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SEASONAL VARIATION of PARTICULATE POLLUTANT CONCENTRATIONS in PARTS of PORT HARCOURT METROPOLIS, RIVERS STATE, NIGERIA.

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Abstract: The study investigated seasonal variation of particulate pollutant concentrations in parts of Port Harcourt Metropolis, Rivers State, Nigeria. The study adopted descriptive research design which involved the description of particulate pollutant concentrations in the study area. The study assessed $PM_{2.5}$, PM_{10} and $PM_{1.0}$ as well as meteorological parameters in eight (8) locations (Rumuola, Rukpokwu, Elioparanwo, Mgbuoshimini, Rumuokurushi, Oroworukwo, Trans-Amadi and Port Harcourt Township) for both the wet and dry seasons. It was reported that, $PM_{2.5}$ during the wet season in all location was above WHO permissible limit. Also, the concentrations of $PM_{2.5}$ and PM_{10} in the dry season for all the locations were above WHO permissible limit of air quality guidelines. It was recommended that, legislation measure should be put in place to curb this menace, alternative sources of fuel should also be adopted.

Keywords: Atmosphere, Environment, Particulate Matter, Pollutant Concentrations, Port Harcourt, Rivers State.

I. INTRODUCTION

Air pollution is one of the primary concerns that should request prompt consideration, especially in thickly populated metropolitan districts like Port Harcourt, where unfortunate air quality remaining parts an issue [9]. Particulate matter (PM) is among the most disturbing air poisons influencing human wellbeing, to the degree that it comprises a critical wellbeing risk in Europe [12]. PM comprises of a mind boggling combination of strong and fluid particles of natural or inorganic nature and by and large displays aspects similar to or more modest than natural atoms, making them profoundly inclined to infiltrating the body [5]. These particles are ordinarily ordered into three large scale bunches in light of molecule measurement. The biggest particles, with a most extreme measurement of 10 μm (PM_{10}), display delayed air constancy. Fine particles ($PM_{2.5}$) have a most extreme measurement of 2.5 μm, and show long air dependability. At long last, more modest particles, known as super fine ($PM_{0.1}$), have a measurement of 0.1 μm or less [5]. Because of their size, these particles are the most harming regarding natural scattering and entrance, being related with cardiovascular and respiratory illnesses, cellular breakdown in the lungs mortality [12], oxidative pressure, and irritation processes [6].

The presence of PM in the climate normally happens because of ocean salt, fierce blazes, and volcanic ejection. Nonetheless, the most well-known wellsprings of particles in metropolitan conditions originate from human exercises like vehicular traffic, modern cycles, and building molding.

The principal compounds creating PM incorporate carbon monoxide (CO), [2], nitrogen oxides (NOx), unpredictable natural mixtures (VOCs), polycyclic fragrant hydrocarbons (PAH), sulfur dioxide (SO_2), and different auxiliary toxins [3]; [11]. Once in the air, the PM can respond artificially to produce optional particles (e.g., sulfates) or be saved (either wet or dry) over the vegetation, soils, water bodies, and metropolitan foundation [12]. The destructive impacts of PM in the metropolitan climate are disturbed by the total of such particles with metals, like Cadmium (Cd), Chromium (Cr), Copper (Cu), Nickel (Ni), Lead (Pb), and others, produced by different anthropogenic exercises [3].; [11].

Before the modern transformation, air contamination was generally insignificant contrasted with today. Most human exercises were revolved around agribusiness and limited scope fabricating, which didn't emanate critical measures of

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contamination into the environment. This is portrayed by spotless and unpolluted air, with insignificant degrees of hurtful poisons like particulate matter, nitrogen dioxide, ozone, and unstable natural mixtures. This air quality as of now would uphold human wellbeing, natural supportability, and biodiversity.

Accordingly, regular sources, for example, fierce blazes and volcanic ejections were the principal supporters of air contamination, however their effect was inconsistent and limited. Generally, the air quality was a lot of cleaner contrasted with what we experience as of now. Nigeria is gone up against with rising air contamination worries because of exercises of extractives, industrialisation and high populace development rate. Numerous areas of Waterways State, which give 60% of Nigeria's unrefined petroleum yield, have as of late been encountering apparent aftermath of residue [7].. Here in Waterways state, particularly in Port Harcourt City, there is an expansion in populace, industrialization and transportation exercises which could significantly affect the nearby air quality. In any case, aside from vehicular outflow in Port Harcourt City, deforestation and bramble consuming has likewise contributed extraordinarily to the current difficulties of air contamination nearby.

