

# Air Quality Bulletin

April- June 2025

A Publication of Nigerian Meteorological Agency

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# Preface

Air quality is a vital component of environmental health monitoring and public safety. With the increasing urbanization, industrial expansion, and shifting climatic patterns in Nigeria, the need for consistent and comprehensive air quality monitoring becomes very crucial.

This edition of the bulletin provides air quality information across Nigeria for April, May, and June 2025. It is part of the Nigerian Meteorological Agency's commitment and ongoing effort to provide timely, science-based insights into the state of the atmosphere over the country. The bulletin presents a comprehensive analysis of key pollutants in the atmosphere: PM<sub>2.5</sub>, NO<sub>2</sub>, CO, and SO<sub>2</sub>, alongside meteorological parameters such as wind patterns, mean sea level pressure, and the movement of the Inter-Tropical Discontinuity (ITD), which collectively influence the dispersion, concentration, and impact of air pollutants across Nigeria.

By integrating satellite data from the Copernicus Atmospheric Monitoring System (CAMS) with ground-based observations, all the analyses were done with a goal to provide useful information and serve as a critical resource for policymakers, health professionals, researchers, and the general public.

It aims to increase awareness creation, support informed decision-making, and promote actions that encourage human practices that ensure the sustainability of healthy air quality and general wellness.

Through this publication, NiMet reinforces its commitment to observe, analyze, and communicate environmental data that supports national development, public health and international obligations for sustainable, clean, and healthy air for all.

**Professor Charles Anosike**

*Director General/CEO NiMet & Permanent  
Representative of Nigeria with WMO*

# Introduction

Air pollution continues to rise at an alarming rate, affecting economies and the quality of life of people globally (WHO 2016)[1]. It poses significant environmental risk to human health, and it is "a silent killer that claims more than 8.1 million lives every year" (UNEP 2026)[1]. Ambient air pollution alone has been reported by WHO to kill three million people each year. Surprisingly, only one person out of ten live in cities that comply with WHO Air Quality guidelines. This underscores the need for continuous monitoring and collection of Air Quality data. The April-June 2025 edition of Air Quality Bulletin is therefore produced by the Nigerian Meteorological Agency (NiMet) with data obtained from continuous monitoring of the Air Quality over Nigeria.

The bulletin presents a quarterly review of Nigeria's atmospheric conditions and pollutant levels, with a focus on spatial distribution, seasonal transitions, and health implications. This edition highlights the dynamic interplay between meteorological variables and air pollution during the onset of the rainy season, especially in the South.

It is a period marked by the northward migration of the ITD, changing wind regimes, and increasing rainfall. Each chapter of the bulletin provides a month-by-month analysis of pollutant concentrations, visibility trends, and influence of

meteorological factors on air pollutants. Chapter One covers the retreat of Harmattan conditions and the emergence of cyclonic vortices, which temporarily improved air quality in some regions in April. The evolving pollutant profiles in May and June are discussed in chapters two and three. The regional disparities and the role of rainfall in pollutant dilution are also highlighted in these two chapters. Chapter Four synthesizes quarterly trends, offering comparative insights across cities and regions. The bulletin concludes with a summary of all the events that occurred during the second quarter of the year in chapter five. The overall effort emphasizes the importance of continuous monitoring aimed at enhancing Nigeria's air quality management strategies and the need for targeted interventions in air pollution control

## **Air quality**

Air quality refers to the condition or cleanliness of the air we breathe. It is determined by the presence and concentration of pollutants such as particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>), nitrogen dioxide (NO<sub>2</sub>), carbon monoxide (CO), Sulphur dioxide (SO<sub>2</sub>), and ground-level ozone. These pollutants can originate from natural sources like dust storms and wildfires, or human activities such as vehicle emissions, industrial processes, and open burning.

Poor air quality escalates respiratory health risks such as Asthma, Chronic

Obstructive Pulmonary Disease (COPD), and elevated risks of lung cancer, especially in children, the elderly, and individuals with preexisting respiratory or cardiovascular conditions.[1] It can also impact ecosystems, reduce visibility, and contribute to climate change. Monitoring air quality helps identify pollution sources, assess health risks, and guide policies aimed at improving environmental, public, and individual health outcomes.

### **Particulate Matter (PM)**

Particulate matter (PM) refers to a mixture of tiny solid particles and liquid droplets suspended in the air. Common sources of particulate matter include vehicle emissions, industrial activities, dust storms, and biomass burning. These particles vary in size, origin, and composition, and are usually classified according to their diameter. PM<sub>10</sub> have diameters less than 10 micrometers, while PM<sub>2.5</sub> have diameters less than 2.5 micrometers. PM<sub>2.5</sub> is especially hazardous because it can penetrate deep into the lungs and even enter the bloodstream, posing serious health risks such as respiratory and cardiovascular diseases. PM<sub>2.5</sub> can irritate the lungs, causing coughing, wheezing, shortness of breath, and aggravating asthma and bronchitis. Long-term exposure increases the risk of heart attacks, strokes, and hypertension. Inhalation of PM<sub>2.5</sub> is linked to millions of premature deaths globally, especially among vulnerable populations like children and the elderly. Some PM<sub>2.5</sub> particles contain carcinogenic compounds, raising the

risk of lung cancer. Emerging research suggests links to cognitive decline and neurodevelopmental disorders. PM<sub>2.5</sub> contributes to haze, affecting transportation and scenic views. It alters cloud formation by acting as condensation nuclei and affects solar radiation by scattering and reflecting radiation. These, potentially impact weather patterns. Deposits on soil and water can harm plant life and aquatic organisms. Even at low concentrations, PM<sub>2.5</sub> can be harmful to humans depending on exposure duration and the individual's sensitivity. Monitoring and minimizing exposure are key to protecting public health.

Ground-level ozone, nitrogen oxides, carbon monoxide, and Sulphur oxides are also of great health concerns as these are the main precursors of secondary PM in the atmosphere. The World Health Organization Air Quality guidelines, which spell out acceptable limits of each pollutant is shown in Table 1.

**Table 1: World Health Organization Guidelines – Update 2021 (Source: World Health Organization)**

Pollutant	Averaging Time	2005 AQGs	2021 AQGs
PM <sub>2.5</sub> , µg/m <sup>3</sup>	Annual	10	5
	24-hour <sup>a</sup>	25	15
PM <sub>10</sub> , µg/m <sup>3</sup>	Annual	20	15
	24-hour <sup>a</sup>	50	45
O <sub>3</sub> , µg/m <sup>3</sup>	Peak season <sup>b</sup>	-	60
	8-hour <sup>a</sup>	100	100
NO <sub>2</sub> , µg/m <sup>3</sup>	Annual	40	10
	24-hour <sup>a</sup>	-	25
SO <sub>2</sub> , µg/m <sup>3</sup>	24-hour <sup>a</sup>	20	40
CO, mg/m <sup>3</sup>	24-hour <sup>a</sup>	-	4

### Air Quality Index (AQI)

The Air Quality Index (AQI) is a standardized parameter used to measure and communicate how clean or polluted the air is, and the associated health effects might be of concern. It converts complex air pollutant data—such as concentration of PM<sub>2.5</sub>, PM<sub>10</sub>, NO<sub>2</sub>, CO, SO<sub>2</sub>, and ozone into a single number which represents the AQI. The values of AQI range from 0 to 500. Lower values (0–50) indicate good air quality with minimal health risk, while higher values (above 150) indicate unhealthy or hazardous conditions (Table 2). AQI helps individuals, communities, and governments take timely action to protect public and individual health.

**Table 2: AQI Categories and Health Implications**

Air Quality Index Range	Class/Category	Health Advisory
1-50	Good	The quality of the air is good; it presents no threat to anyone's health. Air quality is satisfactory; no health risk.
51-100	Moderate	The air quality is acceptable, except for unusually sensitive individuals. Acceptable air quality; sensitive individuals may experience minor effects.
101-150	Unhealthy for Sensitive group	Outdoor activity should be minimized for sensitive group such as the elderly, children, and individuals with heart and lung diseases. Sensitive groups should limit prolonged outdoor exertion.
151-200	Unhealthy	Everyone should avoid prolonged exposure to prevent breathing difficulties which may be more severe in sensitive populations. Everyone may begin to experience health effects; sensitive groups more serious.
201-250	Very Unhealthy	Minimize time spent outdoors. The entire populace is likely to be affected. Health alert; everyone may experience more serious health effects.
251-500	Hazardous	Hazardous for everyone and may prompt emergency condition alerts. Emergency conditions; entire population likely affected.

During the JFM 2025 period, AQI values varied significantly across Nigeria discussed in details in sections 1.9, 2.9 and 3.9

## CHAPTER ONE

### 1.0 April 2025 Review

#### 1.1 Position of the Inter-Tropical Discontinuity (ITD) and Rainfall Across Nigeria

The Intertropical Discontinuity (ITD) is a crucial atmospheric boundary over Nigeria that separates the dry, dusty continental air mass from the moist maritime air mass. Its seasonal movement plays a dominant role in determining Nigeria's weather and climate such as rainfall, humidity, wind patterns as well as air quality during the season. The northward movement of the ITD during the rainy season allows moist air from the Atlantic Ocean to penetrate inland, triggering rainfall across Nigeria. Its southward retreat marks the beginning of the dry season. The ITD also influences the distribution of atmospheric aerosols over Nigeria. During the dry season, when the ITD is farther south, northern Nigeria is dominated by dry, dusty Harmattan winds, increasing the concentration of particulate matter in the atmosphere. This results in deterioration of air quality, visibility, and respiratory health, especially in urban places.

During the month under review, the ITD continued its northward progression from the previous position of 10°N in March to 11.2°N in the first dekad of April. It reached latitude 12.4°N by the 3<sup>rd</sup> dekad of the month. The ITD, therefore, maintained a mean position of 11.6°N during the month. The average position of the ITD in April 2026 was observed to be more northerly compared to the climatological mean position. This suggests an earlier onset of rainy season and more rainfall than normal over the Central states of the country. The coastal States recorded the highest rainfall of 240 to 480mm while the inland States of the South and some central States such as Benue and Nasarawa recorded rainfall which ranged from 120 mm to 240 mm.

Other Central States recorded rainfall of 10 mm to 120 mm, while the northern States remained dry and hazy due to suspension of particulate matter in the atmosphere over the region (Figure 1.1)

As the ITD oscillated northward, dry continental air mass also receded northward, while the southern and central States were overlain with moist maritime airmass, which absorbed and reduced the dust concentration in southern and central regions. As a result, air quality improved in southern Nigeria but remained poor over Sokoto, Zamfara, Katsina, Kano, Jigawa, Yobe, Bauchi and Borno States in the North.

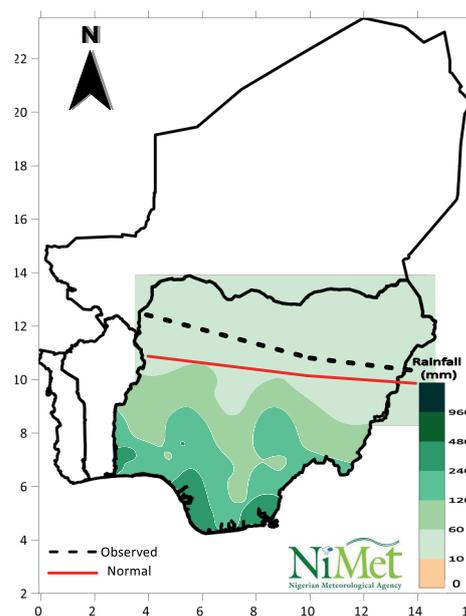


Figure 1.1: Mean Position of ITD and Rainfall Amounts across Nigeria in April 2025.

