The scale **Journal Website:** https://thescalejournal.com.ng/
An Interdisciplinary Journal of
The ACADEMIC STAFF UNION OF POLYTECHNICS - ZONE D
ISSN: 2992-3727 Published 25th May, 2025

ASSESSMENT OF AIR QUALITY STATUS OF OKUJAGU AND ABULOMA COMMUNITY IN OKRIKA LOCAL GOVERNMENT AREA RIVERS STATE NIGERIA

Habiganuchi Okeburunwo
School of Foundational Studies, Rivers State College of Health Science and Management Technology
Oro-Owo Rumueme, Port Harcourt
okeburunwo@gmail.com
09032320090

Abstract
Air quality status of Okujagu and Abuloma community in Okrika Local Government Area Rivers State Nigeria was determined. Air samples were collected from five (5) points in each of these communities. Standard methods were employed and compared with the National Ambient Air Quality Standard (NAAQS). The gas monitoring device used was calibrated in ppm (part per million). From the comparison of the mean Concentration of sites with NAAQS, it shows that CO (5.404ppm) is higher in Okujagu than in Abuloma (4.0ppm) but it falls within the National Ambient Air Quality Standard (9.0ppm). This may be because of the anthropogenic activities are more in that area. NO_2 in Okujagu (0.2004ppm) is not up to the NAAQ standard (0.053ppm) though its presence could be due to the practice of artisan refinery in the area. For SO_2, the concentration in Abuloma (1.1ppm) is slightly higher than NAAQ standards (0.5ppm) and Okujagu community (0.188ppm), this is because Abuloma is a busier area compared to Okujagu, so therefore the vehicular activities (jetty operations) is the reason for this. $PM_{2.5}$ and PM_{10} (0.0246µg/m^3) and (0.024µg/m^3) are with limits (15µg/m^3) and (150ug/m3). The air quality results appear to be ok but the pollutants are present in the study area. The air quality index (AQI) interpretation proved to us that even if the air is not polluted the fact that those pollutants are present proofs that it is contaminated and poses some health complications for some people in the society like the aged people, children, and people with respiratory disease, heart disease, and asthma. Carrying out a study like this will help this category of people that are vulnerable to the air condition to maintain good health.
Key words: Air, quality, status, Okujagu, Abuloma, community

Introduction

Poor air quality poses a great treat to human health and environment at large. Exposure to air contaminants cannot be avoided especially in urban/industrial areas. When the air quality of an environment has not posed any damaging effect on the environment, it is considered as air contamination, but when it becomes a treat to the living condition of the environment, then, air pollution exists (Akinfolanrin et al., 2017).

Air pollution damages our environment. Toxic pollutants and chemicals form acid rain and ground level ozone that can damage trees, crops, wildlife, lakes and other bodies of water. Air quality assessments inform air quality management activities by providing an understanding of various pollutants sources, emissions; characteristics, and meteorological conditions and how they contribute to the local air quality (Prabjite et al., 2011).

Air contaminants has been linked to man's constant need to improve their standard of living and natural causes due to industrial and technology development, population increase etc. air pollution is a state where contaminants which includes gases (such as SO_2, NO_2, CO, VOC – volatile organic compound, NH_3), particular matter (like soot, smoke, dust, fumes, aerosol, etc.) and radioactive materials are present in high concentrations that may produce damaging effect on the environment and man (Magaji, 2015).

Methods

Aeroqual 500 was used alongside the gas pollutant sensors. A GPS was used to check the coordinate of the study areas. A hand-held weather meter for checking the metrological data was used. The gas monitoring devices used was calibrated in ppm (part per million).

Collection of air samples and measurement of air quality parameters was done with automatic gas monitors aeroqual 500 series. Five (5) readings were taken from each of the samples areas. The five readings were taken from the busiest areas of the study sites. The coordinates for these sites were taken using a GPS device. The meteorological data of the study areas were also taken. The results obtained were compared with the national ambient air quality standard (NAAQS) and interpreted using Air Quality Index (AQI).

Sampling was done in one day, 5 readings were taken from each site. Sampling involved open air sampling on the pavements in closest proximity to the roads and at a height of 1m. Measurements were taken after steadying the equipment for 5 minutes before reading was taken in order to provide real time reading of parameters of interest. Five readings were collected in each of the study areas; areas that had most activities; vehicular, industrials and/or boat activities.