It is against this background, the current review considered it significant to investigate seasonal variations of particulate pollutant concentrations in parts of Port Harcourt Metropolis, Rivers State, Nigeria.

II. AIM AND OBJECTIVES OF THE STUDY

The aim of this study was to investigate seasonal variations of particulate pollutant concentrations in parts of Port Harcourt Metropolis. The objectives from this aim were, to;

i. determine the seasonal meteorological parameters of the study area
ii. assess the particulate pollutants concentrations during the wet season in the study area
iii. assess the particulate pollutant concentrations during the dry season in the study area

III. LITERATURE REVIEW

Around the vicinity of the study area and beyond, many works have been reported in related area which is crucial to guiding the present investigation. As reported in what follows are previous works of scholars that were carefully reviewed and presented thus;

[14]. researched “the Role of Meteorology for Seasonal Variation in Air Pollution Level in Eleme, Rivers State, Nigeria”, study examines the impact of meteorological boundaries on occasional varieties of air poisons in a semi modern region. A ten-year set of air quality and meteorological information were gathered and utilized in the review. Information examination was finished utilizing MatLab and SPSS programming. As per the report, it uncovered that the level of air contamination in the space fluctuates as per two winning breeze bearings that overwhelmed the region. The review showed that NO_2 diminishes with wind speed and relative mugginess, and marginally increments with wind course and temperature. CH_4 speeds up and temperature and diminishes with wind bearing and relative dampness. CO somewhat increments with wind heading and relative mugginess, and diminishes with wind speed and temperature. While SO_2 speeds up and wind heading, and somewhat diminishes with temperature and relative stickiness [14]. It was additionally detailed that the coefficient of assurance (R2) for both dry and stormy seasons are exceptionally low, demonstrating that there is a feeble straight connection between toxin focuses and meteorological boundaries in both dry and blustery seasons, and that there is no huge connection between poison fixations and meteorological boundaries too showed that the connections between contamination fixations and meteorological boundaries in the space are profoundly nonlinear [14]. Consequently, the yearly mean grouping of methane hydrocarbon was 146.2 $\mu g/m^3$ in the dry season and 167.8 µg/m3 in the stormy season. The yearly mean grouping of carbon monoxide was 59.0 $\mu g/m^3$ in the dry season and 60.4 $\mu g/m^3$ in the stormy season. The yearly mean grouping of nitrogen dioxide in the dry season was 67.2 $\mu g/m^3$ and 49.1 $\mu g/m^3$ in the stormy season, while the yearly mean centralization of Sulfur dioxide in the dry season was 47.7 $\mu g/m^3$ and 48.8 $\mu g/m^3$ in the blustery season [14].

Hence, on another review “The study of “Urban Air Pollution and its Effects on Health, Safety and the Environment in Nigeria: A Concise Review” was completed by [15]. The effect of metropolitan air contamination on human wellbeing, security and the climate in Nigeria was fundamentally analyzed. It was seen that most urban communities and cities in Nigeria are described by elevated degrees of air contaminations especially when contrasted with European Association (EU) guidelines for air quality. The discoveries are generally credited to different regular or anthropogenic exercises, for example, outside copying of squanders, ignition of fossil and strong powers, vehicle exhaust vapor, land clearing, mining, agribusiness, concrete creation and use, among others. The long-and momentary openness to the elevated

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degrees of air contaminations discharged from such exercises present huge dangers to human wellbeing, security and the climate in Nigeria [15].

[7]. did an examination on “Satellite Determination of Particulate Load over Port Harcourt during Black Soot Incidents”, The HYSPLIT model created by NOAA and Australia's Agency of Meteorology was utilized to figure airborne particulate burden, direction and scattering over the city. As per the report, least and most extreme emanation focuses scattering across Port Harcourt went from 0.000035 mg/m3 to 0.18mg/m3 (0.035-180 µg/m3), individually, for the hours considered. The most extreme worth acquired from these displaying results surpass the public yearly typical restrictions of 40-60 µg/m3 by 77-85% for suspended particulate matter and dark smoke. Particulates discharges as seen from the HYSPLIT model stage shows that outflow sources south of Port Harcourt contribute immeasurably to the particulate burden across the lower air of Port Harcourt and environs particularly during the evening and early long periods of sunrise. It was suggested that dynamic measures and functional arrangements be advanced to shield the air nature of the city[7].

