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Comparative Analysis of the Concentration of Greenhouse Gases in Michael Okpara University of Agriculture, Umudike

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Abstract:
Background*: Concentration of greenhouse gases in the atmosphere has increased rapidly due to anthtopogenic activities resulting in significant increase in temperature of the Earth causing global warming. Assessing the greenhouse émissions is an important step towards making quantifiable émission reduction. This study focuses on estimating the concentration of greenhouse gases émission in Michael Okpara University of Agriculture (MOUAU), umudike.*
Materials and Methods*: In this comparative study, the concentration levels of Carbon monoxide CO, Sulphur IV Oxide SO_2 and Nitrogen IV Oxide NO_2 were measured in using Crowncon gasman monitor model CE89/336/EEC (Handheld) in Seven different different locations scattered spread across theUniversity in two consecutive days in September, 2015.*
Results*: The value for the concentration of measured gases are by far above Federal Environmental Protection Agency(FEPA) standard. SO_2 recording an average value of 0.87ppm above 0.10ppm FEPA Standard, while NO_2 recorded 0.17ppm above 0.06ppm FEPA Standard and CO with an average value of 10.47ppm above1.00ppm FEPA Standard.*
Conclusion: *Dumpsites, high vehicular activities and prolonged usage of both diesel and Petrol generator sets has accounted for large concentration of these gases beyond the required FEPA Standard within the University community and its conurbations.*
Key Word*: Greenhouse Gases; Emmission; Sulphur IV Oxide; Nitrogen IV Oxide; Carbon Monoxide; Concentration.*

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I. Introduction

Increased interest in quantification of greenhouse gas emission is the result of growing public awareness of global warming. Many global metropolitan cities and organizations do estimate their greenhouse emissions with a mind to developing strategies to reduce their emissions. From Intergovernmental Panel on Climate Change (IPCC), Carbon dioxide (CO_2) , Methane (CH_4), Nitroxide(N_2O), Hydro fluorocarbon (HFCs), perflourocarbons (PFCs) and Sulphur hexafluoride (SF_6) are major greenhouse gases. [1,2,3,4]. Uncontrolled disposal generates serious heavy metals pollution occurring in the water, soil, and plants [6], open burning is cause of CO, CO_2, SO, NO, PM_{10} and other pollutant emissions that affect the atmosphere [7], waste picking within open dump sites pose to serious health risk people working on these areas [8], release of SW in water bodies improve the marine litter globally, enhancing environmental contamination [9]. Therefore, Solid watste (SW) mismanagement is cause of sever and various environmental and social impacts, which do not allow improvements in sustainable development[5]. Worldwide, net emissions of greenhouse gases from human activities increased by 43 percent from 1990 to 2015. Emissions of carbon dioxide, which account for about three-fourths of total emissions, increased by 51 percent over this period. As with the United States, the majority of the world's emissions result from transportation, electricity generation, and other forms of energy production and use.[10,11]. Concentrations of carbon dioxide and other greenhouse gases in the atmosphere have increased since the beginning of the industrial era. Almost all of this increase is attributable to human activities.[2] Historical measurements show that the current global atmospheric concentrations of carbon dioxide are unprecedented compared with the past 800,000 years, even after accounting for natural fluctuations.[11] There was been no effort to determining the types of greenhouse present and their concentration levels within the study area and its conurbations. The current study aims at determining the presence of some greenhouse gases and their concentration as against Federal Environmental Protection Agency (FEPA) standard within the study area.

II. Material And Methods

This study was carried out within the vast spread of Michael Okpara University of Agriculture, Umudike, Abia State on September, 2015 within 2 consecutive days.

Study Design: On site and open air measurement

Study Location: Seven key locations were carefully selected spread across the University environs and its conurbation. The location are; Gate Six (University man entrance), Administrative block, , Administrative power house, Computer village (Point 1), Computer village (point 2), College of Physical and Applied Sciences (COLPAS), and Engineering workshop.

Subjects & selection method: The choice locations for onsite open air measure was based areas of human traffic and vehicular/ business activities.

Material/ Apparatus: The following instruments were used for the study namely; Anemometre and Crowncon gas monitor (89/336EEC).

