution by commercial motorcycles is indeed high and people get disturbed by the many sound of motorcycle engines and the frequent blow of horns.

The above statement corroborated with findings in table 8 when respondent were asked to comment on the level of noise pollution in the study area.

DETECTION OF NOISE POLLUTION USING NOISE DOSIMETER READER

To detect the level of noise pollution in Katsina metropolis, five locations were strategically taken to give a good coverage of the areas were people experience high level of noise in the metropolis. In all the locations, noise dosimeter was set on automatic mode to run continuously for thirty minutes at every instance and it was recorded five times in each location. Afterwards the average mean equivalent noise level was calculated by the instrument in each location. The recording was done between 5: pm-5:30pm in each location. The rationale behind the timing was 5: pm to 5.30Pm used to be the busiest period in Katsina metropolis. Many people close shops, western and Islamic schools closes around that period.

Table 9: Noise pollution in some selected areas of Katsina metropolis

S/N	Location	Area/Road	Time	Noise pollution reading
1	L_1	Katsina central market	5:00-5:30pm	89.7dB
2	L_2	Kofar Kwaya round about	5:00-5:30pm	85dB
3	L_3	Batsari Round about	5:00-5:30pm	87.1dB
4	L_4	Kofar Soro road	5:00-5:30pm	84.1dB
5	L_5	Kofar Marusa road	5:00-5:30pm	85.7dB

Source: field measurement, 2013.

According to the results in table 9, the level of noise for all the five locations measured by dosimeter reader fell above the National Environmental Standard and Regulation Enforcement Agency (NESREA) ACT, 2007 maximum permissible noise limit for the day time from 6am-10pm in a mixed residential and commercial areas which was pegged at 55dB. When compared with the World Health Organization (WHO) standard of 90dB, the results fell below the permissible limit set by WHO. In fact the value of the results in the five location are closer to the permissible limit of WHO and above the NESREA permissible limit. Katsina central market location recorded 89.7dB (the highest), while Kofar Soro road recorded 84.1dB. The reason central market location recorded the highest level of noise is because it is the meeting point where people from different locations within and outside Katsina metropolis meet for commercial undertakings.

IMPLICATIONS OF COMMERCIAL MOTORCYCLES TRANSPORTATION ON ENVIRONMENTAL SUSTAINABILITY

Making reference to public perception on the impact of commercial motorcycles as means of transportation on the environment of Katsina metropolis, a greater 72% of the respondents observed commercial motorcycles are source of air pollution and the level of pollution created is very high. Only 1% of the respondent showed that air pollution caused by motorcycles is very low. This confirmed the general perceptions that vehicles cause pollution and vehicular air pollution contribute to global warming, atmospheric ozone depletion and acid rain. The emitted hydrocarbons, nitrogen oxides and carbon monoxide caused or contributed to adverse health problem in humans and aquatic ecosystem. Even though transport is believed to be one of the worst defilers of the environment. Its effect on the health of people and ecology to say the least is

deplorable. Accordingly, the impact of emitted hydrocarbons by automobiles (motorcycles inclusive) was projected to increase the average global temperature by about 3.5^0C by 2100 (Climate Action Tracker, 2012), well above 2^0C of warming considered by many as threshold for triggering dangerous climate change (UK. Met office, 2010).

On the impact motorcycles on the level of noise pollution, majority of the respondents 78% perceived that the level of pollution caused by commercial motorcycle is very high and none of the respondents disagree. Also the results of noise dosimeter in some selected locations shows that the level of noise is very high. This is in line with Onuu (1999) observation that road traffic noise constitutes the largest proportion of environmental noise in Urban areas. Therefore the implication of noise pollution according to Ochsner (2003) is that depending on the amount and length of time one is exposed to, noise damage hearing ability of people. She further explained, sounds that are louder than 85 dB are potentially hazardous. Menkiti (1976) also shared the same opinion, and indicated there were many deaf people in Nigeria caused by exposure to loud noise but it is not known their deafness is caused by exposure to loud noise because often hearing loss occur gradually. For this reason many people do not become aware until it is too late.

Overall, this implies that one best way to ensuring environmental sustainability is to develop more policies that will tackle the issue of environmental pollution caused by commercial motorcycles in Nigeria.

CONCLUSION

This article intended to establish whether commercial motorcycle mode of transport has any environmental impact in Katsina metropolis. Air and noise pollution were identified among the causes environmental degradation. The study seek the public perception and found that72% of the respondents said motorcycles are source of air pollution and the level of pollution created is very high. It was also found that noise pollution in the study area is very high. 78% of the respondents attested. The findings of noise dosimeter also concurred with the respondent's perception.

We have to note that quite a number of people have called for the outright banning of commercial motorcycle transport due to its negative impact on the society. States like Lagos, Rivers, Abia, Borno, Adamawa, Gombe, Plateau, Yobe, Kaduna, Federal Capital Territory-

Abuja and even Cross River (the state that started commercial motor cycle business) have all banned the use of motorcycle as a means of public transportation. Even though some believed it has provided people jobs and easy access to various destinations that are difficult to access by cars and buses. Based on this, the study posits that, since commercial motorcycles use in Katsina metropolis is becoming inescapable. It is recommended that government should discourage the commercial motorcyclists from using the motorcycles that permit the mixture of engine oil and fuel. The mixture produce too much smoke and pollutants that are dangerous to the environment. This can be achieved by enlighten the motorcyclists through the agencies of government namely; Federal Road Safety Corps (FRSC) and National Environmental Standard and Regulation Enforcement Agency (NESREA). Also through these agencies, government can stop the motorcyclists from instilling and blowing horn unnecessarily. Furthermore, motorcyclists can also be compelled to service their engine regularly for better performance and less engine sound. Finally, government may decide to introduce a levy to motorcyclists as polluter pay and the levy collected can be used to protect the environment through growing forest that can absorbs the emitted gases. It is interesting to note, environmentalists have shown that managed forests provide climate change mitigation benefits over time through sequestering carbon, and thus reducing the amount of carbon dioxide released in the atmosphere (Ruddell et al., 2007, Nosiru et al, 2013).

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