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Evaluating the Air Pollutant in MOUAU Old Female Hostel with Special Reference to CO_2

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ABSTRACT
Air pollution is a huge problem which has the potential to affect everyone. Evaluating the Air Pollutant in MOUAU Old Female Hostel with Special Reference to CO_2 was carried in this study. The air sampling equipment used for this research work was Extech gas analyzer. The gas detector was set and mounted 5meters for five minutes to absorb air pollutant at a specific location and after that, readings was recorded. The hostel consist of five blocks, out of the five blocks, two were selected randomly as sampling stations block and samples were taken at different time intervals (6.am,12 noon and 6.pm). At each of the sampling block, a sampling point was selected and the sample was collected for one month. Data in numerical and tabular form was presented and analyzed using mixed effect models with random subject effect for repeated measurement. The CO_2 mean values ranged from 387 to 405ppm in Hostel D and 370 to 436ppm in Hostel A. The values of CO_2 obtained in the present study were below the recommended WHO thresh hold limit value (TLV) of 500ppm, indicating that CO_2 level in both Hostel A and D are within the acceptable level and hence will not pose any health challenge to the students.
Keywords: *Air pollution, CO2, Umudike, Pollutants, Air-quality, Nigeria*

INTRODUCTION
There is nothing quite like opening the door and breathing fresh air. But how clean is the air you are breathing? The gases which are sucked up through the nose could be slowly killing. According to the world health organization, 2 million people die prematurely from the effect of polluted air every single year. Air pollution is a huge problem which has the potential to affect everyone. The atmospheric air is an element in the physiochemical component of the human environment, (Nwakanma *et al.,* 2016). The composition and percentages are: Oxygen-21%, Nitrogen-78%, Carbon dioxide-0.04%, Noble gas about1%, Water vapor, dust and others- variables percentage (NRC, 2001). The composition of carbon we breathe in is determined by a delicate balance in nature. However, many of our activities increase the amount of carbon dioxide in air and introduce undesirable substances known as pollutants into the air. Air pollution is one of the severe problems the world is facing today. Air pollution deteriorates ecological condition and can be defined as the fluctuation in any atmospheric constituent from the value that would have existed without human activity (Akpansi , 2003). Air pollutants include Particulate Matters(pm), Ozone (o_3) ,Carbon monoxide (CO), Carbon dioxide (CO_2),Sulfur dioxide (SO_2) , Nitrogen dioxide (NO_2) and Lead (pb). We come in contact with many kinds of air pollutant every day. Depending on the kind and amount emitted .These pollutants may affect air quality at the local, regional and global scale. Smoke from stoves, motor vehicle exhaust, burning of waste that contain

poisonous substances, are pollutants mixture that can affect air quality in our neighborhood, communities and homes. Concern over air pollution have become the bases for the exploitation of suitable alternative to which passive ventilation is needed for indoor thermal comfort and cooling of students hostels (Trivedi *et al.,* 2003). Ventilation is required among other needs to supply sufficient oxygen for respiration and maintenance of safe carbon dioxide concentration within acceptable limits. The chemical composition of the atmosphere is being altered/changed by the addition of gases, particulates and volatiles substances, which may be toxic to living beings. The levels of air pollutants are rapidly increasing in urban, periurban and rural areas in many megacities (urban population greater than 10 million) of the developing world (Agrawal, 2005; 2006). Increased numbers of motor vehicles, power generation, domestic fuel use, refuse burning and other miscellaneous sources contribute to the problem of air pollution in Nigeria. Natural ventilation can be induced by wind pressure, temperature difference, humidity difference (cool tower effect) or combination of any or all of the three (WHO, 2005). One of the greatest problems in female hostel today is inadequate ventilation which directly hampers thermal comfort of an enclosed space and amount to high energy consumption. Air pollution is woven throughout the fabric of our modern life.

