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Ambient Air Quality in Some Strategic Locations of Bori Town, Khana Local Government Area, Rivers State, Nigeria

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Abstract
The study evaluates the ambient air quality in the atmosphere at some strategic locations in Bori Town ie Bori Main Market (BMM), Bori Motor Park (BMP), Bori Mechanic Village (BMV), Ken Sarowiwa Polytechnic (KSWP) and Bori Timber Market (TMB) all in the Khana Local Government Area in Rivers State. Due to their fewer traffic hotspots, Gwara was taken as the control location. Standard AeroQUAL series 500 air quality monitors and sensors for various air contaminants were used in the monitoring process. Bori Main Park (BMM) had the highest mean CO level at 0.051±0.09μg/m^3, followed by Bori Mechanic Village (BMV) at 0.012±0.01μg/m^3, and Bori Main Market (BMM) at 0.011±0.0μg/m^3. BMM (0.171±0.07μg/m^3) and BMP (0.131±0.003 μg/m^3) were the values for nitrous oxide. H_2S: 0.045±0.01μg/m^3 for BMV, 1.012±0.12μg/m^3 for BMP, 0.123±0.02μg/m^3 for BMM, and 0.056±0.01μg/m^3 for KSWP. BMM had a total particulate matter (TPM) of 1.351-2.1488μg/m^3, BMP had 1.222±0.16μg/m^3, and BMV had 0.234±0.12μg/m^3. According to the results, of all the locations sampled, Bori Motor Park had the worst ambient air quality, while Ken Sarowiwa Polytechnic had the best. H_2S was the most prevalent air contaminant, and VOC was the least prevalent. The health risk Index indicates that there is not much air pollution in the area at the time of sampling. It is however advised that continuous surveillance of air pollution and assessment of environmental health risks be done.

Keywords: Ambient Air Quality, Bori Town, Khana LGA, Rivers State

Introduction

The crude oil exploitation had led to the flaring of obnoxious gas via flare stacks thereby polluting the natural environment. The exploration of minerals within the region had led to the dumping of industrial waste and spills into water-bodies within the Niger Delta area, which has affected fishing as a means of livelihood for the people because very few fish survive the polluted river. The horizontal flaring of natural gas inside the Ogoni axis of the Niger Delta is a by-product of drilling and comes from flaring stations in the region, some of which are located near settlements and residences. Flaring refers to the combustion or cold flare that releases natural gas into the atmosphere. This procedure is quite problematic for the residents and occupants of the region since it produces a significant quantity of carbon dioxide in the environment. Low air quality is associated with an increased risk of cancer, asthma, and other respiratory ailments; this is due in large part to the combination of flares, methane, and soot from the two refineries, the petrochemical complex, and fertiliser complex located in Ogoniland. Flaring gas on Ogoni land has many consequences, such as stunted plant growth and decreased agricultural output on neighbouring farms (Raji & Abejide, 2013).

In addition to the destruction of extensive arable land in the region, the Ogonis have also endured additional consequences of oil extraction, such as oil leaks. Many oil wells and pipelines wind their way over the landscape, giving the region its distinctive look. Since the pipelines pass through rural areas and towns, they are vulnerable to leaks and frequent occurrences of spills. The Ogoni are a linguistically varied people that hail from four distinct kingdoms. Although there is some shared language across these kingdoms, not everyone speaks them (Ocholi, 2022). Children, the elderly, and those with preexisting conditions are particularly vulnerable to the acute and chronic health impacts linked to the increased levels of air pollution. An irritated nose, throat, eyes, and pleurisy, as well as bronchitis, pneumonia, coughing, wheezing, nausea, and headaches, are some of the short-term side effects.

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Prolonged exposure to high levels of air pollution may have long-term impacts such as asthma, heart disease, COPD, and lung cancer (Manisalidis et al., 2020).