## 1.2 Mean Sea Level Pressure (Azores and St. Helena High) April 2025

Two of the high-pressure systems that modulate weather over Africa are the Azores and St. Helena high-pressure cells located of the Azores pressure cells was quasi-constant around 30°N and 30°S respectively.

The average Mean Sea Level Pressure (MSLP) at the centre Average Mean Sea Level Pressure below 1010 hPa were recorded over places covered by the heat lows (Figure 1.2). These conditions favoured rainfall over the South and Central States of the country.

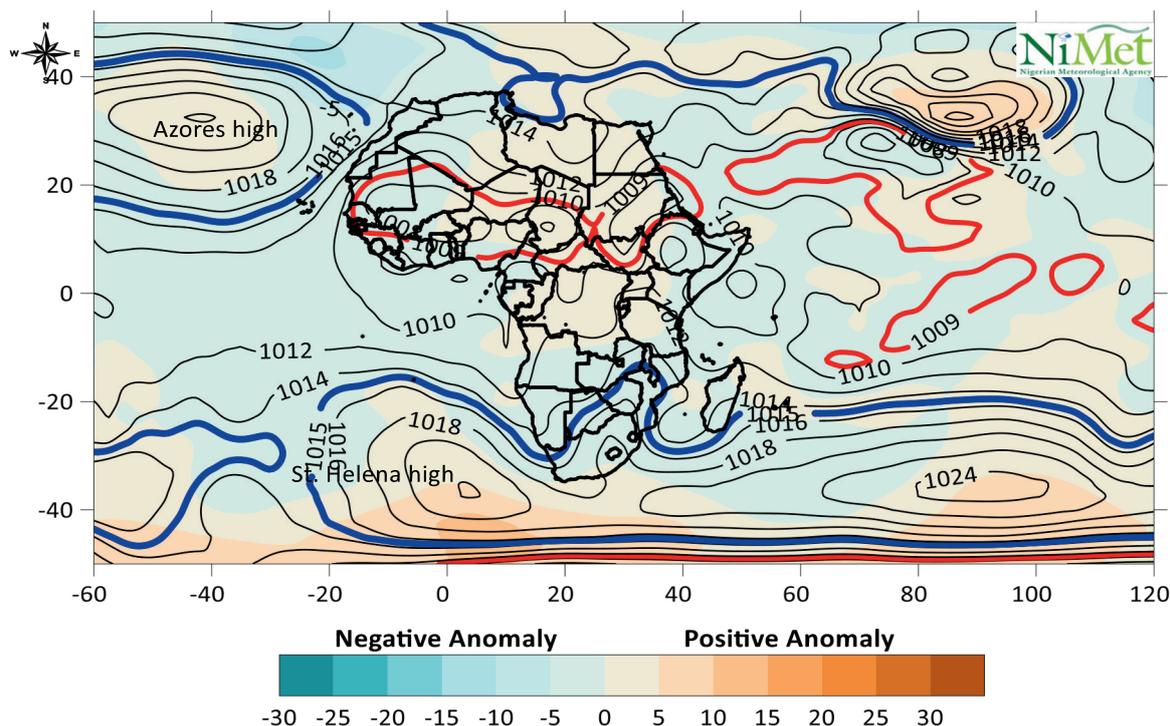


Figure 1.2: Mean Sea Level Pressure in April 2025.

## 1.3 Winds in April 2025

### 1.3.1 Winds at 925hPa Level (about 900m above the ground)

At a level of about 900 m above the ground, winds observed were dominantly northeasterly over the far northern States, while south-westerly winds with speeds of 5 to 20Knots prevailed over the South and Central Nigeria. Cyclonic vortices, which are localized low-pressure systems characterized by rotating winds, vertical motion, and moisture convergence, were also seen on the wind chart around the north central states during the month.

Such features intensify uplift and moisture convergence, leading to enhanced rainfall at lower levels of the atmosphere and early onset of rains over the South and Central States for agriculture.

Consequently, dust transport was suppressed, and air quality improved considerably across the country in April 2025.

### 1.3.2 Winds at 850hPa Level (about 1500m above the ground)

At this level, Northeasterly (NE) winds prevailed across the country on most days with speeds ranging from 5 to 30 knots. South-westerly (SW) winds appeared intermittently, especially over the Southern states, indicating moisture advection into those areas. Cyclonic Vortices were also seen at this level of the atmosphere around the Northeastern and Northcentral States, indicating a deep layer of moisture convergence and

vertical uplift. These features reflect a transitional process from the dry-season, dominated by stable weather, to the wet season, and are essential for enhancing convective development and rainfall during the rainy season.

### 1.4 Particulate Matter (PM<sub>2.5</sub>) Concentration in April, 2025

In April 2025, the PM<sub>2.5</sub> concentrations recorded in most states of Nigeria were between 30 and 55 $\mu\text{g}/\text{m}^3$ . The highest PM<sub>2.5</sub> concentrations were observed across Kano, Katsina, Kaduna, Jigawa, Bauchi, and Plateau, with cities such as Zaria (88  $\mu\text{g}/\text{m}^3$ ), Kano (75  $\mu\text{g}/\text{m}^3$ ), and Jos (66  $\mu\text{g}/\text{m}^3$ ), far exceeding health safety limits. The increase in concentration was mainly as a result of Saharan dust transport, urban/industrial emissions, and bush burning.

Concentrations ranging between 15 and 30 $\mu\text{g}/\text{m}^3$  were observed over the coastal and Southwestern states such as Lagos, Edo, Rivers, Bayelsa, Akwa Ibom, Delta, Cross River and Ogun, Ondo, Ekiti, Ogun states. Lagos and Ondo states, however, experienced the lowest concentrations of 17  $\mu\text{g}/\text{m}^3$  attributed to maritime winds and rainfall over the region (Figure 1.3)

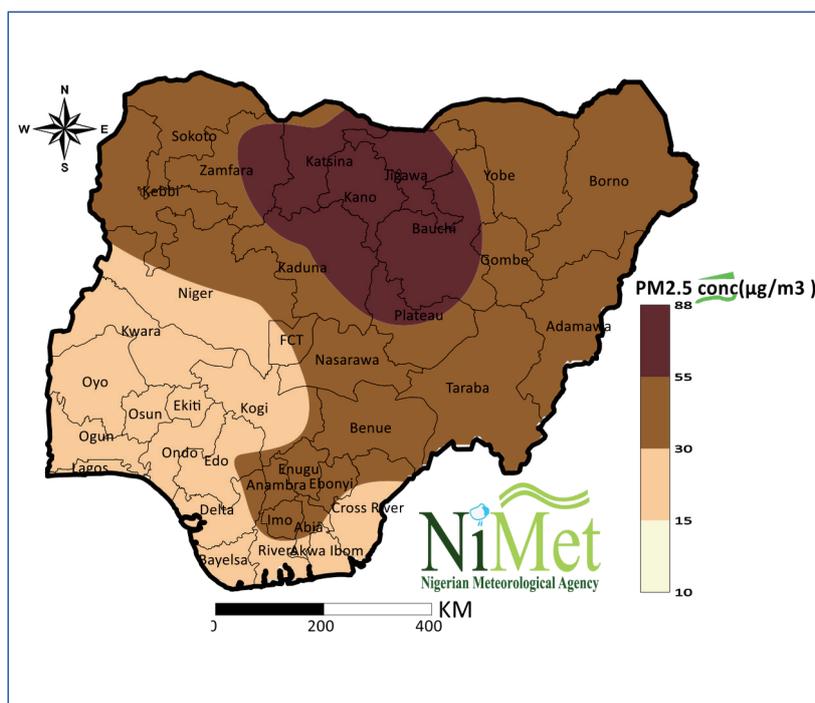


Figure 1.3: Mean Concentration of Particulate Matter (PM<sub>2.5</sub>) in the Atmosphere over Nigeria in April 2025.

### 1.5 Horizontal Visibility in April 2025

Horizontal visibility is the maximum distance at which an observer can see and recognize an object situated in essentially the same horizontal plane. Horizontal visibility is sometimes reduced by air pollution and high humidity. In April 2025, various weather stations in the country reported such deterioration in visibility as haze when associated with particulate matter and dry winds.

Conversely, mist and fog cause deterioration associated with moist winds. Fog and smoke can reduce visibility to near zero, making driving extremely dangerous. These particles vary in shape, size and chemical composition, and come from a variety of natural and man-made sources. Some haze-causing particles are directly emitted into the atmosphere, such as windblown dust and soot.

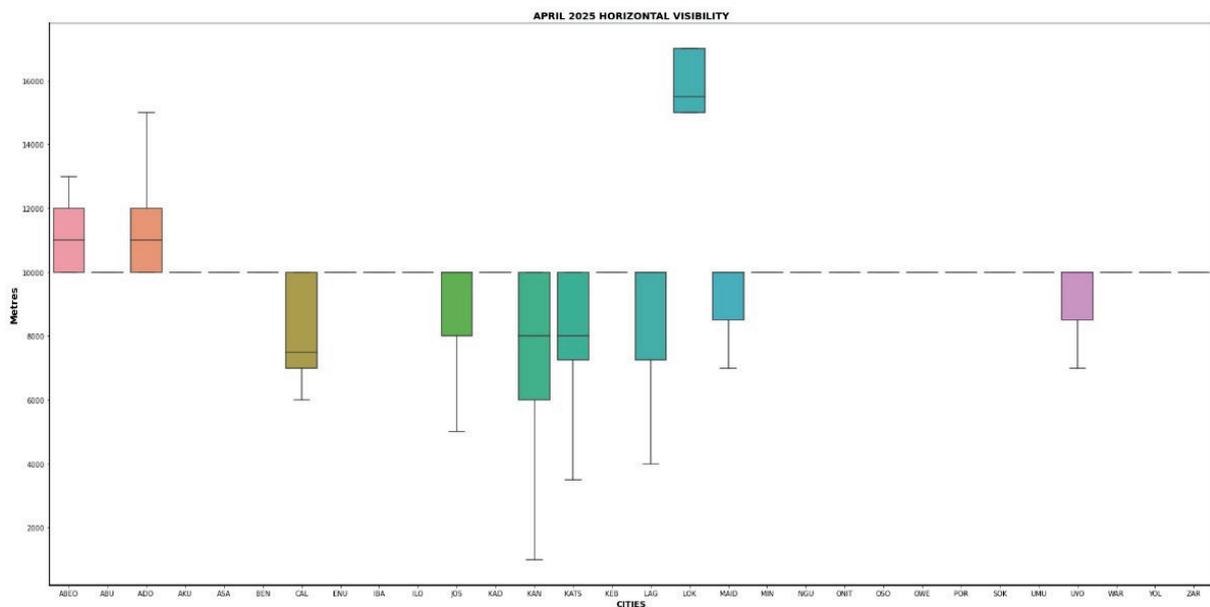


Figure 1.4: Mean Daily Horizontal Visibility Over Cities Across Nigeria in April 2025

Visibility was good across most Nigerian cities in April 2025. This can be attributed to the gradual transition from the dry to the rainy season. The lowest horizontal visibility of 1000 m was observed over Kano on 13<sup>th</sup> April, and 1200 m over Maiduguri on 11<sup>th</sup> April, 2025. The highest visibility of 20 km was observed over Abeokuta on 29<sup>th</sup> April, 2025. As shown in Table 2, no city in Nigeria reported visibility below 1000 m.