Concentrate by [11]. on Seasonal Variations in the Concentration of some Atmospheric Pollutants along a major Highway in Southern Nigeria, 108 air tests were gathered during the dry (November - Walk) and wet (May - September) seasons in Nigeria, and the centralizations of certain particulates ($PM_{2.5}$ (particulate matter 2.5), PM10 (particulate matter 10), and TSP (all out suspended particulate) were estimated, though over similar period, a few known vaporous poisons (CO (carbon monoxide), NH3 (smelling salts), H2S (hydrogen sulfide), VOC (unstable natural compound), NO2 (nitrogen dioxide), and SO2 (Sulfur dioxide)) were checked. "The outcomes were in the reach 0.00 - 0.30 ppm, 0.00 - 0.20 ppm, 0.00 - 0.70 ppm, 0.00 - 0.30 ppm, 0.00 - 0.20 ppm, 4.20-19.60 ppm, 16.30-51.40 µg/m3, 43.20-266.00 µg/m3 and 56.30 - 434.60 µg/m^3 for NH_3, H_2S, CO, NO_2, SO_2, VOC, $PM_{2.5}$, PM_{10} and TSP, separately" (Richard et al., 2023). Measurably huge varieties (at $p<0.05$) were tracked down in the groupings of most air poisons during the dry and wet seasons aside from NH3, H_2S, and CO. The groupings of a few vaporous toxins (CO, NO_2, SO_2) and particulate TSP were inside the cutoff points determined by the Nigerian Encompassing Air Quality Norm. In any case, be that as it may, PM2.5 and PM10 surpassed the World Wellbeing Association cutoff points of 25µg/m3 and 50µg/m3 for a 24-hourly normal [11].

Environmental Change and Air Contamination: Suggestion for Human Wellbeing and Climate in Waterways State by [1], in light of their examination, it was finished up and suggested as subsequently, "the danger of environmental change and air contamination on the soundness of individuals is hard to miss. This represents an incredible risk to the economy of the state coming about because of individuals moving to different spots. It is vital to lay out and authorize arrangements with respect to air contamination. Hence, unlawful refining of unrefined petroleum ought to be decreased and the public authority ought to proactively participate in enormous tree establishing that will assist with cleaning the climate. There is a requirement for ordinary and severe checking of barometrical contaminations in Port Harcourt district to guarantee it doesn't surpass the acknowledged level in order to deflect its wellbeing challenges. At last, rough copying of dangerous production line squanders ought to be deterred and vehicular discharges ought to be controlled. A sound city is a result of solid climate and environmental cycles" [1].

[10]. dealt with “Assessment of Automobile Induced Pollution in an Urban Area (A Case Study of Port-Harcourt City, Rivers State,Nigeria)”, the review examined the impact of vehicle discharge in a metropolitan city (Port-Harcourt, Waterways State) was conveyed for a long time. Two areas noted for weighty gridlock in the city were picked for the review. Observing times were decided to catch the gridlock. Altogether, five (5) morning and night estimation were directed at every area throughout the span of two weeks (2) starting from August eleventh - fifteenth 2010 for post crossing point and August eighteenth - 22nd 2010 for butcher convergence. Fixation estimation for Hydrocarbon (HC), Sulfur dioxide (SO2), Nitrogen dioxide (NO2) and carbon monoxide (CO) were done in the first part of the day (6.30 - 8.00am) and nights (5.00 - 7.00pm) per times of gridlock utilizing standard gas screen (temperature at the hour of estimation were noted). discoveries uncovered that the levels of these vaporous discharges were higher than reasonable level on Wednesday to Saturday at the two intersections both morning and night. Be that as it may, the level of these gases on Sunday at the two intersections in the first part of the day and night were underneath identification limit. It suggests that these regions are contaminated in morning and night when workplaces and business exercises start [10..