Results

Table 1.1: Concentrations of gaseous emissions and particulate matters of Okujagu community in Okrika Local Government Area.

Samples	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Mean	SD
CO(ppm)	0	0	11.3	10.5	5.22	5.404	5.46
NO_2(ppm)	0.339	0.156	0.167	0.211	0.109	0.2004	0.09
SO_2(ppm)	0.56	0.1	0.09	0.1	0,08	0.188	021
VOC(ppm)	0.5	0.2	0.6	0.9	0.12	0.464	0.32
$PM_{2.5}$(µg/m^3)	0.026	0.024	0.023	0.028	0.022	0.0246	0.00
PM_{10}(µg/m^3)	0.032	0.029	0.028	0.031	0.027	0.0294	0.00

Table 1.2: Meteorological Parameters. The high temperature is due to the anthropogenic activities in the area like artisan refinery.

Samples	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Mean	SD
RH%	48.8	52.7	53.4	54.5	57.1	53.3	3.02
Temp^{0}C	39.3	37.4	37.8	37.1	38.2	37.96	0.86
Velocity(m/s)	1.6	0.9	1.5	1.3	1.2	1.3	0.27

Table 1.3: Concentrations of gaseous emissions and particulate matters of Abuloma community in Okrika Local Government Area.

Samples	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Mean	SD
CO(ppm)	2.3	8.3	2.5	3.2	3.9	4.0	1.6
NO_2(ppm)	0.171	0.291	0.232	0.141	0.137	0.2	0.9
SO_2(ppm)	0.12	0.1	1.93	1.83	1.49	1.1	0.9
VOC(ppm)	0.4	0.4	0.6	1.5	1.8	0.9	23.8
$PM_{2.5}$(µg/m^3)	0.021	0.201	0.03	0.024	0.028	0.1	27.0
PM_{10}(µg/m^3)	0.041	0.234	0.065	0.045	0.049	0.1	26.5

Table 1.4: Meteorological Parameters. The high temperature is due to the anthropogenic activities

Samples	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Mean	SD

RH%	47.6	49.6	49.7	45.5	48.2	48.1	1.7
Temp^{0}C	41.8	40	39.2	43.1	45.3	41.9	2.4
Velocity(m/s)	1.6	1.2	1.6	1.6	1.6	1.5	0.2

Table 1.5: Concentrations of gaseous emissions and particulate matters of control site at D-line Port Harcourt City Local Government Area.

Samples	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Mean	SD
CO(ppm)	0	0	0	0	0	0.0	0.0
NO_2(ppm)	0.056	0.03	0.034	0	0	0.0	0.0
SO_2(ppm)	0	0	0	0	0	0.0	0.0
VOC(ppm)	4.7	0.5	0.1	0.3	0.7	1.3	1.9
$PM_{2.5}$(µg/m^3)	0.014	0.019	0.02	0.017	0.018	0.0	0.0
PM_{10}(µg/m^3)	0.015	0.025	0.024	0.025	0.024	0.0	0.0

Table 1.6: Meteorological Parameters.

Samples	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Mean	SD
RH%	67.7	67.7	67.6	60.6	60.3	64.8	3.95
Temp^{0}C	32.7	31.3	32	35.3	35.7	33.4	1.98
Velocity(m/s)	1.1	1.3	1.6	2.2	3	1.8	0.77

Table 1.7: Mean Concentrations GPS and NAAQ Standard of air Quality Parameters

Location	GPS coordinate	CO (ppm)	NO_2 (ppm)	SO_2 (ppm)	VOC (ppm)	$PM_{2.5}$ (µg/m^3)	PM_{10} (µg/m^3)
OKUJAGU	N4 48’20.5” E7 2’ 55”	5.404	0,2004	0.188	0.164	0.0246	0.0294
ABULOMA	N4 46’ 56.3” E 3’ 16.3”	4.0	0.2	1.1	0.9	0.1	0.1
CONTROL	N4 48’21.7’ E7 0’ 24.6” 0	0	0	0	1.3	0	0
NAAQS		9ppm	0.053ppm	0.5ppm		15 µg/m3	150 µg/m3