According to research, air pollution affects death rates worldwide, particularly in the US (Zhang et al., 2019). U.S. PM2.5 levels are below EPA requirements every year. Air pollution was among the top ten major causes of disability-adjusted life years (DALYs) in the 2016 Global Burden of Illness (GBD) Study, which investigates the causes and risk factors for mortality and illness (US Burden of Disease Collaborators et al., 2018). Deadly accumulation of accumulated years of potential life lost owing to early death and the years of productive life lost due to disability is what the World Health Organisation (WHO) calls DALYs (World Health Organisation, 2012). According to the World Health Organisation (2019), 4.2 million people die each year from respiratory issues caused by air pollution, making it one of the leading global health hazards. According to recent research, there is a strong and statistically significant correlation between certain air pollutants and health problems. These include but are not limited to, asthma, cancer, lung issues, osteoporosis, metabolic dysfunctions, type 2 diabetes, and particulate matter (PM), ozone (O_3), and oxides of nitrogen (NOx) (Chen et al., 2017). The primary contributors to the emissions of gases that hurt human health are sulphur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), and hydrogen sulphide (HS). Improving the air quality in both indoor and outdoor spaces would need massive efforts. There has been a gradual transition from manual to automated control of environmental monitoring. The severe climate continues to elude the many advancements in environmental monitoring instruments (Abou-Donia, 2015).

Extractive industries and motor vehicle emissions are issues that are confronting the ancient city of Bori, which has affected the amount of pollutants in the atmospheric space (increment). However, in Bori, the level of awareness on air pollution is poor which could be due to no facility to monitor these pollutants or the non-existence of adequate information concerning the amount of pollutants in the environment. There may be little complete and realistic data on the extent of pollution within the Khana local government area, which could be due to lots of factors like lack of commitment on the part of researchers, agencies and organisations (Echendu et al., 2022). Anthropogenic activities such as biomass combustion, refuse burning, and generating sets of emissions release a large volume of substances at Bori and other typical Niger Delta areas, including volatile organic compounds, sulphur oxides, nitrogen, particulate matter, heavy metals, and other toxics, often exceeding both national and international guidelines. Air pollution from petrol flaring and the usage of rickety automobiles is prevalent in interior regions of the Niger Delta, and study in this area is necessary. As a result, studies and innovations should centre on air quality monitoring in these developing nations. This will allow us to gauge the current state of the air that people live in and give them the information they need to make educated decisions and rest easy knowing that pollution isn't putting their health at risk.

Material and Methods

The town of Bori, which is part of the study region, is booming and has many resources, both human and otherwise. Bori is a town in Rivers State, specifically in the Khana Local Government Area. The Ogoni people have long considered Bori to be their ancestral home. For the several Niger Delta ethnic groups that call it home—the Ogoni, Andoni, Opobo, and Annang—it is both a political and economic hub. It is where Ken Saro Wiwa Polytechnic is located. There are more than 5,000 inhabitants per square kilometre in Bori, which has a total population of over 250,000. The town's total size is around 50 km² or 20 square miles. The coordinates of Bori town are 4°40′34″ and 7°21′54″. It is also a major centre for the cultivation of many agricultural goods, including yams, garri, maize, cocoyam, and palm oil. Saro Wiwa Park and a large market make up the neighbourhood.

The continuous monitoring of atmospheric air quality is a requirement for assessing the class of the quality of air in any selected location of study. The sampling was carried out thrice daily, each sampling time was one hour. It was morning, afternoon and evening respectively. The time of sampling were 8.00 am to 9.00 am, 12.00 noon to 1.00 pm and 4.00 pm to 5.00 pm This was an hourly sampling for three hours a day starting from 8.00 am to 5.00 pm and the average was taken for each location. This was done continuously for March, April, and May 2023 to ascertain the true content of the pollutants in the presumed polluted air.

Air quality monitoring involves the use of hand-held movable monitors that can easily be transferred from one location to another and make the monitoring easier.

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The Aeroqual Series 500 Air Quality Monitors are a practical analysis tool for gaseous emissions; they can gather data autonomously for up to 48 hours, allowing for their usage even hours after collection. O_2, CO, NOx, NO, NO_2, SO_2, HC, and H_2S are the parameters it estimates. A user-friendly interface with menus and an LCD are part of the feature. Equipped with an automatic probe blowback mechanism, this gas tester is ready to go. Measurement of flow rate and temperature of sensors by US EPA CTM-030, -034 and ASTM D6522 standards. The simple onsite sensor has a calibration capability ranging from 0 to 100%, which includes diagnostics and sensor output.

Air quality monitors by Aeroqual, the Series 500, are programmable multi-gas devices with electrochemical sensors that can detect inorganic air pollutants like SO_2. Pulsed fluorescence is the standard approach for continuously monitoring the gas. This technique applies short bursts of ultraviolet light to air as it passes through a sample chamber. The gas inside the sample is thereafter subjected to a greater energy degree of agitation; upon its return to its initial condition, fluorescence is released. The concentration of the analyte in the gas is directly proportional to the fluorescence measurement.