Method: It is important to perform the zero adjustment before taking the reading in a clean environment with respect to the environment being monitored. Zero the unit and set to the "low" position to begin monitoring of gases. Reading form the measurement was analyzed using Microsoft excel and results compared against FEPA standards.

III. Result

From Table One, and for SO_2, Gate Six which is the main entrance into the University has a high value of 0.94. Computer village which is the business hub within the school for Staff, Students, and other members of the University community and its conurbation records the highest values of 1.69 and 1.38 for point 1 and 2 respectively. The Administrative block which houses the principal officers (with the exception of the Library/ Librarian), senate and lots more records the second lowest value of 0.2. COLPAS building records the lowest value of 0.18.

For NO_2, Gate Six records the highest value of 0.41and COLPAS building recording the lowest value.

For CO, Gate Six records the second highest value of 15.0. Engineering workshop records the lowest value of 1.0.

Table 1: Concentration of SO2, NO@ and CO measured at different locations for Day One compared with FEPA Standard

LOCATION	SO_2 (ppm)	NO_2 (ppm)	CO (ppm)
Gate Six	0.94	0.41	15.0
Engine Workshop	0.86	0.14	1.0
Computer Village Point 1	1.69	0.26	15.1
Computer Village Point 2	1.38	0.14	13.9
Administration Block	0.2	0.13	3.5
Admin Power House	0.4	0.19	6.9
COLPAS Building	0.18	0.09	8.9
AVERAGE	0.81	0.19	9.19
FEPA Standard	0.1	0.06	1

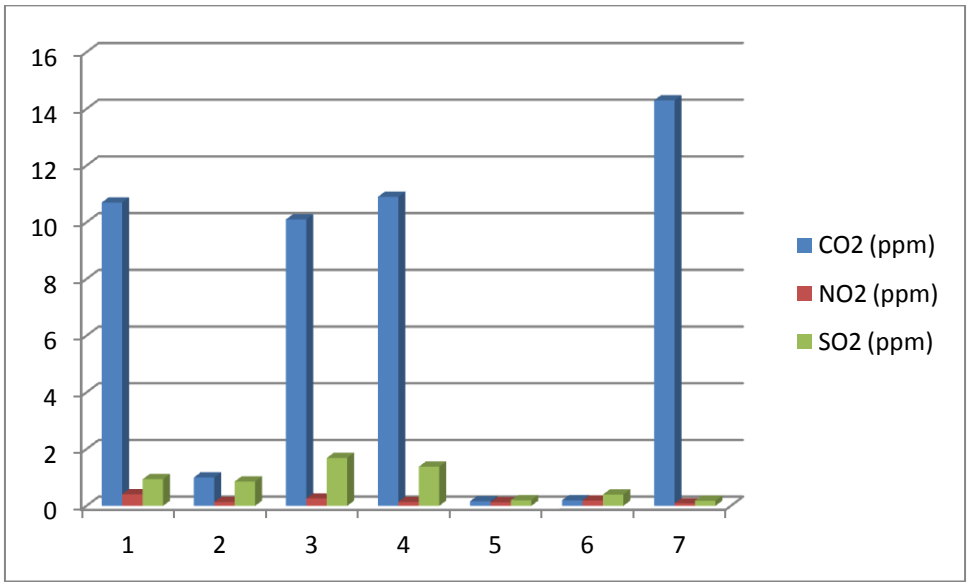

Figure 1: Concentration of SO_2, NO_2 and CO for the seven sites for Day one

From Table Two, and for SO_2, Computer village (Point 1 and 2) records the second and highest values respectively, with Administrative block recording lowest value of 0.58.
For NO_2, Gate Six and Computer Village Point 1 recorded the joint highest value Administration of 0.26. Administration power house recorded the lowest value of 0.02.
For CO, Administration Power House recorded the highest value of 35.7, followed by computer village point 2 with value 35. Administration block records the least value.

