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Impact of Gas Flaring on Ambient Air Quality in Ogba/Egbema/Ndoni Local Government Area (ONELGA), Rivers State

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Abstract
An investigation to assess the impact of gas flaring on the ambient air quality in Obiafu/Obrikom Community in Ogba/Egbema/Ndoni Local Government Area (ONELGA) of Rivers State was studied. The study determined the concentration of gases, the instrument used for the collection of data was AeroQual 500 series (Gas monitor). The results obtained was, Carbon dioxide (568.67-632µg/m3), Ammonia)0), Methane (0.3-10.3µg/m3), Nitrogen oxide (0.0053-05667µg/m3); Sulphur oxide (0.0167-0.133µg/m3); Hydrogen Sulphide; Volatile Organic Compound (0-0.1µg/m3); Carbon monoxide (0); Ozone (0). The observed results are within the permissible limits of the Reference Air Quality Standard. Meaning the air in Obriafu/Pbrikom Community is free from pollutants as of the time the investigation was carried out. However, it is recommended that investigations with the aim of monitoring air quality should be carried out frequently in the study area in order to avoid the occurrence of potential health and environmental hazards due to the continuous gas flaring as a result of the operations of the Nigerian Agip Oil Company (NAOC).

Keywords: Ambient, Gas flaring, Air quality, Ogba/Egbema/Ndoni Local Government Area (ONELGA) of Rivers State, Ozone

Introduction

For the ever-increasing global population, the air we breathe is crucial to our standard of existence. The atmosphere is a living, breathing community that reacts to changes on Earth's surface and a wide variety of pollutants. After a week of human-powered balloon rides across the globe, air pollution and climate change have emerged as really global concerns (Karl & Trenberth, 2003). This is related to what Nwankwo and ogagarue (2011) said, which is that human activities cause industrial and household waste to pile up and disrupt the natural balance of ecosystems through surface, ground, and air water bodies.

In order to lower the danger of explosions, limit the combustion of volatile organic compounds, and discharge waste products from chemical manufacturing, the oil and gas extractive industries often flare natural gas. While flaring is technically a part of normal fossil fuel operations, it is more commonly done when there are technical, regulatory, or economic hurdles to building gas markets and infrastructure, or when it is not possible to re-inject the gas into the reservoir (Buzcu-Guven& Hrriss 2014; Elvidge et al 2009). The World Bank Group 2021).

Flaring is a problem in environmental management because it releases a lot of pollutants into the air, such as CO2, CO, SO2, NO2, naphthalene, black carbon particles, photochemical oxidants, and nitrogen oxides (CO, NO2, and NO3) (Gobo et al., 2009). To summarise, gas flaring refers to the practice of releasing heat and gaseous particles into the atmosphere via the controlled burning of surplus natural gas at oil processing and production facilities. Oando Oil Company Nigeria Limited (OOCNL), the Nigerian Agip Oil Company (NAOC), the Nigerian National Petroleum Corporation (NNPC), and NAOC are all partners in a joint venture in the Obiafu/Obrikom field, which is located in O.M.L. 61. A huge NAOC field is the one that includes the west fields of Obiafua, Obbrikom, and Omoku. The fields are gas condensate fields, and the Obiafu/Obrikom gas plant is directly related to their development.

A gas recycling system is used to recover the gas and condensate. Beginning in 1985, the gas recycling project was initiated. The facility is specifically designed to re-inject the gas 9206.BMMSCFD that is created from oil and gas that is received from wells. The highest estimated barrels of oil produced (BOP) are about 42,000. Eleme, a petrochemical complex close to Port Harcourt, intended to receive the recovered ethane, propane and heavier compounds from the gas stream that the NGL plant (NGL project) began operating in 1993–1994. Because of its connections to several fields and the most major terminals in Nigeria, the Obiafu/Obrikom gas plant is becoming more vital. Additionally, the company's overall strategy on safety and environmental protection is enhanced.

Aim and Objectives of the study

The aim of the study is the ambient air quality in Obiafu/Obrikom Community in Ogba/Egbema/Ndoni Local Government Area (ONELGA) of Rivers State. the objective is to;

I Determine the concentration levels of gases such as Carbon dioxide, Ammonia, Methane, Nitrogen oxide, Sulphur dioxide, Hydrogen Sulphide, Volatile Organic Compound, Ozone within Obiagu/Obrikom Community in Ogba/Egbema/Ndoni Local Government Area (ONELGA) of Rivers state.

Materials and Methods

You may rent the AeroQual 200/300 series with a choice of high or low level detectable ozone sensors to boost the instrument's versatility; it is a lightweight, easy-to-use noxious gas detector for acquiring Outdoor and Indoor Air Quality. After turning on the AeroQual 200/300 with the appropriate sensor, we held it approximately 2 meters above the ground to prevent any obstructions, let it about 5 minutes to process, and then recorded the concentration. A separate sensor is available for each of the target gases: ozone, carbon monoxide, ammonia, nitrogen dioxide, methane, hydrogen sulphide, and carbon dioxide.

RESUILTS

Table 1.Range and Mean Values (±SE) of Air Quality Parameters across different Sample Stations.