For CO analysis, the standard instrument is the programmable multigas monitor Aeroqual Series 500 Air Quality Monitor. The electrochemical sensor produces a signal that is directly proportional to the concentration of the gaseous contaminants, making it possible to detect CO gas. A non-dispersive infrared photometry system keeps tabs on air pollution in real-time. Infrared light absorption by CO air pollutants is often at the heart of this detection procedure. Instruments that continually measure CO levels include gas filter correlations and non-dispersive infrared photometry methods. By reducing interference from water vapour, CO_2, and other gases, gas filter correlation can make non-dispersive infrared photometry more specific to CO, while non-dispersive infrared photometry relies on the pollutant's absorption of infrared light.

This procedure included estimating the amount of suspended particulate materials using a little volume device called an aerosol gas monitor. Air metrics' mini-volume portable air tester may collect ambient air samples for particulate matter ($PM_{2.5}$ and PM_{10}) and nonreactive gases (CO, for example). The Environmental Protection Agency and the Lane Regional Air Pollution Authority (LRAPA) collaborated to develop this tool to address the need for mobile survey sampling methods.
Much like a hoover, the sampler uses a hoover mechanism and filter contained in a shelter to collect data. Over eight hours, a pre-weighed filter moves a known volume of air through it. This allows us to calculate the mass of the particles gathered by re-weighing the filter.

To verify that the calculated air quality index is reflective of the actual air quality, we correlate the two variables in Table 1.

Table 1: Air quality index for criteria pollutants

AQI Category	AQI rating	PM_{10} µg/m^3	CO (ppm)	NO_2 (ppm)	SO_2 (ppm)
Very good (0 -15)	A	0 – 15	0 -2	0 – 0.02	0 – 0.002
Good (16 -31)	B	51 – 75	2.1 – 4.0	0.02 – 0.03	0.02 – 0.03
Moderate (32 – 49)	C	76 – 100	4.1 – 6.0	0.03 – 0.04	0.03 – 0.04
Poor (50 – 99)	D	101 – 150	6.1 – 9.0	0.04 – 0.06	0.03 – 0.04
Very Poor (100 or over)	E	>150	>9.0	>0.06	>0.06

Source: USEPA (2000)

Table 1 reveals the AQI for criteria pollutants. This is the assessment set by USEPA for determining the quality of the ambient air.

AQI pollutant = $x = \frac{\text{Conc.of Pollutant}}{\text{Standard limit}}\ x\ 100x = \frac{\text{Conc.of Pollutant}}{\text{Standard limit}}\ x\ 100$

Health Risk Index

Non-carcinogenic Risk Calculation

To determine the non-carcinogenic risk quotient (H_2S and SO_2 inhalation danger), we used equation (3.2) from the EPA's 2009 report:

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The formula for non-carcinogenic risk (HQ) is the product of the exposure concentration (EC) and the minimum risk level (MRL), where EC is the exposure concentration and MRL is the minimal risk level, in micrograms per cubic metre.

The EC is equal to the CA for short-term exposures (less than 24 hours), where CA is the concentration of contaminants in the air in micrograms per cubic metre ($\mu g/m^3$) (EPA, 2009). Hence, equations (1) become HQ = CA/MRL MRLs of H_2S, and SO_2 are 0.07 ppm (98 $\mu g/m^3$) (ATSDR, 2014), and 0.01 ppm (26.2$\mu g/m^3$) (ATSDR, 1998), respectively.

Results

Table 2: Pollutants level (Organic air pollutants) (mg/m^3) of selected locations of Bori and its municipality

Parameters	BMM	BMV	BMP	KSWP	TMB	Gwara I	Gwara II
VOC	0.012±0.010	ND	0.023±0.020	ND	ND	ND	ND
CH_4	ND	ND	ND	ND	ND	ND	ND

Table 3: Pollutants level (inorganic air pollutants) (mg/m^3) of selected locations of Bori and its municipality

Parameters	BMM	BMV	BMP	KSWP	TMB	Gwara I	Gwara II
CO	0.011±0.010	0.012±0.010	0.051±0.090	ND	ND	ND	ND
CO_2	590.10±8.01	599.10±7.52	610.50±8.02	602.00±7.91	612.10±5.11	610.10±5.81	611.10±5.6
SO_2	0.010±0.010	0.011±0.010	0.014±0.010	ND	ND	ND	ND
NO_2	0.171±0.070	ND	0.131±0.030	ND	ND	ND	ND
NH_3	ND	ND	ND	ND	ND	ND	ND
H_2S	0.123±0.020	0.045±0.010	1.012±0.120	0.056±0.010	0.071±0.040	ND	ND
O_3	0.415±0.020	0.213±0.030	0.124±0.010	0.114±0.010	0.104±0.010	0.024±0.010	0.014±0.01
O_2	20.90±0.00	20.90±0.00	20.90±0.00	20.90±0.00	20.90±0.00	20.90±0.00	20.90