Table 2: Concentration of SO2, NO2 and CO measured at different locations for Day Two compared with FEPA Standard

LOCATION	SO_2 (ppm)	NO_2 (ppm)	CO (ppm)
Gate Six	0.84	0.26	1.5
Engine Workshop	0.86	0.14	1.0
Computer Village Point 1	1.06	0.26	5.0
Computer Village Point 2	1.38	0.18	35.0
Administration Block	0.58	0.06	0.5
Admin Power House	1.03	0.02	35.7
COLPAS Building	0.7	0.09	3.5
AVERAGE	0.92	0.14	11.74
FEPA Standard	0.1	0.06	1

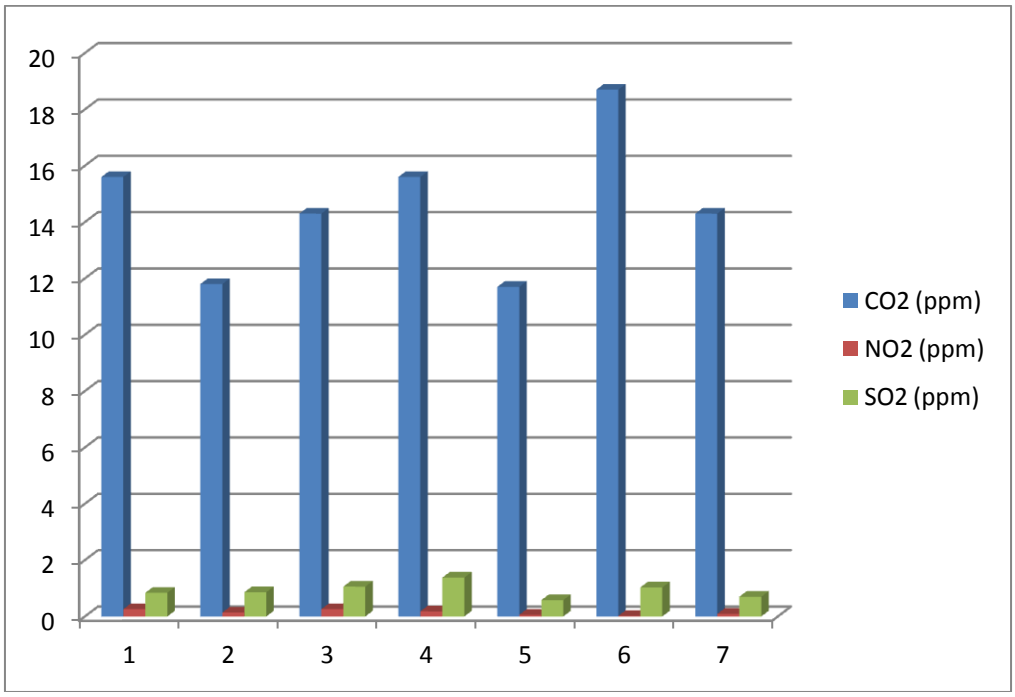

Figure 2: Concentration of SO_2, NO_2 and CO for the seven sites for Day Two

IV. Discussion

From the results, all the site from which measurements were taken exceeded the FEPA standard, hence beyond human allowed threshold.

High values recorded for CO at some sites corresponds to site with high vehicular activities, power generator which serve as alternative to the erratic public power supply. This CO results mainly from incomplete combustion for from vehicles and power generators thus heightened by the increased activities of theirs inthese location. This is affected by the time of measurement and availability of public power supply for the business centres. Moreso, inefficiency of power generators to convert fuel effectively is a major concernSimilar reports of values higher than the recommended limits has been recorded for some other urban cities in Nigeria such as Kano, Lagos and Nsukka.[12, 13, 14]

The concentration of SO_2 above FEPA standard is attributed to dumpsites around the locations with higher values, and moreso as a result of poor refining of crude of which is used by moving vehicles and power generator sets. Other sources of sulphur dioxide apart from the combustion of fossil fuels, incineration of refuse, transport, and the production of elemental sulphur include decay of organic wastes and refuse in the surroundings[12, 13]

The concentration of NO_2 is also a result of vehicular activities and burning of fuel in generators as power alternatives.

V. Conclusion

The concentration of these greenhouse gases above FEPA standard calls for concern because it lowers life expectancy. A blueprint developed to cut down on their continuous emission using technologies that are eco friendly would be of use to reduce the spread of these pollutants.

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