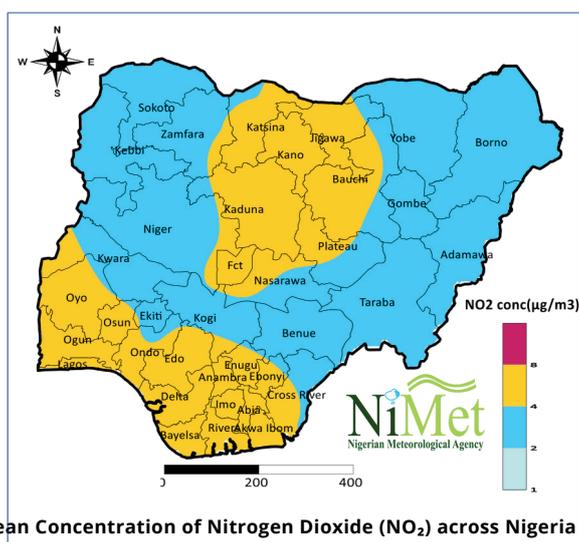
**Table 3: Cities in Nigeria that Recorded Horizontal Visibility between 100m and 2000m in January 2025**

VISIBILITY (m)	LOCATIONS	DATE	TOTAL NUMBER OF DAYS
601-1000m	-	-	-
1000-2000m	Ibadan, Kano, Katsina, Maiduguri, Nguru, Sokoto, Zaria.	11th, 12th, 13th, 25th, 26th, 27th, 30th	7
2001-4000m	Ado-Ekiti, Jos, Kaduna, Kano, Katsina, Kebbi, Lagos, Maiduguri, Nguru,	1st, 3rd, 4th, 12th, 14th, 15th, 26th, 28th, 29th	9

**1.6 Nitrogen Dioxide (NO<sub>2</sub>) Concentration Across Nigeria in April 2025**

Moderate nitrogen dioxide concentrations of 2.0 to 8.0 µg/m<sup>3</sup> generally prevailed across the country in April 2025. The southern states of Lagos, Ogun, Oyo, Osun, Bayelsa, Ebonyi, Rivers, Delta, Anambra, Enugu, and Imo recorded higher concentrations between 4 and 8 µg/m<sup>3</sup> (Figure 1.5). The FCT Abuja, Kaduna, Bauchi, Kano, Katsina, Jigawa, Plateau and Nasarawa also recorded concentrations of NO<sub>2</sub> similar to the South in April while the rest of the country covering the northeastern, northwestern and central

states except the FCT observed lower concentrations of 2 to 4 µg/m<sup>3</sup>. The lower concentrations in those areas could be attributed to lower industrial activities compared to the South. The observed mean monthly concentrations across the country during the month were lower than the World Health Organization (WHO) 24-hour standard limit of 25 µg/m<sup>3</sup> and also lower than the annual limit of 10 µg/m<sup>3</sup>.



**Figure 1.5; Mean Concentration of Nitrogen Dioxide (NO<sub>2</sub>) across Nigeria in January 2025.**

## 1.7 Carbon Monoxide Concentration Across Nigeria in April 2025

Carbon monoxide (CO) is a colourless and odourless gas that can be released into the atmosphere by the incomplete combustion of carbonaceous materials such as fossil fuels. Carbon monoxide can kill if it is inhaled within minutes, even before being detected. The gas has mild effects at low levels of exposure, which could trigger symptoms of Flu such as headache, nausea, disorientation, dizziness, and tiredness. The concentration of CO across Nigeria in April 2025 ranged between 180 and 481 ppbv (0.18 and 0.48 mg/m<sup>3</sup>) across the country. Concentrations of 250 to 320 ppbv (0.29 to 0.37 mg/m<sup>3</sup>) were reported over Sokoto, Borno, Kwara, Oyo, Port Harcourt, Bayelsa

Nasarawa, Benue, Enugu, Imo, Kebbi, Osun, Akwa Ibom, Ebonyi, Taraba, and Lagos states, as well as the Federal Capital Territory (FCT). The highest concentration level of 460ppbv (0.53 mg/m<sup>3</sup>) and above was observed over Anambra and Plateau States, while the lowest CO concentrations of 180 to 250 ppbv (0.21 to 0.29 mg/m<sup>3</sup>) were observed in parts of Edo, Abia, Lagos, and Adamawa states (Figure 1.6). The rest of the country recorded concentrations of 320 to 390 ppbv (0.37 to 0.45 mg/m<sup>3</sup>). Generally, the observed CO concentrations in the month were lower than the WHO air quality standard guideline recommendation of 4 mg/m<sup>3</sup> in 24 hours.

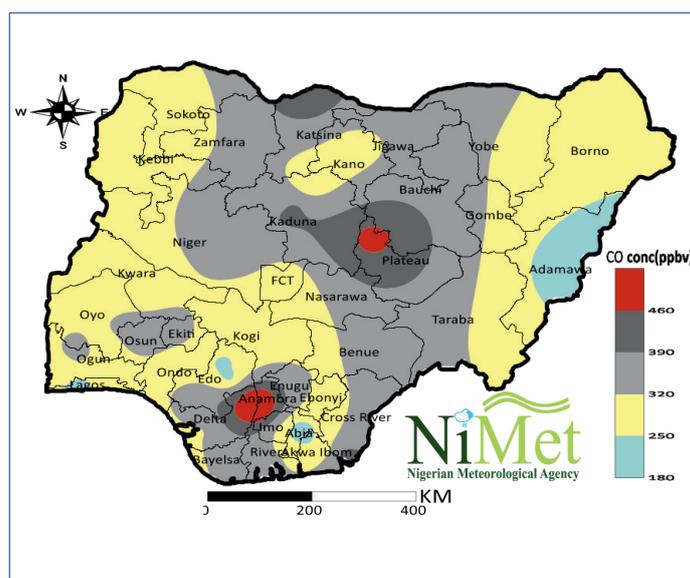


Figure 1.6: Mean Carbon Monoxide Concentration Over Nigerian Cities in April 2025

## 1.8 Mean Sulphur Dioxide (SO<sub>2</sub>) Concentration in April 2025

Sulphur dioxide (SO<sub>2</sub>) is a key pollutant linked to industrial emissions, vehicular exhaust, and biomass burning. In the month, observed SO<sub>2</sub> concentrations ranged from 1.7 to 6.3 µg/m<sup>3</sup> across the country (Figure 1.7). Most of the States recorded concentrations above 2 µg/m<sup>3</sup>, while part of Sokoto, Kebbi, Niger, Kwara, Oyo, Ogun, Delta, Edo, Bayelsa, Katsina, Jigawa, Yobe, and Borno States recorded

concentrations in the range of 1.5 to 2.0 µg/m<sup>3</sup>. The highest concentration of 6.3 µg/m<sup>3</sup> was observed over Calabar in Cross River State, while the lowest concentration in April 2025, which was 1.7 µg/m<sup>3</sup>, recorded in Yobe and Delta states. Generally, the country recorded SO<sub>2</sub> concentrations below the WHO-defined threshold, indicating safe SO<sub>2</sub> levels.

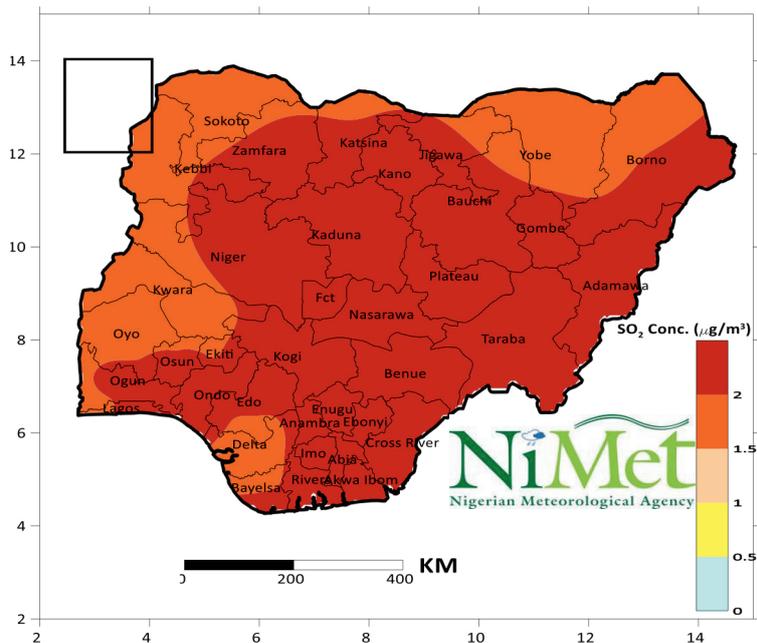


Figure 1.7: Mean Sulphur Dioxide (SO<sub>2</sub>) Concentration Over Nigeria in April 2025

### 1.9 Air Quality Index in April 2025

In April, most of the central and southern states of Nigeria recorded moderate levels of Air Quality (AQI 51 to 100). There was, therefore, no significant air quality-related health risks in those parts of the country during the month. In contrast, the air quality over some other states, including Sokoto, Zamfara, Katsina, Kano, Jigawa, Yobe, Borno, Bauchi, Gombe, and parts of Kaduna and Plateau was within the range was within the range

categorized as ‘unhealthy’ by the World Health Organization (WHO), i.e., 101 to 150. (see Figure 1.8). This elevated AQI was dominantly as a result of high concentrations of particulate matter driven by harmattan dust, dry winds, and the characteristically low rainfall across northern Nigeria during the month.

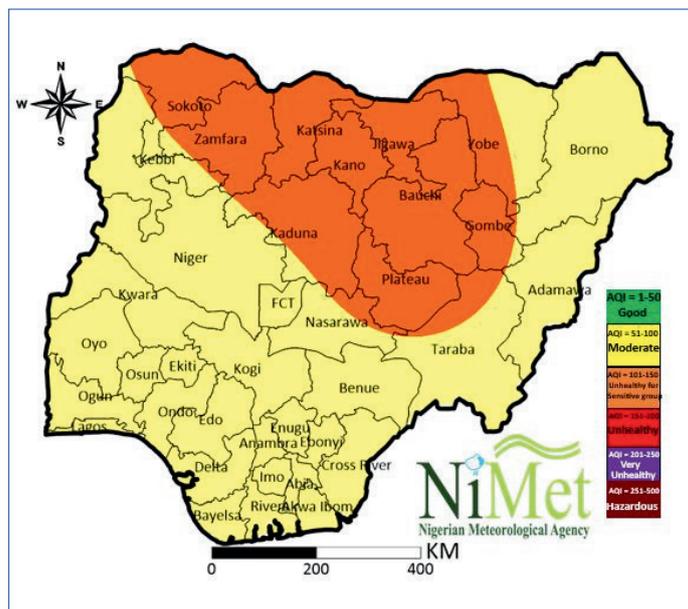


Figure 1.8: Air Quality Index across Nigeria in April 2025

## CHAPTER TWO

### 2.0 May 2025 Review

#### 2.1 Position of the Inter-Tropical Discontinuity (ITD) and Rainfall Across Nigeria in May 2025

The ITD oscillated between latitudes 9.2°N and 16.4°N, but advanced progressively northward during the month. It moved from latitude 12.4°N during the 1<sup>st</sup> dekad to latitude 14.8 by the 2<sup>nd</sup> dekad of May 2025. Thereafter, it surged further northward to latitude 16.4°N by the end of the 3<sup>rd</sup> dekad of the month. It maintained an average position of 14.5°N during the month. The observed mean monthly position was north of the climatological mean position (12.5°N) and therefore favourable for increased rainfall over the country. Total rainfall recorded in the month was: Port Harcourt (418.3 mm), Uyo (412.3 mm), Yenegoa (382.3 mm), Ikom (330.6 mm), and Owerri (328.4 mm), driven by moisture and deep convective activity. Over the central states, Jos recorded 274.2 mm of rainfall, Makurdi (185.7 mm), Lafia (148.7 mm), and Ilorin (138 mm). The northern states recorded rainfall between 10 and 240 mm (Figure 2.1).