Pollution problem began with growth of cities and population and their related water, industrial and disposal needs (Nwakanma *et al.,* 2016). The problem of air pollution is a serious threat to environmental health in many cities of the world (Baldassano *et al.,* 2003). High concentration levels of air pollutants have been shown to have general adverse effects on human health (Burgar *et al.,* 2004). The air quality standard indicated the levels of pollutants that cannot be exceeded during a specific time period in a geographical area. The emission from industries and other sources affect the ambient air. The Federal Ministry of Environment had given guideline for Nigeria ambient air limit for conventional pollutants (USEPA, 2007). In Nigeria, the problem of air pollution has assumed serious proportions in most of the major metropolitan cities, where vehicular emissions contributed about 72% and industrial emissions about 20% to the ambient air pollution (Garg *et al.,* 2001). The aim of this study is to evaluate the air pollutant in MOUAU old female hostel with special reference to CO_2.

MATERIALS AND METHOD

The study was carried out in the old female hostel of Michael Okpara University of Agriculture Umudike.

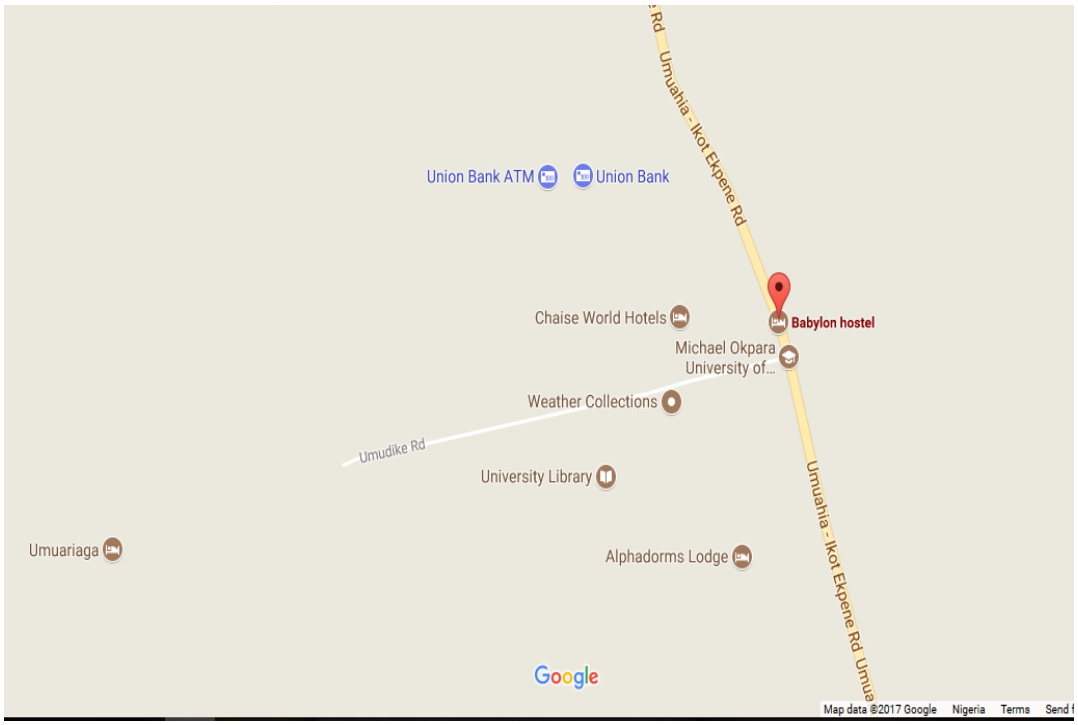

Fig 1. Map of Umudike using Goggle.com

The air sampling equipment used for this research work was Extech gas analyzer. This equipment has an inbuilt electrochemical sensor which response to varying degree of toxic gases and gives insitu analysis. The gas detector monitors flammable gas, toxic gases or oxygen, provides alarm and direct display of gas concentration data on the monitor screen of the equipment. It is dust and watertight. It has adjustable sample rate depending on gas concentration. The gas detector was set and mounted 5meters for five minutes to absorb air pollutant at a specific location and after that, readings was recorded. The hostel consist of five blocks, out of the five blocks, two were selected randomly as sampling stations block and samples were taken at different time intervals (6.am,12 noon and 6.pm). At each of the sampling block, a sampling point was selected and the sample was collected for one month. For the purpose of this analysis, one parameter was critically checked. Which include carbon (iv) oxide. The concentration of this parameter was monitored by continuous monitoring equipment for a period of one month.