Table 1.8: AQI Report on studied site

OKUJAGU	CO	NO_2	SO_2	$PM_{2.5}$	PM_{10}
MEAN	5.404	0.2004	0.4	0.0246	0.0294
AQI	60	0	0	0	0
AQI CAT	MODERATE	GOOD	GOOD	GOOD	GOOD
Sensitive group	People with heart disease are mostly at risk	People with asthma are at risk	People with respiratory disease and heart disease are at risk	People with respiratory disease are at risk	People with respiratory heart disease are at risk

ISSN: 2992-3727 Published 25th May, 2025

ABULOMA	CO	NO_2	SO_2	$PM_{2.5}$	PM_{10}
MEAN	0.4	0.2	1.1	0.1	0
AQI	4.5	0	0	0	0
AQI CAT	GOOD	GOOD	GOOD	GOOD	GOOD
Sensitive group	People with heart disease are mostly at risk	No group is affected	People with asthma are mostly at risk	People with respiratory heart disease, the aged people and children are at risk	People with respiratory heart disease are the group mostly at risk

Table 1.9: Meteorological Results

PARAMETERS	OKUJAGU	ABULOMA	CONTROL
Relative humidity	53.3%	48.1%	64.8%
Temperature	37.96^0C	41.9^0C	33.4^0C
Velocity	1.3m/s	1.5m/s	1.8m/s n

Discussion of Findings

Five samples were obtained from each sites of study as seen in Table 1.1 -1.3 with their meteorological data. The mean of the readings as their standard deviation was also calculated to get a concrete analysis on the sites. From the comparison of the mean concentrations of sites with NAAQS, it shows that CO is higher in Okujagu than in Abuloma but falls within the National Ambient Air Quality Standard. This may be because of activities like artisan refineries operate at night and in the early hours of the morning. This means that by 2pm which is when the samples were taken was enough time for the concentration of the gas emitted to be reduced due to the following meteorological factors like relative humidity appears to be in okujagu also.

For NO_2, the concentration in Abuloma is slightly higher than NAAQ standards and Okujagu communities. This may be, because Abuloma is a busier area compared to Okujagu; so therefore, the vehicular activities and jetty operations NAAQ standard and that of Okujagu; while $PM_{2.5}$ and PM_{10} are within NAAQ standard given.

Table 1.5 gives an elaborate report on the health implication of the presence of these contaminants, how they affect the aged, children, and people with asthma, respiratory disease and heart disease; while figure 3.5 shows variation in meteorological parameters provides logical reasons for the concentration of those air contaminants.

Conclusion

From the results and discussions, air quality results ranged from “moderate” to “good”, but pollutants are much present which still pose risk to some sensitive group of people like children, aged present, still pose health risk.

Carrying out a study like this will help the category of people vulnerable to the air quality to maintain good health.

Recommendations

There should be an education on the dangers of activities that emits those gases that cause the quality of the air to reduce.

There should also be constant air monitoring carried out by the Government or regulatory bodies to checkmate our activities.

References

Akinfolarin, O. M., Boisa, N., and Obumvo, C. C. (2017). Assessment of Particles matter based air quality index in Port Harcourt, Nigeria. *Journal on Environmental analytical chemistry*, 1014.

Isichei, A. O., Fitzgerald, J. F., Brown, S. and Scholes.R. J., (1995). Environmental Monitoring and Assessment. Emission Inventories and Mitigation Options. Kluwer AcademicPublishers (38), 279 - 289.

Magaji, J.T., and Hassan, S.M. (2015); An Assessment of Air Quality in/and Around Gwagwalada, Abattoir. Abuja FCT. Journal of Environmental and Earth Science. (5)1,

Okoya, A. A., Torto, N., Ogunfowokan, A. O., Asubiojo, O.I. (2013). Organic chlorine Pesticide Residues in Soils of Major Cocoa Plantations in Ondo State, South western "Nigeria. African J. Agric. Res., (8), 3842-3848.

Prabjite, O. I, (2011), Ambient Air Particulate Matter in Lagos, Nigeria: A Study Using Receptor Modeling with XRF analysis. Bull. Chem. Soc. Ethiopia (15), 97-108. (43), A407-4415.

WHO (2014); 7 million premature deaths linked to air pollution.

Zagha, O., and Nwaogazie, I. L. (2015). Road side air pollution Assessment in Port Harcourt Nigeria. *Standard Journal*. (3), 5.