The conditions supported vegetation growth and crop production in the country during the month. The northward ITD shift and widespread rainfall also significantly reduced particulate matter concentration in the atmosphere across central and southern Nigeria, with a consequent improvement of air quality in most parts of the country.

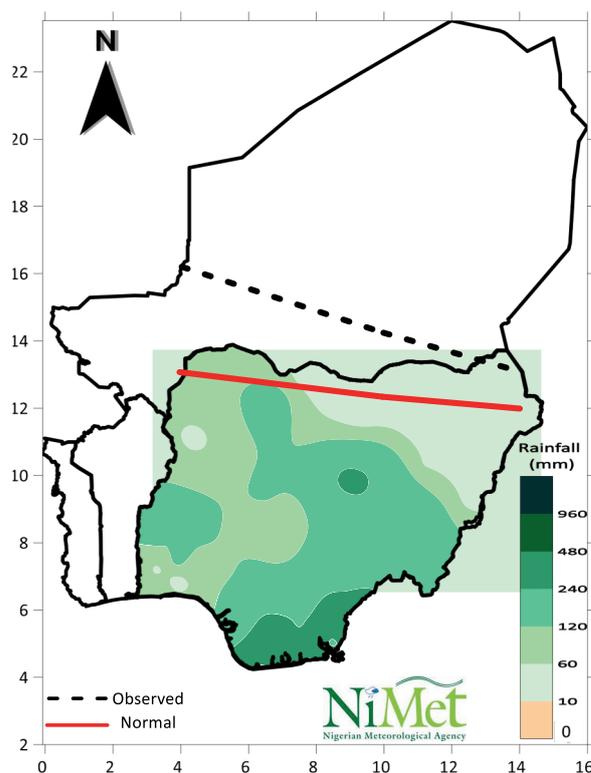


Figure 2.1: Mean Position of ITD and Rainfall amounts across Nigeria in February 2025

#### 2.2 Mean Sea Level Pressure (Azores and St. Helena Highs) in May 2025

In May, the monthly mean value of the Azores high-pressure core remained at 1024 hPa, while the centre of the St. Helena high-pressure system further weakened slightly to approximately 1022 hPa (Figure 2.2). Lower pressure less than 1010 hPa, were observed over the northern parts of Nigeria. These conditions enhanced low-level convergence and vertical uplift of moist south-westerly winds, which gave rise to rainfall over most parts of the country during the month.

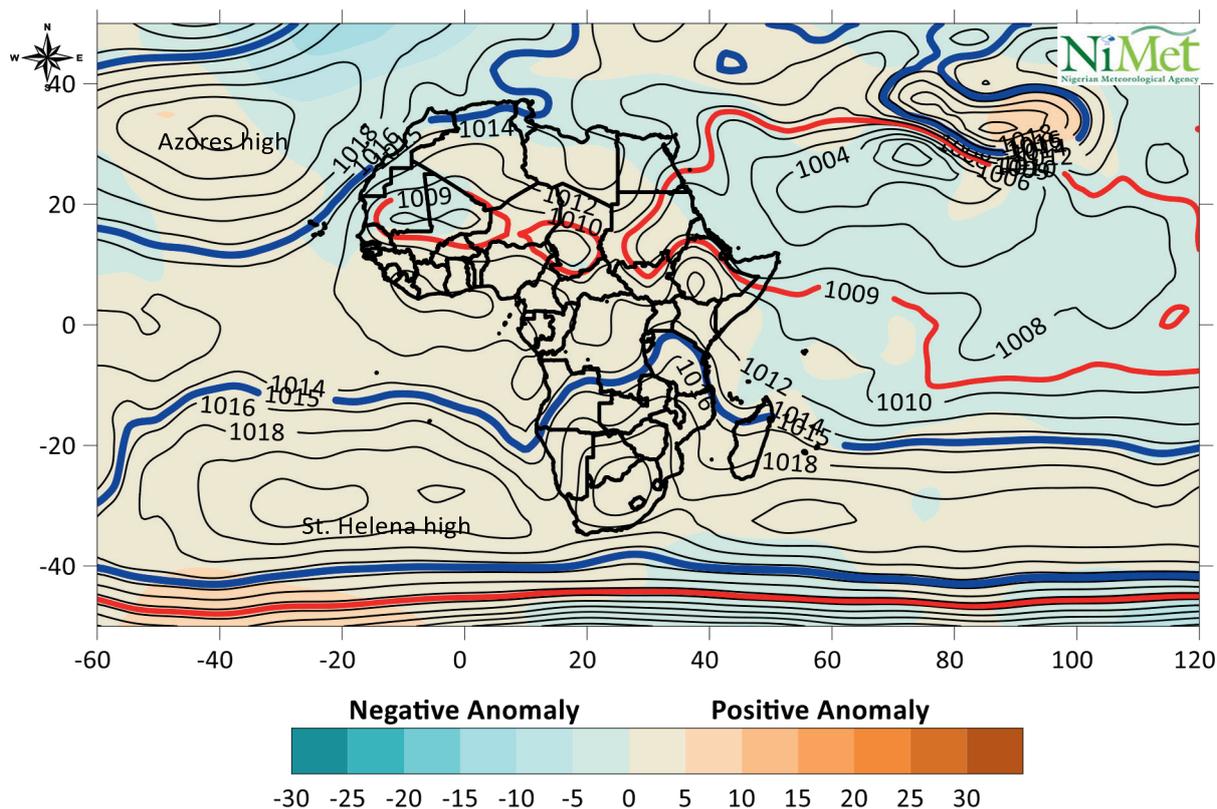


Figure 2.2: Mean Sea Level Pressure in February 2025

## 2.3 Winds

### 2.3.1 Winds at 925hPa Level (about 900m above the ground)

Southwesterly (SW) winds prevailed across most of the country at this level of the atmosphere, especially from mid-May, with speeds ranging from 5 to 30 knots. Northeasterly (NE) winds were, however observed over the northern states of the country early in the month, which gradually weakened as the ITD advanced northward.

The dominance of southwesterly (SW) winds and the northward retreat of NE winds significantly reduced Saharan dust transport, especially over central and southern Nigeria. This led to a marked reduction in particulate matter concentrations and improvement of horizontal visibility across the country, as well as enhanced respiratory health.

### 2.3.2 Winds at 850hPa Level (about 1500m above the ground)

The northeasterly (NE) winds, with speeds of 5 to 25 knots, were dominant in early May 2025, especially over the northern and central states of Nigeria. Limited southwesterly (SW) wind intrusions with weaker speeds of 5 to 15 knots were also observed. A few cyclonic vortices were observed on wind charts over the northeastern and north-central states from mid to late May.

SW winds prevailed over southern and coastal states, with speeds up to 25 knots. These features enhanced vertical mixing, localized convergence, and rainfall. The retreating NE winds and northward incursion of SW winds suppressed Saharan dust transport and generally improved air quality in the country during the period.

## 2.4 Particulate Matter (PM<sub>2.5</sub>) Concentration Over Nigeria in May 2025

The spatial distribution of PM<sub>2.5</sub> concentrations over Nigeria in May 2025 is shown in Figure 2.3. The concentrations ranged from 15 to 80  $\mu\text{g}/\text{m}^3$  across the country. Concentrations ranging from 15 to 30  $\mu\text{g}/\text{m}^3$  dominated in most parts of the country, extending from the northeast to the central and coastal states. Concentrations between 30 and 55  $\mu\text{g}/\text{m}^3$  were recorded over Benue, Cross River, Ebonyi, Enugu, Anambra, Imo, Abia, Sokoto, Kebbi, and parts of Zamfara, Kano, Kaduna, Jigawa, Niger, Kwara, Oyo, Osun, Ogun, Ondo, and Edo States.

The highest concentrations, exceeding 55  $\mu\text{g}/\text{m}^3$ , occurred over Katsina, northern Kaduna, and eastern Zamfara States. Overall, the mean monthly PM<sub>2.5</sub> concentrations across the country were above the World Health Organization (WHO) 2021 updated Air Quality Guideline (AQG) limit of 15  $\mu\text{g}/\text{m}^3$  in 24 hours, as no location recorded concentrations below 15  $\mu\text{g}/\text{m}^3$ .

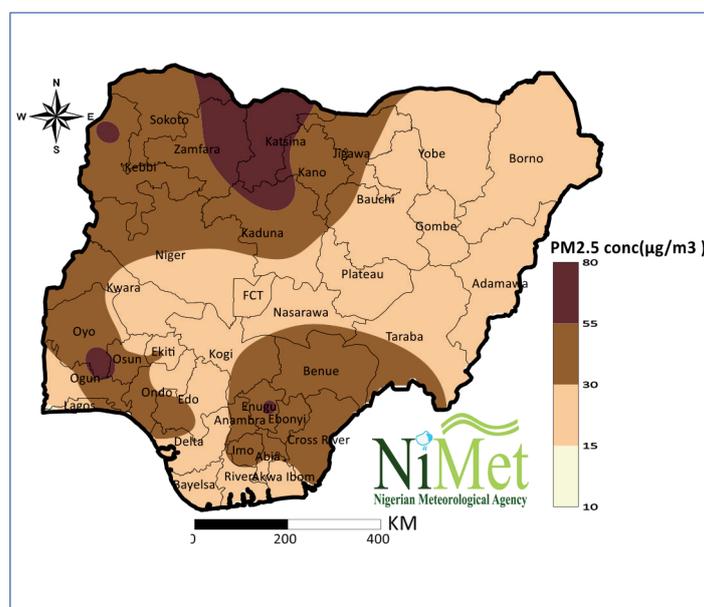


Figure 2.3: Mean Concentration of Particulate Matter (PM<sub>2.5</sub>) over Nigeria in May 2025

## 2.5: Concentration of Nitrogen Dioxide (NO<sub>2</sub>) in May 2025

In May 2025, the spatial pattern of NO<sub>2</sub> distribution was similar to that of April with the lowest concentrations persisting over the northeastern and northwestern states. Elevated concentrations of NO<sub>2</sub> hotspots were observed over parts of Lagos, Ogun, and the FCT, where concentrations reached approximately 8.2  $\mu\text{g}/\text{m}^3$ . This was the highest concentration recorded during the period (Figure 2.4).