[9]. concentrated on Ambient particulate matter levels and health profile in residents of Choba and Mgbuoba areas of Rivers State: A cross-sectional review. The review explored the wellbeing profile of people presented to particulate matter (Dark) residue in Choba and Mgbuoba territories of Port Harcourt. The examination was executed with the guide of 100 respondents (50 from Choba and 50 from Mgbuoba). An organized survey with the illustrated components was used during information assortment for the review and Key Source Meetings (KII) were taken advantage of to acquire relevant information from wellbeing experts. A hand-held Kestrel climate tracker was utilized to determine the breeze

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speed, temperature, and relative stickiness of the review regions while A Met One Instrument, Inc. Spray Mass Screen Model GT-531 was used to gauge complete suspended particulates. Biochemical boundaries, for example, lipid profile, renal markers, and liver markers exercises were dissected from blood tests acquired from the subjects utilizing spectrophotometric strategies. The air quality profile of Mgbuoba showed critical ($p < .05$) increase altogether suspended particulate matter, all out suspended particulate matter (TSPM), particulate matter that is 10 microns in breadth or less (PM10), and particulate matter that is 2.5 microns in distance across or less (PM2.5) from 6 a.m. to 8 a.m. contrasted and Choba. The augmentation altogether suspended particulate matter, PM10, and PM2.5 levels were past the 24-hour PM10 and PM2.5 suggested level by the World Wellbeing Association (WHO) (Nwaichi et al., 2021). In this way, the alanine transaminase (ALT) and low thickness lipoproptein (LDL) levels of Choba and Mgbuoba occupants were past as far as possible set by the Clinical Gathering of Canada. The review showed that occupants in Mgbuoba in Port Harcourt might be more in danger and have higher weakness to the unwanted results related with openings to these air foreign substances. Agreeing result obviously shows that the air contaminations are higher in focuses promptly in the first part of the day and their fixations diminished as the day went by. In their comment, the occupants here might be at high gamble of openness to these air poisons from 6 a.m. to 8 a.m. [9].

[13]. completed an examination on Diurnal Variation of Air Quality in Port Harcourt City Local Government Area, Rivers State. Here, five example destinations (Borokiri, Lagos Transport Stop, Mile One, Old GRA and Amadi indirect) were purposively decided to cover the significant zones that make up the Nearby Government Region. Versatile Aeroqual 200/300 series and Aeroqual PM2.5/10 were utilized for the assurance of gases and particulate matter individually. As per them, the evaluation was completed morning and night (in each visit), two times month to month for quite a long time (November and December 2019). The outcomes got (Mean±SD) in µg/m3 for morning/evening as detailed are, Ozone (0.063±0.017/0.039±0.022), Methane (13.80±4.54/9.75±5.67), Carbon Monoxide (0.080±0.051/0.094±0.043), Carbon Dioxide (840.450±181.293/836.300±303.929), Smelling salts (0.120±0.011/0.100±0.031), Hydrogen Sulfide (0.044±0.015/0.028±0.020), Unstable Natural Carbon (8.715±1.704/9.850±5.021),PM10 (0.052±0.009/0.024±0.007) [13].

[8]. completed a concentrate on 'Spatial and Temporal Variations in the Concentrations of Particulate Matter in Ambient Air from Three Different Locations in River State, Nigeria'. The review was directed because of developing modern exercises and the related outcomes around the review regions to assess the worldly and spatial varieties (changes) in the groupings of particulate matter in encompassing air from Eleme, Aluu and Ikoku in Streams state, Nigeria. The span of this study endured from April, 2021 through January, 2022 which covered both dry and wet seasons. Particulate matters in surrounding air were gathered from these three unique areas utilizing air sampler (Little volair sampler) as per them, during the dry season, mean groupings of Eleme were accounted for to be 40 ±10 µg/m^3 and 60 ±026 µg/m^3 for $PM_{2.5}$ and PM_{10} separately. Ikoku was accounted for to be 30 ±01 µg/m3 and 64 ± 024 µg/m3. While Aluu had mean centralizations of 50 ±10 µg/m^3 and 60 ±116 µg/m3. Accordingly, the outcome showed that Ikoku had the most elevated mean convergence of particulate matter. They insisted that during the pouring (wet) season, Eleme had a mean centralization of 27 ±16 µg/m^3 and 37 ±30 µg/m^3 for $PM_{2.5}$ and PM_{10} separately. The mean convergences of Ikoku were accounted for to be 23 ±08 µg/m3 and 35±14 µg/m^3. Aluu was accounted for to be 13 ± 06 µg/m^3 and 13 ± 06 µg/m^3. In this way, broke down results as per their report obviously showed that the particulate matter focus in the barometrical locale of the concentrated on areas during the wet season, are over the WHO admissible breaking point for $PM_{2.5}$ (12 µg/m^3) and underneath the WHO passable cutoff for PM_{10} (45 µg/m^3 for PM_{10}) [8].