Table 4: Pollutants level (particulate matters) ($\mu g/m^3$) of selected locations of Bori and its municipality

Parameters	BMM	BMV	BMP	KSWP	TMB	Gwara I	Gwara II
$PM_{2.5}$	0.250±0.034	0.112±0.09	0.101±0.01	0.090±0.03	0.081±0.01	0.012±0.0	0.013±0.0
PM_{10}	1.101±0.114	0.122±0.03	1.121±0.15	0.100±0.04	0.103±0.01	0.110±0.0	0.013±0.0
TPM	1.351±0.148	0.234±0.12	1.222±0.16	0.190±0.07	0.184±0.02	0.122±0.0	0.026±0.0

Table 5: Air quality index and summation of the total index

Parameters	BMM	BMV	BMP	KSWP	TMB
PM_{10}	2202	244	2242	200	206
CO	110	120	540	-	-
NO_2	114	-	87.33	-	-
SO_2	50	55	-	-	-

Table 6: Air quality index and summation of the total index

Parameters	BMM	BMV	BMP	KSWP	BTM
PM_{10}	E	E	E	E	E
CO	D	D	E	-	-
NO_2	D	-	C	-	-
SO_2	B	B	-	-	-

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Table 7: Health risk estimation of non-carcinogens from the study for inorganic pollutants (ppm).

Parameters	BMM	BMV	BMP	KSWP	BTM
SO_2	0.0001	0.0001	0.0002	-	-
H_2S	0.012	0.005	0.101	0.007	0.007

Discussion

The results of the investigated ambient air quality within Bori town and some control locations are discussed below. The Bori Town strategic locations of Bori Mechanic Village (BMV), Bori Motor Park (BMP), Ken Saro Wiwa Polytechnic (KSWP), and Timber Market Bori (TMB) in Khana local government area, Rivers State, were the primary focus of this investigation into atmospheric ambient air quality. The control site was Gwara 1 and Gwara 2 locations, which have lesser vehicular traffic in the area.

The mean levels of measured volatile organic compounds (VOCs) were between 0.012±0.01 mg/m^3 and 0.023±0.02 mg/m^3 at Bori Main Market and Bori Motor Park respectively. Other locations showed no presence of VOCs which could be a result of factors like wind, temperature, humidity, and point source discharges. The presence of CH_4 was below the detection limit across the stations in all the areas of the study. The levels of VOCs obtained from the study were below those of Gobo et al. (2012) who obtained 7ppm in their investigations on the ambient air quality within some Okrika Villages.

Table 3 present the result of the inorganic contaminants in air samples from the current study areas. The most dominant air pollutants were the H_2S and CO which were found in all the study locations including the control area. The last parameter was the NH_3 as it was not detected in all the locations from this study. The presence of CO ranged from non-detected to 0.051±0.09 mg/m^3 in all the areas considered. The following sites; Ken Saro Wiwa Polytechnic (KSWP), Gwara I and Gwara II had no detection of the CO. The highest values were for Bori Motor Park (BMM) (0.051±0.09 mg/m^3), Bori Mechanic Village (BMV) (0.012±0.01 mg/m^3), and Bori Main Market (0.011±0.0 mg/m^3) etc. These values are lower than those report by Swemgba et al. (2019) on pollutant levels around selected sites in Port Harcourt (Choba, Rumuobiakani and Rumuokwurushi) (15.7 to 22.3 ppm). Because it forms a binding complex with haemoglobin in the blood, carbon monoxide makes it less efficient at transporting oxygen throughout the body. This whole process interferes with the distribution of oxygen to other organs in the body. The most common effects are fatigue, headaches, confusion, and dizziness due to the cut-off of oxygen to the brain. However, CO_2 has important roles in the maintenance of cellular homeostasis and many physiological and pathophysiological processes.