However, the area of moderate to high NO<sub>2</sub> concentration expanded slightly over the central and southern states compared to April, suggesting increased anthropogenic activities and less efficient atmospheric dispersion as the transition to the rainy season progressed. The observed NO<sub>2</sub> concentration in the month was lower than the WHO standard limit (Table 1)

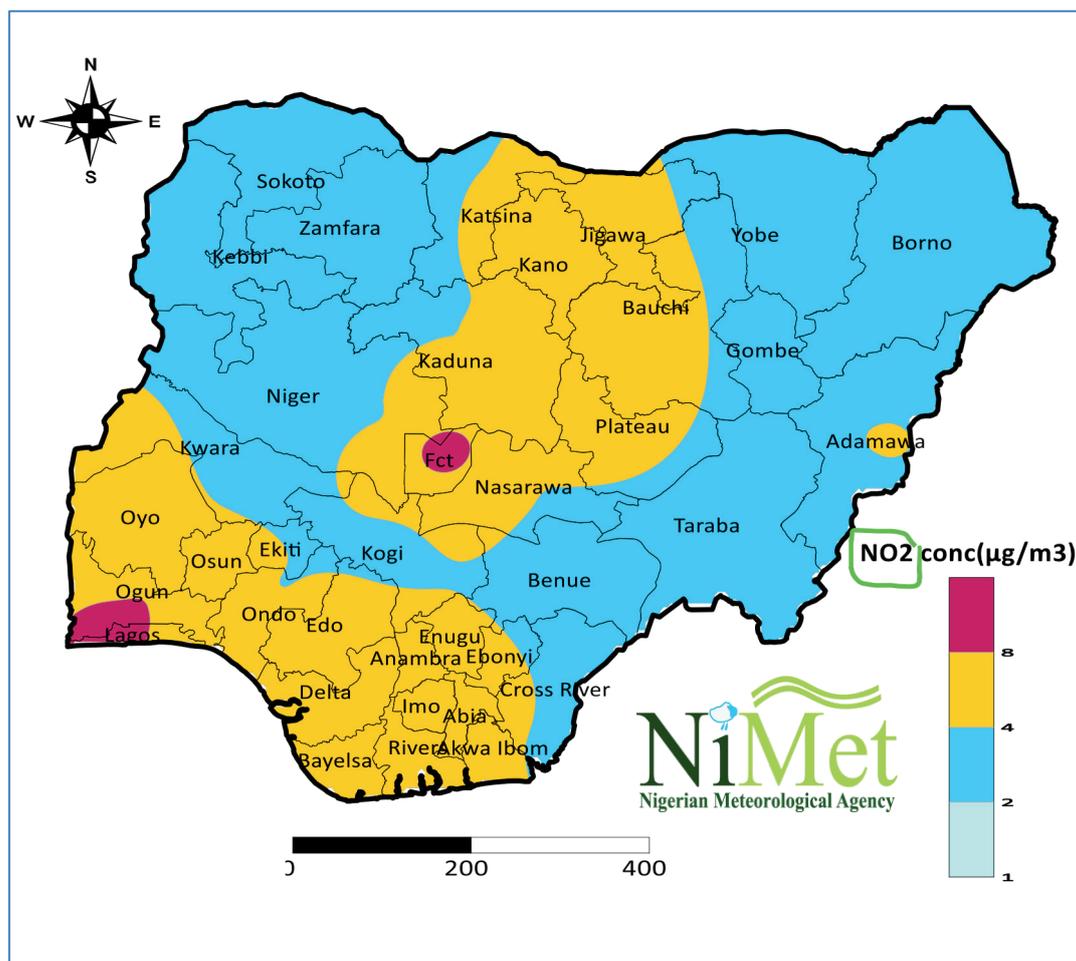


Figure 2.4: Mean Concentration of Nitrogen Dioxide (NO<sub>2</sub>) across Nigeria in May 2025

## 2.6: Carbon Monoxide (CO) Concentration in May 2025

In May 2025, the observed carbon monoxide concentration generally ranged from 180 to 530 ppbv (0.21 to 0.61 mg/m<sup>3</sup>) across the country (Figure 2.6). Parts of the northern border states such as Sokoto, Zamfara, Katsina, Jigawa, Yobe, Borno and few other states such as Kano, Kogi, Imo, and Abia recorded the lowest CO concentrations in the range of 180 to 250ppbv (0.21 to 0.29 mg/m<sup>3</sup>). Most of the states recorded moderate concentrations of 250 to 320ppbv (0.29 to 0.37 mg/m<sup>3</sup>), while Taraba, Plateau, Osun, Edo and parts of Anambra, Delta, Ondo, Ogun,

Lagos, Oyo, Kebbi, Niger, Kaduna, FCT Abuja, Nasarawa, Benue, Cross River, Bauchi, and Adamawa states recorded concentrations between 320 and 460ppbv (0.37 and 0.53 mg/m<sup>3</sup>).

The highest concentration of 530 ppbv (0.61 mg/m<sup>3</sup>) was observed over southern Cross River state. The observed monthly average CO concentration recorded over Nigeria was less than the WHO 2021 standard limit of 4 mg/m<sup>3</sup> in 24 hours.

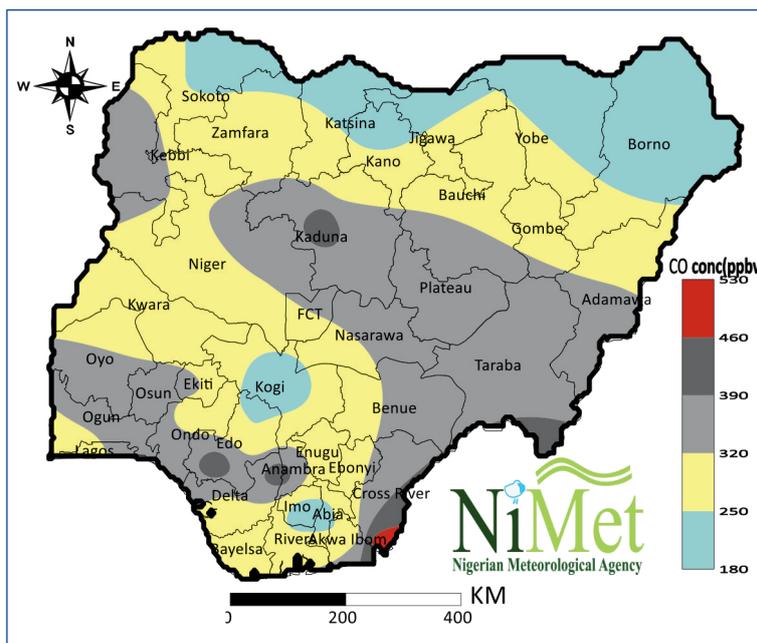


Figure 2.6: Mean Carbon Monoxide Concentration Over Nigerian Cities in May 2025

### 2.7: Mean Sulphur Dioxide (SO<sub>2</sub>) Concentration in May 2025

In April 2025, the SO<sub>2</sub> concentration exceeded 1.5 µg/m<sup>3</sup> all over the country. Concentrations above 2.0 µg/m<sup>3</sup> were observed over most of the northern and southeastern states. The highest concentration of 4.5 µg/m<sup>3</sup> was recorded over Kebbi state, followed by Kano (2.7 µg/m<sup>3</sup>) and Kaduna (2.5 µg/m<sup>3</sup>). Most of the Central and southwestern states, as well as Bayelsa, Delta, Edo, Taraba, and

Adamawa states recorded concentrations of 1.5 to 2.0 µg/m<sup>3</sup> (Figure 2.7). The observed levels of SO<sub>2</sub> in the month over the country were below the WHO thresholds. The health risk due to exposure to sulphur dioxide was therefore low nationwide during the period. Although current levels are low, persistent and uncontrolled emissions in urban centres may pose long-term hazard to human health.

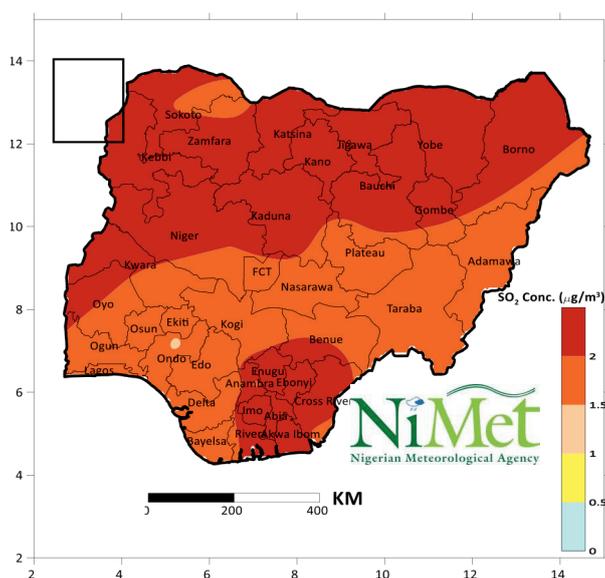


Figure 2.6: Mean Carbon Monoxide Concentration Over Nigerian Cities in February 2025

### 2.8 Air Quality Index in May 2025

During the month, the country experienced moderate air quality with Air Quality Index (AQI) of 51 to 100 (Figure 2.8) which posed no serious health risk to Nigerians except over Katsina, Kano, Jigawa and parts of Kaduna, Bauchi, Zamfara, Yobe and Sokoto states where the observed air quality with AQI of 101 to 150 posed some health risks to sensitive

group of persons such as those with respiratory conditions, heart or lung diseases. This could be attributed to occasional dust storms, vehicular emissions, and sparse vegetation cover over these northern states of the country.

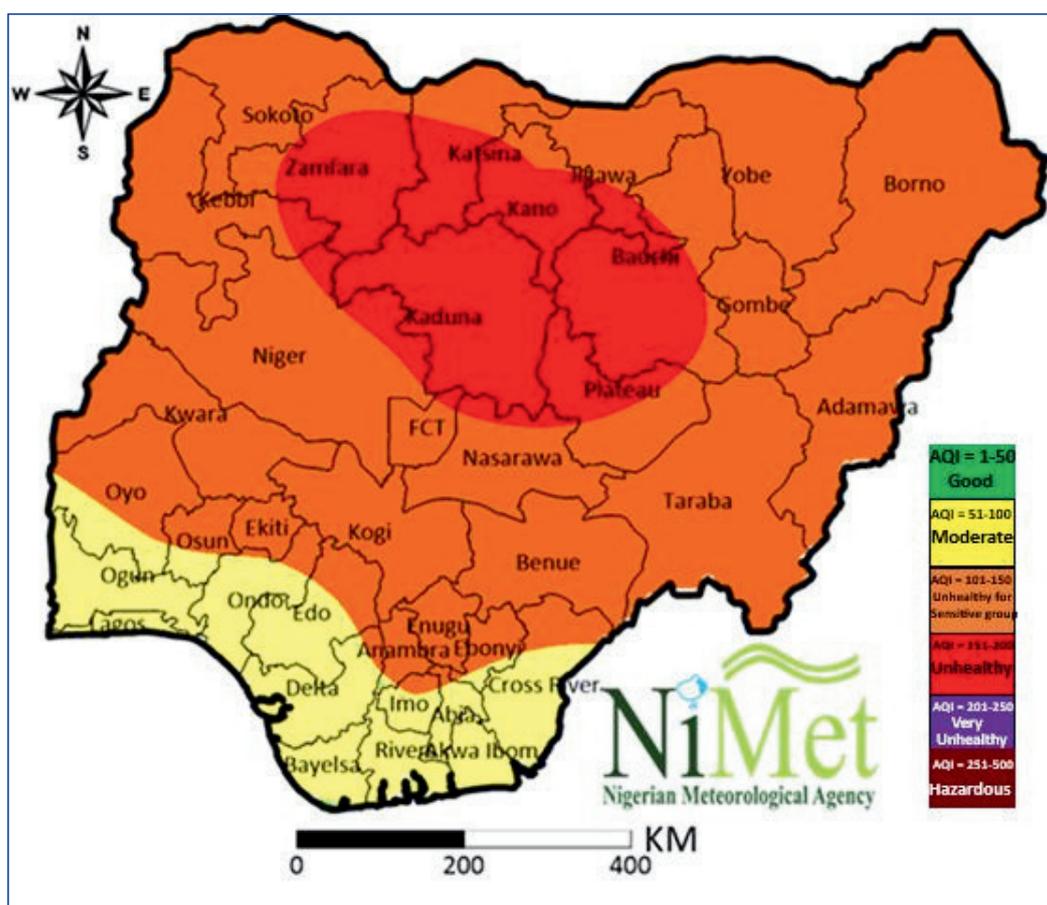


Figure 2.8: Air Quality Index Across Nigeria in February 2025

## CHAPTER THREE

### 3.0 June 2025 Review

#### 3.1 Position of the Inter-Tropical Discontinuity (ITD) and Rainfall Across Nigeria in June 2025

There was significant variability in rainfall distribution across Nigeria in June 2025. This was influenced by the northward movement of the Inter-Tropical Discontinuity (ITD). The ITD, which marks the boundary between moist maritime air and dry continental air, played a critical role in shaping rainfall distribution patterns and, by extension, air quality across the country.