About 0.035%(350 ppm) of air consist of carbon dioxide. Carbon dioxide with water vapor is primarily responsible for the absorption of infrared energy re-emitted by the earth so that some of this energy is reradiated back to earth's surface (USEPA, 2007).

	Sample	Temperature	Relative Humidity	CO_2
Hostel A				
	Week 1	$27.06^{ab}\pm0.10$	$84.19^{a}\pm5.80$	$407.67^{a}\pm34.69$
	Week 2	$26.64^{b}\pm0.29$	$85.21^{a}\pm7.41$	$370.00^{a}\pm17.00$
	Week 3	$27.19^{a}\pm0.33$	$77.52^{a}\pm7.57$	$436.45^{a}\pm63.21$
	Week 4	$26.66^{b}\pm0.28$	$77.64^{a}\pm7.08$	$408.00^{a}\pm032.51$
Hostel D				
	Week 1	$26.97^{a}\pm0.14$	$82.89^{a}\pm8.51$	$394.56^{a}\pm44.38$
	Week 2	$26.61^{a}\pm0.32$	$91.85^{a}\pm2.79$	$387.00^{a}\pm52.65$
	Week 3	$26.89^{a}\pm0.30$	$83.14^{a}\pm13.81$	$405.67^{a}\pm49.60$
	Week 4	$26.62^{a}\pm0.64$	$80.81^{a}\pm6.52$	$391.66^{a}\pm43.19$

Changes in the atmospheric carbon dioxide level will subsequently alter the earth's climate through the greenhouse effect. The most obvious factor contributing to increased atmospheric carbon dioxide is consumption of carbon-containing fossil fuels. For the purpose of understanding of the status of air quality within the female hostel, descriptive statistics will be employed to present data in graph and bar chart. The interaction of the gases in the table was best explained using the modeling technique by USEPA (2006). Data in numerical and tabular form was presented and analyzed using mixed effect models with random subject effect for repeated measurement. Also, ANVOA (analysis of variance) was used to monitor the mean variance of the pollutant concentrations in the female hostel.

RESULTS AND DISCUSSION

Table 1 Evaluation of CO_2level of air pollutant in female Hostel A and D

Means with different superscript within the same column are significantly different ($p<0.05$) CO_2 is a colorless and odorless gas emitted from sources such as combustion, cement production, and respiration (Olayinka *et al.,* 2015). The result of the CO_2 level in female hostel A and D is presented in Table 1. From the result it can be observed that there was no significant difference ($p<0.05$) in the CO_2 level from Week 1 to Week 4. The CO_2 mean values ranged from 387 to 405ppm in Hostel D and 370 to 436ppm in Hostel A. This range value was however; lower than those earlier reported by Olayinka *et al.,* (2015) on major highways in Abeokuta. The high CO_2 level in the earlier report could be due to high traffic volume on the highway. Carbon dioxide (CO_2) may arise from the combustion of coal for domestic cooking at various points in the hostel. The values of CO_2 obtained in the present study were below the recommended WHO (2005) thresh hold limit value (TLV) of 500ppm indicating that CO_2level in both Hostel A and D are within the acceptable level and hence will not pose any health challenge to the students. There was no significant difference ($p<0.05$) in the temperature and relative humidity of Hostels A and D. The temperature values as observed in the result were slightly below the ambient temperature of 25°C. The temperature mean values ranged from 26.66 to 27.19°C in Hostel A and 26.61 to 26.97°C in hostel D. Air pollution continues to be a very significant health concern of people living in hostel, contributing to the overall impact of ambient air pollution. The

concentration of pollutant CO_2 varies from both spatially (location) and temporary (by time). CO2 level at the study area mean value ranged from 387 to 405ppm in hostel D and 370 to 436 in hostel A. This ranged value was below the WHO (2005) threshold limit value (TLV) of 500ppm indicating that the CO_2 level in both hostel A and D are within the acceptable level. Also the concentration of CO_2 in the study area is below the USEPA limit. CO_2 emission in hostel A is heavier compared to hostel D due to their improper refuse disposal and lack of ventilation. CO_2 emission is a common occurrence around the area during the peak hours of morning, afternoon and evening.

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