The presence of CO_2 was between 590.1 ppm to 612.1 ppm for all the study areas which is within the acceptable limit of the World Health Organisation (WHO). It is pertinent to note that the presence of CO_2 in the environment enhances the growth of green plants which in turn affects agricultural production positively. CO_2 is needed by plants for the process of photosynthesis which leads to the production of its food. Some of the negative effects of CO_2 include but are not limited to; headaches, dizziness, restlessness, breathing difficulty, sweating, and heartache in humans. The other effect includes an increase in temperature that can lead to global warming, extension of the season, increase in humidity, etc.

Levels of SO_2 in the ambient air from the current study are detailed as follows; Gwara I, Gwara II, and KSWP had very low contaminant levels that the monitor could not detect. The highest value was for BMP at 0.014±0.00 mg/m^3, followed by BMV at 0.011±0.01mg/m^3, and BMM had 0.010±0.01 mg/m^3, respectively. The level is an indication of the traffic within these three areas. The BMP is a place where lots of vehicles assemble to pick up passengers and goods to all parts of the local government and state at large therefore the high values. The presence of SO_2 in high amounts affects the growth and development of plants and tree foliage, it also aids in the acidification of oceans, lakes, streams, and wetlands which lowers biodiversity, deforestation, and also depriving the soil of essential nutrients. The results obtained from the study were similar to those of Henry et al. (2019) who 0.77ppm in their study involving ambient air quality in some areas of Port Harcourt.

Nitrous oxides play a vital role in the environment both positive and negative. The levels were below the detection level for samples of BMV, KSWP, Gwara I, and Gwara II. The highest amount of nitrous oxide was found in BMM (0.171±0.07 mg/m^3), and BMP (0.131±0.003 mg/m^3) respectively. The amount is low compared to the permissible

limit. A high amount of NO_2 damages foliage, and decrease the yield and growth of crops. It also has side effects on structures, fading and discolours of furnishing and fabrics reduced visibility, and reactions with surfaces.
The current investigation found H_2S in all locations. The findings were as follows: BMP had 1.012±0.12 mg/m3, BMM had 0.123±0.02 mg/m3, KSWP had 0.056±0.01 mg/m3, and BMV had 0.045±0.01 mg/m3. Gwara I and II had lower values, serving as the control. The creation of sulphur hydric acid—a byproduct of hydrogen sulfide's solubility in water—contributes to acidic deposition in soil and water and is corrosive to metals. Serious damage to the human central nervous system, including inhalation of the contaminants, may induce coma, convulsions, and perhaps death. Gobo et al. (2012) found 0.2 ppm in their investigation of ambient air quality inside several Okirika communities, which is consistent with the results observed in the current study. The present investigation found ozone levels ranging from 0.014 to 0.415 mg/m3. A high concentration of ozone may harm plant and tree leaves, alter the overall appearance of flora, slow the expansion of forests, and even affect some animal species. The oxygen level was satisfactory. The result shows that the most polluted air was that of Bori Main Park (BMP), followed by Bori Main Market (BMM), and Bori Mechanic Village (BMV), while Ken Saro Wiwa Polytechnic was the least in terms of concentration. The most dominant pollutant was hydrogen sulphide followed by NO_2, CO and then SO_2 respectively. The result shows air pollution is not at the risk level as compared with other areas of Ogoni land like Bodo City. The result obtained from the study may not be as high as other areas but the need to monitor the air is necessary. The

The level of particulate air pollutants in the study area is presented in Table 4, and it shows slight variations among the locations monitored in this study. The $PM_{2.5}$ had most concentration in monitoring around BMM (0.250±0.034 μg/m^3), other locations were of the order; BMV (0.112±0.09μg/m^3)>BMP (0.101±0.01μg/m^3)>KSWP (0.090±0.01μg/m^3). While the two locations of Gwara were the least and also understandable since they were the control sites for the study. The value for PM_{10} was highest for air around BMP (1.121±0.15 μg/m^3), while others were lower with values at 1.101±0.14 μg/m^3 for BMM, 0.122±0.03 μg/m^3 for BMV, 0.100±0.04 μg/m^3 for KSWP while the contr4ol was far lower than the values as mentioned earlier. The total particulate matter (TPM) was highest in BMM (1.351±0.148μg/m^3), others were also higher but lower than the value for BMM. The other areas had 1.222±0.16 μg/m^3 for BMP, and 0.234±0.12 μg/m^3 for BMV while the rest were lower than the former. The research found decreased total particulate matter compared to previous reports on landfills in Cameroon (6.44 mg/m3) and a residential neighbourhood near the On-Nooch solid waste disposal facility in Bangkok (Thailand) (7.79 mg/m^3) during 8 hours. Ezekwe et al. (2016) found that in a residential area near the Eneka dump in Port Harcourt, Nigeria, it was less than 4 ppm, or 4.64 mg/m^3. The occurrence of $PM_{2.5}$ has a pronounced effect on human beings and the environment, it moves deep into the respiratory tract which eventually gets to the lungs. The major effects include but are not limited to; irritation of the eye, nose, throat, and lungs, coughing, sneezing, runny nose and breathing difficulty. Apart from motorists and power plants, particulate matter can come from construction sites, unpaved roads, fields, and smokestacks or chimneys. Since petrol flaring and vehicle emissions are unavoidable in the research region, they pose a significant threat to air quality and are hence difficult to regulate. People who live near polluted areas are at risk from particulate matter 10 (PM_{10}), which is a complex combination of soot, smoke, metals, nitrates, sulphates, dust, water, and rubber. It is therefore necessary to state that the amount of TPM found in the study may be lower than the standard and also the threshold for concern but there is a need for proper action to be taken as its continuous inhalation could result in serious health challenges.
Figure 4.2 Statistical representation of total particulate matter (TPM) from the study