The ITD continued its northward movement during the month and moved from a position of latitude  $16.4^{\circ}\text{N}$  in the 3rd dekad of May to latitude  $17.4^{\circ}\text{N}$  by the end of the 1st dekad of June. Furthermore, it oscillated northward to reach latitudes  $18.7^{\circ}\text{N}$  and  $19.0^{\circ}\text{N}$  during the 2nd and 3rd dekads, respectively. The ITD therefore surged northward from a mean position of latitude  $14.5^{\circ}\text{N}$  in the previous month to latitude  $18.4^{\circ}\text{N}$  in June. The observed position was more northerly compared to the normal position (Figure 3.1), and this enhanced convective activities and increased rainfall across the country.

During the period under review, Cross River and Akwa Ibom states recorded the highest rainfall of 566.1 mm and 509.4 mm respectively, while the inland states of the

south recorded rainfall between 120 and 480 mm. The Federal Capital Territory (FCT), the central and other northern states of Nigeria, recorded rainfall of 60 to 240 mm during the month. The air quality across the country improved during the period. This could be attributed to the enhanced rainfall, which helped in removing pollutants from the atmosphere.

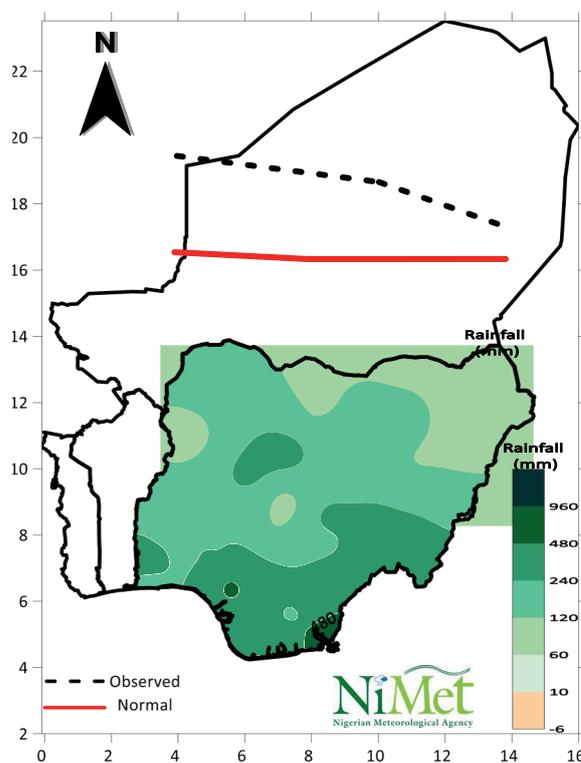


Figure 3.1: Mean ITD Position and Rainfall Amounts across Nigeria in March 2025

#### 3.2 Mean Sea Level Pressure (Azores and St. Helena Highs) in June 2025

In June 2025, both the Azores and the St. Helena high pressure systems intensified as their centre values increased by 2 hPa each from the previous month to 1026 hPa and 1024 hPa, respectively (Figure 3.2). During the month, the Heat-Lows (1009 hPa and below) were observed to be further northward, thereby supporting the prevalence of moisture-laden south-westerly winds across the entire country. The position of the 1015 Isobar over the southern hemisphere also oscillated northwards close to the equator, thereby pushing moisture over the Gulf of Guinea further northward as well as the ITD position. These conditions enhanced rainfall across Nigeria during the month.

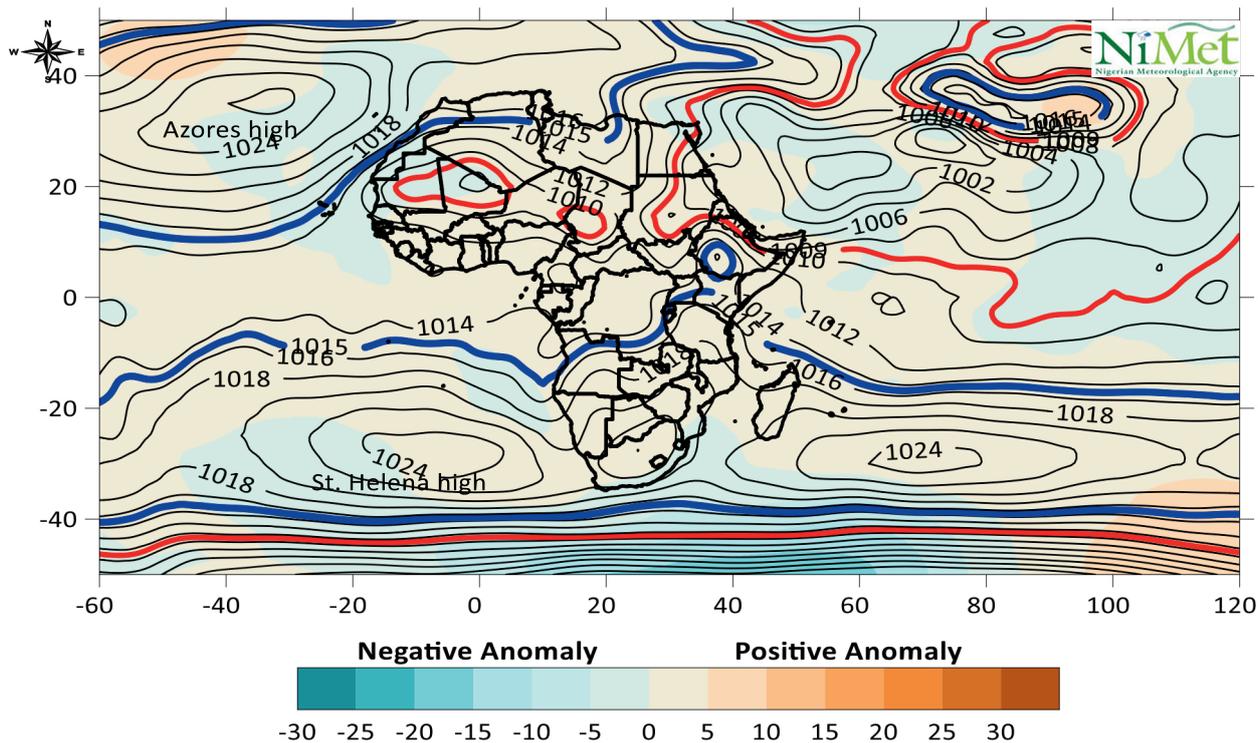


Figure 3.2: Mean Sea Level Pressure in June 2025.

### 3.3.1: Winds at 925hPa Level (about 900m above the ground)

The 925 hPa level reflects low-level atmospheric flow, crucial for pollutant dispersion and moisture transport. June 2025 was dominated by southwesterlies at 900m above the ground, with speeds that ranged from 5 to 30 knots across most of the country. Northeasterly flows were also observed intermittently over the northern parts of the country.

The increased rainfall frequency and strong winds enhanced pollutant dispersion and low particulate matter concentration in the atmosphere. Generally, moderate to good air quality was observed as a result of this weather condition.

### 3.3.2: Winds at 850 hPa Level (about 1500m above the ground)

The 850 hPa level is critical for understanding moisture transport, convection, and the extent of pollutant dispersion. June 2025 featured a dynamic mix of southwesterlies (SWs) and northeasterlies (NEs). Southwesterly winds, which transported moisture inland

were dominant over the southern and central states of the country, while northeasterly winds were prevalent over the northern states during the month. These conditions also enhance air quality across the country.

### 3.4 Particulate Matter (PM<sub>2.5</sub>) Concentration in June 2025.

The mean concentrations of PM<sub>2.5</sub> across the country in June 2025 generally ranged from 10 to 55 µg/m<sup>3</sup> (See Figure 3.3). Most states recorded PM<sub>2.5</sub> concentrations between 15 and 30 µg/m<sup>3</sup>. Concentrations which ranged between 30 and 55 µg/m<sup>3</sup> were observed over Kano, Jigawa, Yobe, Bauchi, Anambra, Imo, Enugu, Abia, and parts of Katsina, Kaduna, Gombe, Borno,

and Delta states. Concentrations lower than 15 µg/m<sup>3</sup> were recorded in some parts of Ondo state and environs. The observed PM<sub>2.5</sub> concentrations in the month exceeded the WHO 2021 Air Quality Guideline of 15 µg/m<sup>3</sup> for a 24-hour average in most states of Nigeria.

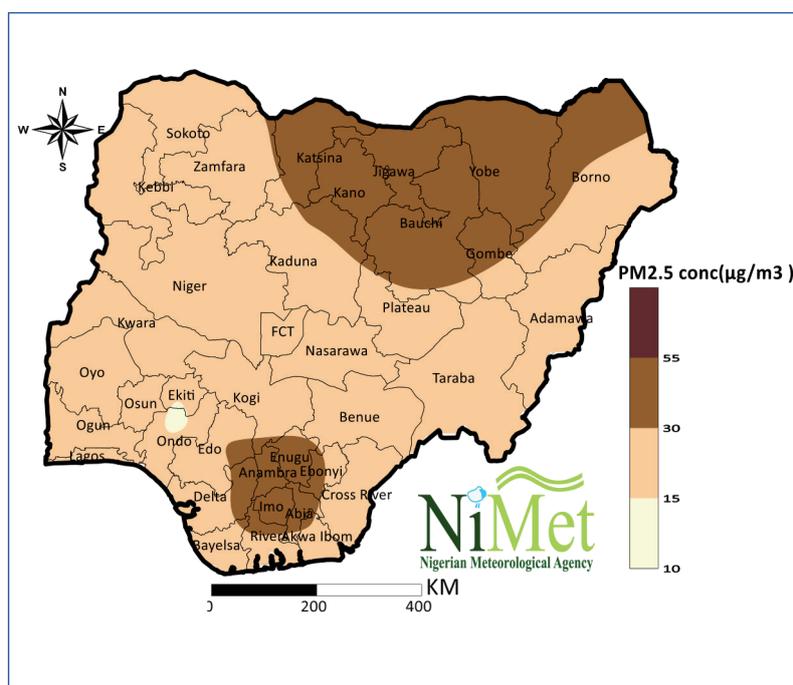


Figure 3.3: Mean Concentration of Particulate Matter (PM<sub>2.5</sub>) in the atmosphere over Nigeria in June 2025.