	STATION A-100M		STATION B -200M		STATION C- 300M		STATION D-1000M	
Parameters	Range µg/m³		Range µg/m³	Mean ±SE	Range µg/m³	Mean ±SE	Range µg/m³	Mean ±SE
CO_2	560-582	568.67-575.6	566-602	586-597.33	643-598	609-621	603-641	615.33-632
NH^3	0	0	0	0	0	0	0	0
CH_4	3-5.2	4-4.1667	5 - 6.4	5.333-5.5333	5 - 6.2	5.3333-5.9667	6-13.1	9.6333-10.3333
NO_2	0.04-6.6	0.05-0.5667	0.05-0.07	0.05-0.06	0.0045-0.0006	0.0053-0.0057	0.08-0.15	0.1067-0.12
VOC	0	0	0	0	0	0	0.1-0.1	
SO_2	0-0.05	0.0167-0.03	0.02-0.03	0.0233-0.0233	0.02-0.04	0.02-0.0333	0.08-0.17	0.12-0.1333
H_2S	0	0	0	0	0	0	0	0
CO	0	0	0	0	0	0	0	0
O_3	0	0	0	0	0	0	0	0

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Discussion

In this research, the average concentration of CO2 ranged from 568.67 to 632µg/m3. According to Wokoma and Adeola (2022), the morning readings in Port Harcourt City Local Government Area of Rivers State were within the range of 667 - 1125.75µg/m3, whereas the evening values ranged from 582 - 1260.5µg/m3. Nevertheless, the range of 19-430µg/m3 indicated by Martins et al. (2019) is lower than what is seen in this analysis. Dissimilarities in the research locations may account for the observed variance.The concentration of ammonia in the study area was found to be 0.00 - 1.63µg/m3 according to Ugbebor et al. (2019), who evaluated the air quality and its impact on health in the resident halls of the Abuja campus. The average concentration of ammonia in the morning was 0.120±0.011µg/m3, whereas in the evening it was 0.100±0.031µg/m3, according to Wokoma & Adeola (2022). While looking at the changes in air quality throughout the day in Port Harcourt. Nonetheless, ammonia did not show up at any point throughout the examination in this current study.

July had a usually greater quantity of methane in the atmosphere compared to June and August, according to this air quality research. The mean concentration of methane ranged from 0.3 to 10.3µg/m3 in June, July, and August, respectively. Nevertheless, the average levels that were obtained fall below both the range of 21.25-32.50µg/m3 found by Ugbebor et al. (2019) and the acceptable limits set by the reference air quality standard. Possible explanations for the discrepancies include seasonal and temporal variations in the research locations as well as variances in the most common types of activities conducted during those times. At a confidence level of $p < 0.05$, there was a notable difference in the sample time. In their studies on the effects of air pollution on diseases in both populated and vegetated areas of Apani Community, Ikwerre Local Government Area, Rivers State, Nwachukwu et al. (2012) and Nzekwe (2014) found nitrogen oxide concentrations ranging from 0.0053 to 0.5667µg/m3, 125.4 and 110.6µg/m3 respectively. The current investigation found that the concentration of nitrogen oxide varied significantly among the several sample locations. Thus, it was determined that the content of Nitrogen oxide in the research region is influenced by sampling stations.

Throughout the study period, the average atmospheric content of sulphur oxide varied across all sites, ranging from 0.0167 to 0.133µg/m3. This falls below the ranges found in previous studies on the ambient air quality along urbanisation gradients in the Apo district of the Federal Capital Territory of Nigeria. Ugbezor et al. (2019) found it to be between 0.25 and 0.63, while Ishaya et al. (2017) found it to be between 0.5 and 0.63 in the core zone, 0.41 and 0.66 in the transitional zone, and 4.4 and 0.60 in the peripheral zone of Abuja, the Federal Capital Territory of Nigeria. Exposure to high amounts of Sulphur Oxide might cause respiratory problems, but this range was documented by Nwachukwu et al. (2012), which is far lower.

Across all sites, the investigation on air quality found a mean value for Volatile Organic Compound (VOC) ranging from 0 to 0.1µg/m3. In his 2012 paper titled "A survey on the effects of air pollution on diseases of the people of Rivers State, Nigeria," (Nwachukwu et al.) observed a range of 0.3 - 315 that is lower than this. According to Chevron (2015), the environmental impact assessment (EIA) report for the Otumara AGS Project indicated a concentration of 3.2µg/m3, which is not supported by the results of this analysis. Not every station measured carbon monoxide during the research period. However, a mean concentration of 0.2µg/m3 was found across all stations by Amaechi-Onyerimma et al. (2023) while operating in a comparable environment. The current investigation did not detect ozone throughout the study, in contrast to the findings of Amaechi-Onyerimma et al. (2023) who investigated the effects of gas flaring near Igwuruta Flow-Station in Rivers State and found a range of 0.1-0.03µg/m3.

Conclusion

Field measurements of gas air quality parameters in the Obiafu/Obrikom Community in the Ogba/Egbema/Ndoni Local Government Area in Rivers State were the focus of this investigation. Nevertheless, the values recorded at various stations in June, July, and August fall below or within the permissible limits set by the National Environmental (Air Quality Control) Regulations, 2014, which are enforced by the National Environmental Standards and Regulations Enforcement Agency (NESREA) and the World Health Organisation (WHO). As a result, throughout the duration of this inquiry, the air quality at Obiafu/Obrikom Community in Ogba/Egbema/Ndoni Local Government Area (ONELGA) of Rivers State was deemed safe.

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