[2]. completed a review that documented the baseline, spatial and temporal variation of $PM_{2.5}$ particulate matter in Isoko land, Delta State, Nigeria. Miniature residue expert constant residue screen roll utilized for airborne particulate matter testing; the acquired outcome was in the scope of 4-310 µg/m3. Their outcomes uncovered that the 24 hours Public Surrounding Air Quality Standard Unit (NAAQS) for PM2.5 edges in all the examining sitter was surpassed. Additionally, the dry season displayed altogether more elevated levels than the wet seasons.

IV. MATERIALS AND METHOD

The design for this study was longitudinal descriptive research design. This involved the continuous measurement of particulate pollutant as well as describing their concentrations in the study area. This assessment of particulate concentrations was carried out during the wet and the dry seasons. The wet season was in the month of May, June and July, 2014 while the dry season was in November, December and January, 2024/2025.

The study location was selected communities in Port Harcourt Metropolis, Rivers State, Nigeria. Port Harcourt is the capital city of Rivers State, one of the oil rich States in the Niger-Delta in the South-South region of Nigeria.

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Thus, the communities in Port Harcourt Metropolis that were randomly selected for the study are; Rumuola, Rumuokurushi, Rukpokwu, Elioparanwo, Mgbuoshimini, Oroworukwo, Trans-Amadi and Port Harcourt Townhip.

The study adopted simple random sampling techniques to arrive at its sample size. The particulate pollutants sizes of interest were PM_{10}, $PM_{2.5}$ and $PM_{1.}0$.
The instrument used for the assessment of the pollutants were Blatn air quality detector, Bosean multi gas detector, EG Air quality, met metre and hand held GPS.
The Blatn air quality detector, Bosean multi gas detector and EG Air quality were used to measure the concentrations of the particulate pollutants, met metre was used to determine the meteorological parameters while the hand held GPS was used to determine the global positioning system coordinates of the various sampled locations.

The pollutants were measured once the devices were turned ON and allowed for 3 minutes to be stabilised, with full arm stretched to the height of 1.5metre. The reason for 1.5 metre was because this is the average breathable height of humans. On stability of the devices, the readings of the pollutants were taken. This was done in all the selected locations for both the wet and dry seasons for the total period of six (6) months.