### 3.5 Concentration of Nitrogen Dioxide (NO<sub>2</sub>) in June 2025

NO<sub>2</sub> concentration over Nigeria is shown in Figure 3.5. The highest concentrations of 8.2 µg/m<sup>3</sup> were localized over Lagos, Ogun, and the Federal Capital Territory (FCT), Abuja, reflecting likely anthropogenic influence from dense traffic, industrial activities, and urban emissions. Concentrations of 4.0 to 8.0 µg/m<sup>3</sup> extended across Kano, Jigawa, Bauchi and part of Katsina, Kaduna, Niger, Nasarawa, and Kogi states to the southern states.

Most of the north-western and north-eastern states notably Sokoto, Kebbi, Zamfara, Borno, Yobe, Gombe, Taraba, and Adamawa recorded low NO<sub>2</sub> concentrations of 2.0 to 4.0 µg/m<sup>3</sup>, consistent with at the beginning of the wet season over the Northern states. Overall, the mean observed NO<sub>2</sub> concentrations during the month were below the WHO standard limit (Table 1).

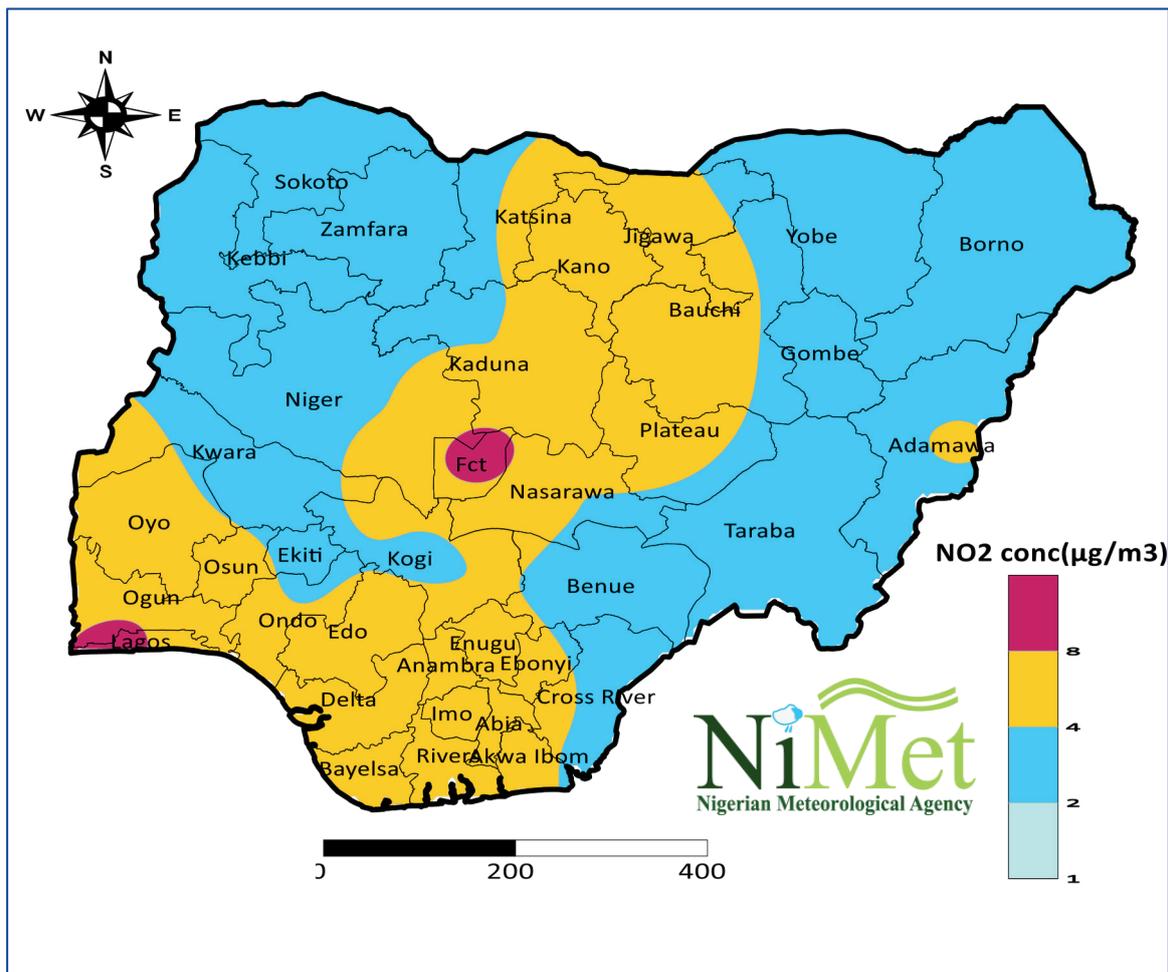


Figure 3.4: Mean Concentration of Nitrogen Dioxide (NO<sub>2</sub>) across Nigeria in June 2025

### 3.6 Carbon Monoxide (CO) Concentration in June 2025

Carbon monoxide concentration in the month ranged between 180 and 464 ppbv (0.21 and 0.53 mg/m<sup>3</sup>) across the country (See Figure 3.6). The lowest concentration of 180 to 250 ppbv (0.21 to 0.29 mg/m<sup>3</sup>) was observed in parts of Abia and Borno states. Concentrations of 250 to 320 ppbv (0.29 to 0.37 mg/m<sup>3</sup>) were observed over Oyo, Ogun, Kwara, Lagos, Kogi, northern Ondo, Edo, Borno, Yobe, and part of Abia, Imo, Ebonyi, Sokoto. Katsina, Zamfara, Kano, FCT, Jigawa and Borno states.

Most states in the country recorded CO concentrations between 320 and 460 ppbv (0.37 and 0.53 mg/m<sup>3</sup>). The highest concentration of 464ppbv (0.53 mg/m<sup>3</sup>) was observed over Anambra. The average CO concentration recorded over Nigeria in June 2025 was less than the WHO 2021 standard limit of 4 mg/m<sup>3</sup> in 24 hours.

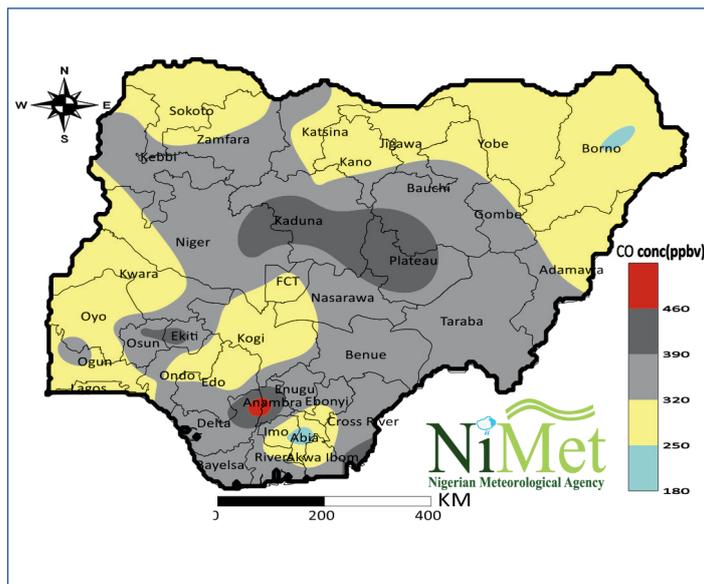


Figure 3.5: Mean Carbon Monoxide Concentration Over Nigeria Cities in June 2025

### 3.7 Mean Sulphur Dioxide (SO<sub>2</sub>) Concentration in June 2025

SO<sub>2</sub> concentrations across Nigeria in the month remained generally low and ranged between 1.2 and 2.3 µg/m<sup>3</sup>. The highest concentrations of 2.3 µg/m<sup>3</sup> were observed over Jigawa, Kano, and Yobe states, followed by Uyo and Port Harcourt (2.2 µg/m<sup>3</sup>), Umuahia (2.1 µg/m<sup>3</sup>), and Owerri (2.0 µg/m<sup>3</sup>), possibly as a result of industrial or traffic sources.

Concentrations of 1.5 to 2.0 µg/m<sup>3</sup> were observed over Sokoto, Zamfara, Kaduna, the FCT Abuja, Katsina, Enugu, Anambra, Ebonyi, Cross River, and parts of Imo, Bayelsa, Benue, Rivers, Delta, Plateau, Taraba, and Adamawa states. The rest of the country recorded concentrations between 1.0 and 1.5 µg/m<sup>3</sup> (See Figure 3.7)

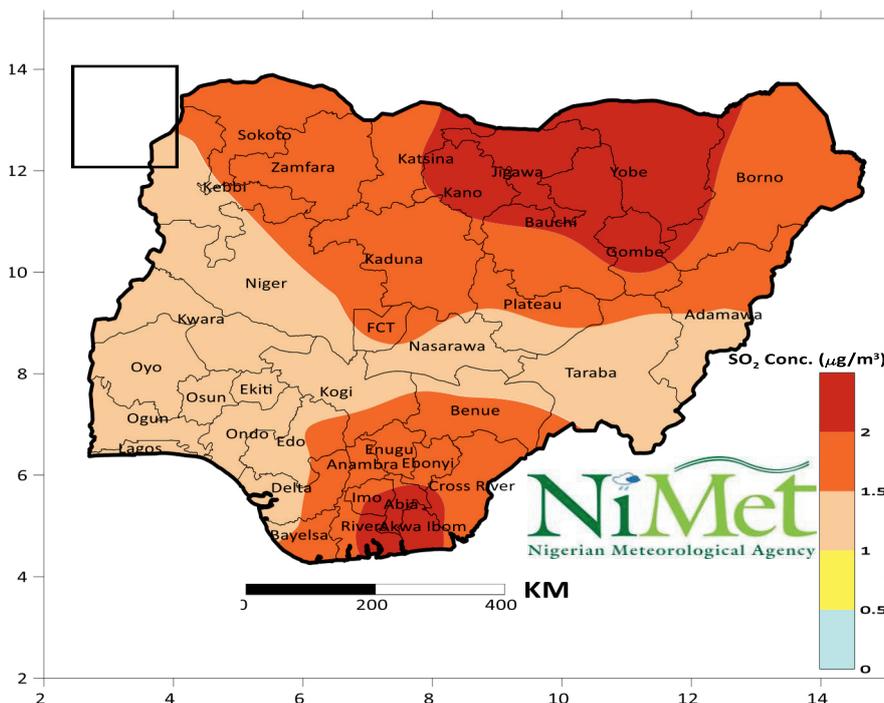


Figure 3.6: Mean Carbon Monoxide Concentration Over Nigerian Cities in March 2025

### 3.8 Air Quality Index in June 2025

Most states of Nigeria, especially major the urban centers such as Lagos, Abuja, Port Harcourt, and Kaduna, recorded moderate air quality with AQI of 51 to 100 in July (See Figure 3.8). The air quality in these places did not constitute serious health hazards to people during the month. Air quality was however good over part of Ondo, Osun Ekiti states with AQI of 1-50 considered healthy air without any associated health risks. The significant improvement in the quality of air was majorly as a result of increased rainfall which removed most particulate matter from the atmosphere particularly over the southwest. This provided ideal conditions for outdoor activities and respiratory wellbeing.