The Air Quality Index (AQI) assessment, as shown in Table 5 PM_{10} had 2202, 244, 2242, 200, and 206 for BMM, BMV, BMP, KSWP, and TMP respectively. The CO from the table showed values for BMM (110), BMV (120), and BMP (550). The other air pollutants like SO_2 were 114 for BMM, and 87.33 for BMP, while SO_2 had 50 to 55 for BMM and BMV respectively. The air quality for PM_{10} in the study shows that the sampled stations were very poor. PM_{10} had a Very poor pollution index rating across all the locations of study which is an indication of the high vehicular emission of particulate matter, indicating that human activities had great consequences on air quality. The rating for CO was also very poor for BMP, and poor for BMM, and BMV this could be due to the poor conditions of most of the commercial vehicles used for transportation within the area which could lead to incomplete combustion of the fuel in the internal combustion engines of the vehicles. The rating also showed that NO_2 was poor for BMM, and moderate pollution BMP while SO_2 was good in BMM, and BMV respectively. The AQ indicated varying pollution for all the ambient pollutants in all the zones of the current study. The result of the air quality index shows that the pollutant levels were not too high but some had severe pollution in selected areas of the study which could indicate poor air quality and such the need for constant monitoring of the pollution level.

We assessed the health risk from inhalation exposure to SO_2 and H_2S attributable to the non-carcinogens by computing the hazard quotient (HQ). If the HQ value is less than 1.0, it means that the pollutant in question is not likely to cause health problems, according to the literature. If the value is larger than 1.0, it means that there is a possibility that the pollutant might cause health harm. The Hazard Quotient values for SO_2 were 0.0001, 0.0001, and 0.0002 for BMM, BMV and BMP respectively. These values were all less than 1.0. The estimated values for H_2S were 0.012, 0.005, 0.101, 0.0007, and 0.0007 for BMM, BMV, BMP, KSWP, and BTM respectively. Comparing the sulphur dioxide and hydrogen sulphide, it clearly shows that the latter had more probability of risk than the former. As a result of the HQ values being below the 1.00 threshold, it seems that barring a very unusual event, the adjacent people of the zones are not in danger of future health problems caused by the inhalation of H2S. In comparison to the values obtained by Feuyit et al. (2019) on residential areas near the Nkolfoulou landfills in Yaounde metropolitan, Cameroon, all of the HQ values attributable to SO2 in this research were lower. It can therefore be concluded that the presence of pollutants in the area within the period of this study is not high enough to cause health challenges, which could be a result of the time and season of the study. It could also be attributed to lots of factors like human activities, climate change and weather conditions.

Conclusion

The findings from the air quality monitoring of air pollutants in the Bori metropolis revealed that all the pollutants did not exceed the permissible limit which could be attributed directly to season, and low traffic within the areas of the current study. The pollutants monitored in this current study were also considered moderate in concentration as the values were below the hourly air quality monitoring standard of the World Health Organisation (WHO) and the United States Environmental Protection Agency (USEPA). This research work has discovered that some of the meteorological parameters had little effect on the quality of the atmospheric air within the areas selected for this study. The findings suggest that Bori Motor Park had the most pollutants in the air. The result of the air quality index shows that the pollution levels are not too high but some had severe pollution in selected areas of the study, which could indicate poor air quality, hence the need for constant monitoring of the pollution level.

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