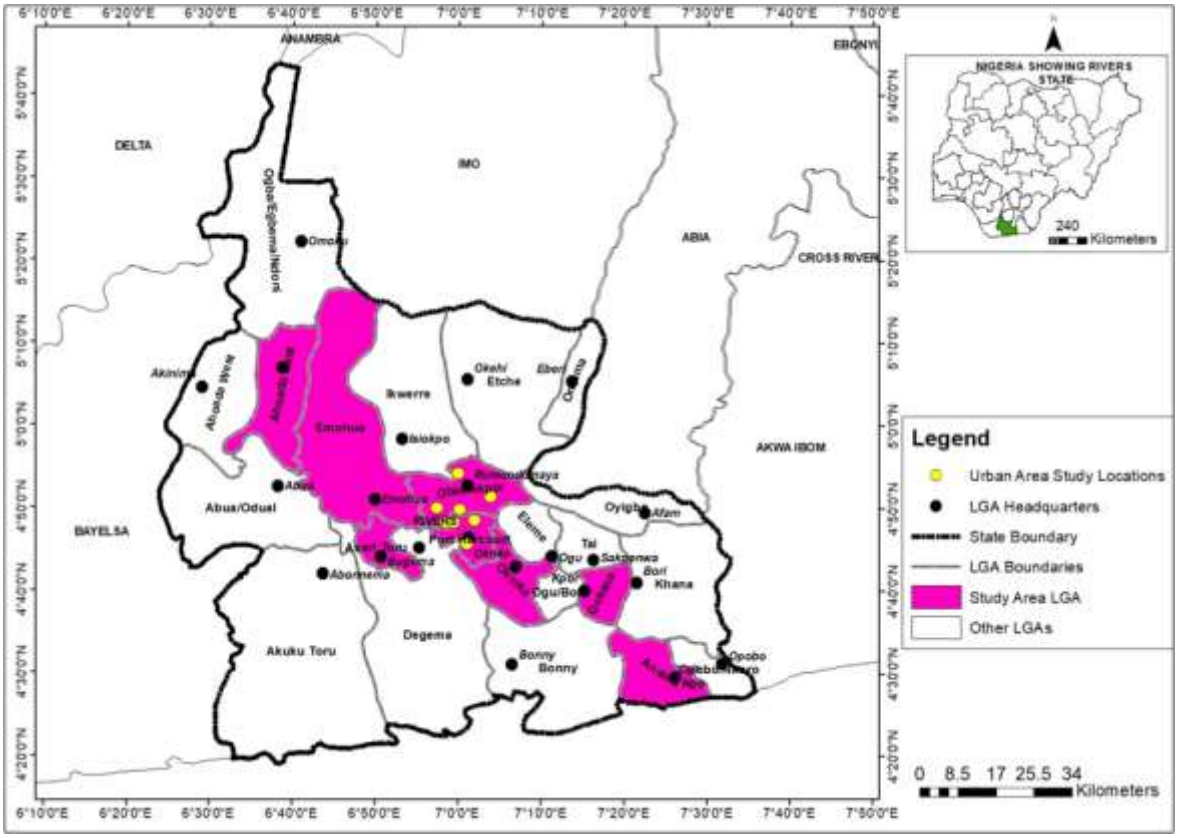

Fig. 1 Study Area Sampled Locations

Figure 1 shows the sample points of the various locations where assessment of particulate pollutants and meteorological parameters were carried in the study area.

V. RESULTS AND DISCUSSIONS

Table I Global Positioning System Coordinates

S/NO	Sampled Stations	Coordinates	
1	Rumuola	04º49’51.1”N	007º0’11.7”E
2	Rukpokwu	4º54’13.6”N	06º59’59.6”E
3	Elioparanwo	04º49’58.6”N	006º57’27.1”E
4	Mgbuoshimini	04º48’15.7”N	006º58’29.6”E
5	Rumuokurushi	04º51’22.8”N	007º03’52.9”E

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6	Oroworukwo	4º48'12.2"N	006º59'27.1"E
7	Trans-Amadi	04º48'29.4"N	007º001'55.8"E
8	Port Harcourt Township	04º45'41.3"N	007º01'06.1"E

Source: Researcher's Fieldwork, 2025.

Table I presents the global positioning system coordinates of the various locations in the study area where assessment of particulate air pollutants was carried out in the study area. These locations were 8 in number and from these coordinates, the sample map of the various points where assessment was carried out can be produced.

Table II Mean Concentrations of Meteorological Parameters During the Wet Season in the Study Area

Met. Variables/Locations	Temperature(ºC)	R. Humidity(%)	Wind Direction	Wind Speed(m/s)
Rumuola	27.9	95.7	SE	0.5
Rukpokwu	29.2	82.3	SE	0.2
Elioparanwo	26.3	100.7	NW	0.3
Rumuokurushi	29.4	81	NW	0.6
Mgbuoshimini	26.9	97.7	NW	0.3
Oroworukwo	26.9	96	NW	1.2
Trans-Amadi	27.3	93.3	NW	1.43
Port Harcourt Township	26.3	91	NW	1

Source: Researcher's Fieldwork, 2025.

Table II presents the mean concentrations of meteorological parameters during the wet season in the study area. From the table, it was observed that during the wet season, high relative humidity was recorded which was aa a result of high moisture content in the atmosphere during this season. Temperature on the other hand was not observably high and the wind direction was more at the direct of North-West with variable wind speed.

Table III Mean Concentrations of Meteorological Parameter During the Dry Season in the Study Area

Met.Variables/Locations	Temperature(ºC)	R. Humidity(%)	Wind Direction	Wind Speed(m/s)
Rumuola	33.4	43.2	NE	1.1
Rukpokwu	34.5	40.4	E	0.3
Elioparanwo	34.6	38.5	NE	0.533
Rumuokurushi	35.4	41.03	NE	0.23
Mgbuoshimini	33.1	43.3	SW	0.4
Oroworukwo	35.1	41.03	NE	1.33
Trans-Amadi	35.3	40.8	NE	3.3
Port Harcourt Township	35.17	37	E	1.1

Source: Researcher's Fieldwork, 2025.

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Table III presents the mean concentrations of meteorological parameter during the dry season in the study area. As seen, relative humidity was low, temperature on the increase which was opposite of what was observed during the wet season in these same locations. Here, the wind direction was more in the North-East Direction with varying speed.

Table IV Mean Particulate Pollutant Concentrations During the Wet Season in the Study Area

Locations/Pollutant	$PM_{2.5}$	PM_{10}	$PM_{1.0}$
Rumuola	27.7	39	21
Rukpokwu	23.7	22.3	18.7
Elioparanwo	58.3	54.7	40.3
Rumuokurushi	47	33	22.7
Mgbuoshimini	25.7	18.3	14.7
Oroworukwo	38.7	20.7	14.3
Trans-Amadi	34.3	28.3	19.7
Port Harcourt Township	27	15.3	11

Source: Researcher's Fieldwork, 2025.

Table IV displays the mean particulate pollutant concentrations during the wet season in the study area. As observed, $PM_{2.5}$ in the respective locations were all above the WHO permissible limit for air quality guidelines of $15ug/m^3$. While for PM_{10}, it was only in Elioparanwo ($54.7ug/m^3$) it was recorded to be above WHO permissible limit of $43ug/m^3$. PM1.0 does not have established limit by WHO for the time being.

Table V Mean Particulate Pollutant Concentrations During the Dry Season in the Study Area

Locations/Pollutant	$PM_{2.5}$	PM_{10}	$PM_{1.0}$
Rumuola	77.7	90	58
Rukpokwu	82	93.7	60.7
Elioparanwo	59.7	67	47.3
Rumuokurushi	82.7	80.7	59.7
Mgbuoshimini	82.7	91.7	62
Oroworukwo	69	73.3	53
Trans-Amadi	84	77.3	64.3
Port Harcourt Township	82.3	74	66.3

Source: Researcher's Fieldwork, 2025.

Table V presents the mean particulate pollutant concentrations during the dry season in the study area. As observed from the table, $PM_{2.5}$ and PM_{10} in all locations were all above WHO permissible limits of air quality guidelines of $15ug/m^3$ and $43ug/m^3$ respectively.

VI. DISCUSSION

Particulate pollution is an important aspect of concern in the overall air pollution assessment. These various particles of interest have far-reaching health consequences upon inhalation. This can worsen an asthma attack and other respiratory ailments. Small particles sizes as small as $PM_{2.5}$ and PM_{10} can bypass the respiratory air ways through the nasal mucosa to exacerbate health conditions. As observably recorded in the field, the study area was impacted by particulate pollution which could be as a result of anthropogenic activities such as transportation-induced pollution, industrial activities, burning of biomass and illegal refining of petroleum product in the urban centre. These activities are much concentrated here (Port Harcourt Metropolis) and it impacts the air quality of the area. The concentrations of $PM_{2.5}$ in the wet season was very high in all the studied location but this was not the case for PM_{10}. However, in the dry season, the concentrations of these pollutants were all very high above the standard set by the WHO. This means that in general, as meteorological variables is a factor in air pollutant concentrations, season also is a determinant factor on the atmospheric residence of these pollutants. Thus, during the wet season, these pollutants are washed off the atmosphere through precipitation and air movement, this being the cause for reduced particulate matters concentrations in the study areas. These findings are in line with the submissions of[8], [14]. and [11].

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VII. CONCLUSION

Air pollution is a serious menace of concern which should be tackled with all seriousness. The understanding of the air pollution concentrations and spread pattern in an area is very paramount to addressing its further distributions. Port Harcourt Metropolis was no doubt polluted with particulate maters which differ in concentrations for the both seasons (wet and dry). This is key to arresting those activities that contribute to this pollution in the area by ways of legislations and some penalty spelt out to defaulters. There is also need for alternative sources of energy and fuels as these are the chief polluters of the atmosphere.

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