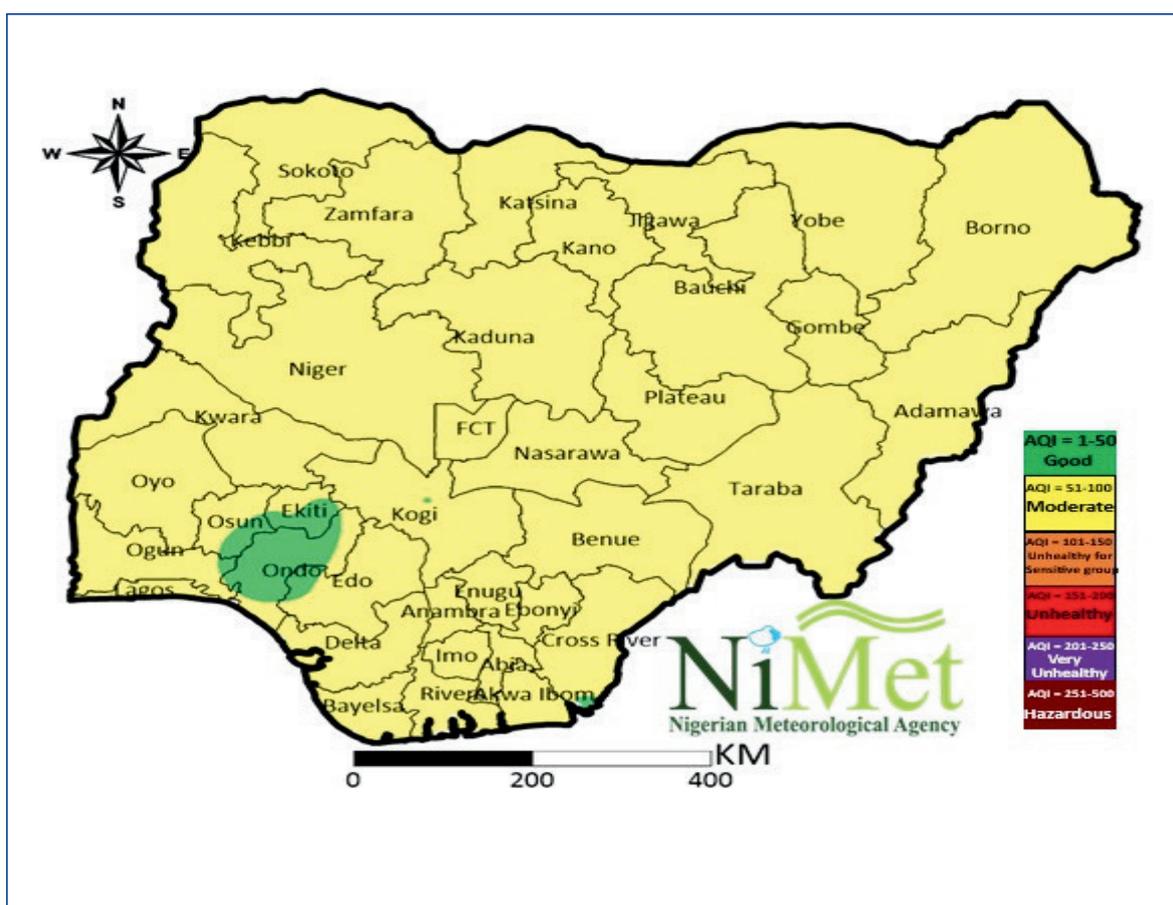


Figure 3.7: Air Quality Index across Nigeria in June 2025

## CHAPTER FOUR

### 4.0 Quarterly Trends: January, February, March (JFM)

#### 4.1 Observed ITD Positions in April, May and June 2025

The Inter-Tropical Discontinuity (ITD) during the April-May-June season steadily advanced northward from a position latitude 11.2°N during the 1<sup>st</sup> dekad in April to latitude 19.0°N during the 3<sup>rd</sup> dekad of June, thereby maintaining average positions of 11.6°N, 14.5°N and 18.4°N in April, May and June respectively (Figure 4.1).

The observed positions were more northerly compared to the normal positions during the second quarter of the year. This brought above-normal rainfall over most of the states and a general improvement in air quality across the country during the period.

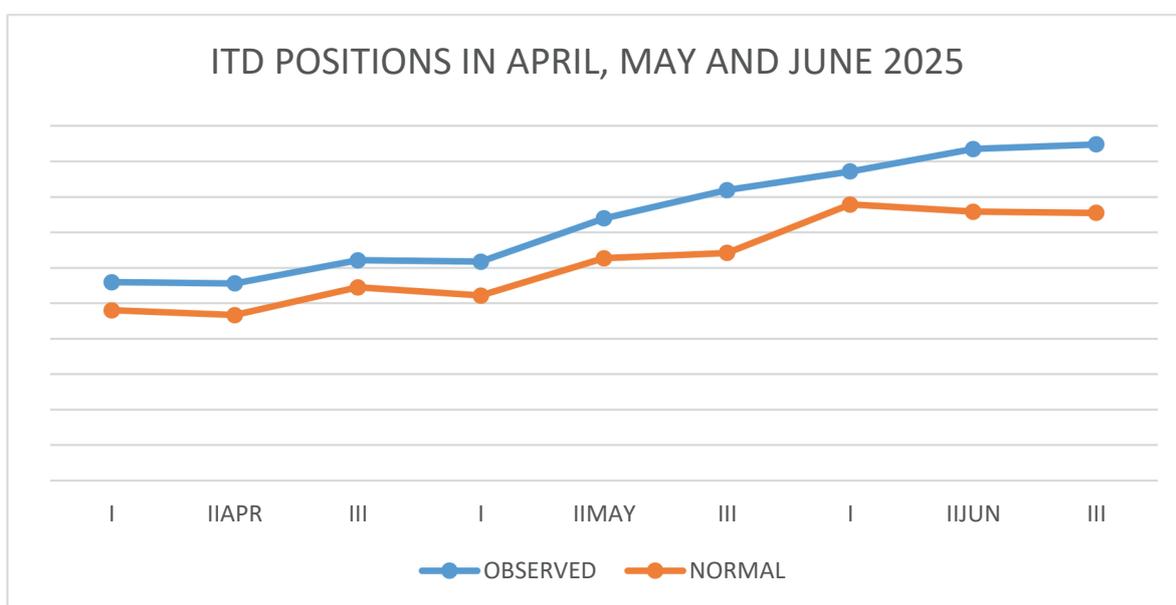


Figure 4.1: Second Quarter 2025 ITD Positions

#### 4.2 Spatial Distribution of Particulate Matter (PM<sub>2.5</sub>) Concentration Over Nigeria During the Second Quarter of 2025

The spatial distribution of mean PM<sub>2.5</sub> concentrations over Nigeria from April to June 2025 is shown in Figure 4.2. The highest concentrations were observed over parts of southern Katsina, western Kano, and northern Kaduna states. Sokoto, Zamfara, northern Kaduna, northern Katsina, northern Kano, Jigawa, northern Plateau, and northern Bauchi

states recorded mean PM<sub>2.5</sub> levels ranging from 40 to 55 µg/m<sup>3</sup>. During the quarter under review, the PM<sub>2.5</sub> concentration over most parts of Nigeria was between 25 and 40 µg/m<sup>3</sup>. Meanwhile, lower concentrations of 10 to 25 µg/m<sup>3</sup> were observed across parts of southern Niger, Kwara, Kogi, Ekiti, Ondo, Ogun, Lagos, southern Delta, Bayelsa,

southern Rivers, and southern Akwa Ibom states. Overall,  $PM_{2.5}$  concentrations across the country during this period remained well above the WHO air quality guideline (Table 1).

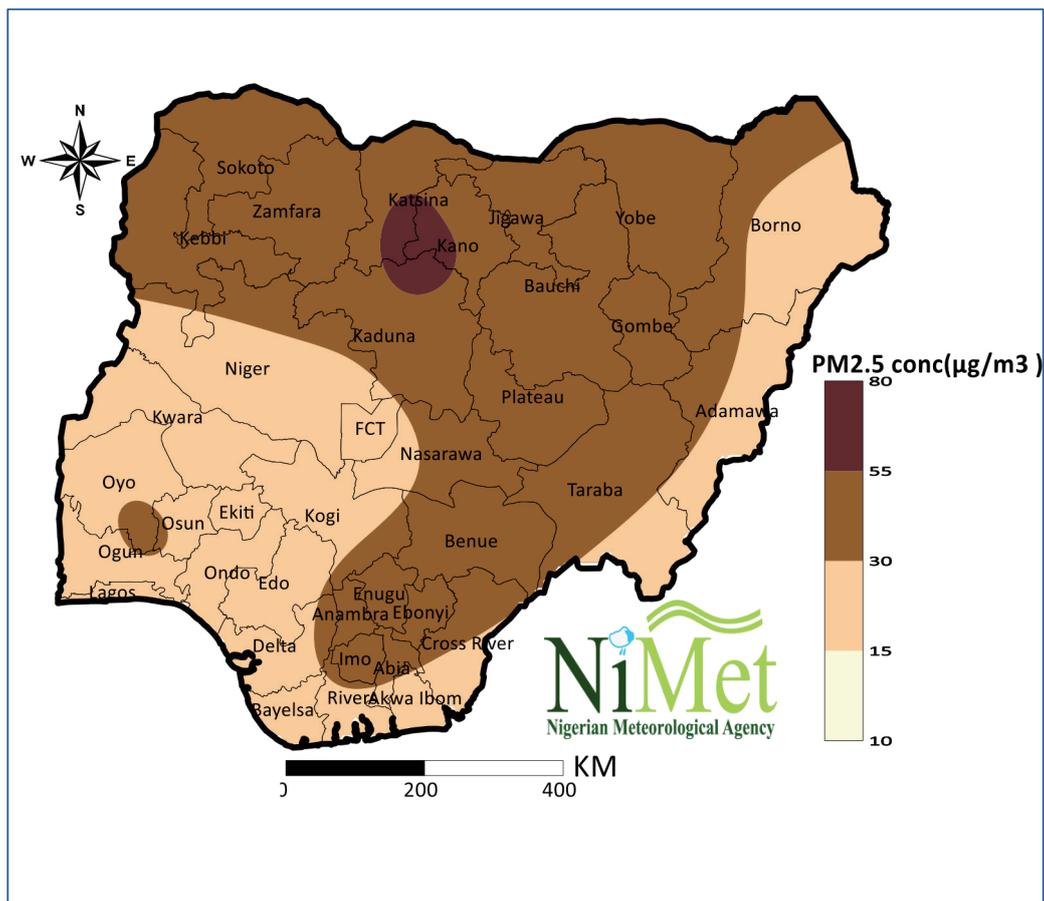


Figure 4.2: Mean Concentration of Particulate Matter ( $PM_{2.5}$ ) over Nigeria from April to June 2025

### 4.3 Daily Mean concentration of Particulate Matter ( $PM_{2.5}$ ) over Some Cities in Northern Nigeria in the Second Quarter 2025

As shown in Figure 4.3, the highest  $PM_{2.5}$  concentration in the northern region during the quarter under review was  $137 \mu\text{g}/\text{m}^3$ . This was recorded in Zaria on 12<sup>th</sup> April, 2025. The lowest concentrations were observed in Jos and Abuja on 14<sup>th</sup> and 29<sup>th</sup> May, 2025, respectively, each recording  $11 \mu\text{g}/\text{m}^3$ . Across most cities in the Northern region,  $PM_{2.5}$  concentrations ranged

between 18 and  $125 \mu\text{g}/\text{m}^3$  during the period under review. The elevated daily  $PM_{2.5}$  levels observed across the region posed significant health risks, as concentrations consistently exceeded the WHO 24-hour Air Quality Guideline threshold of  $15 \mu\text{g}/\text{m}^3$ .

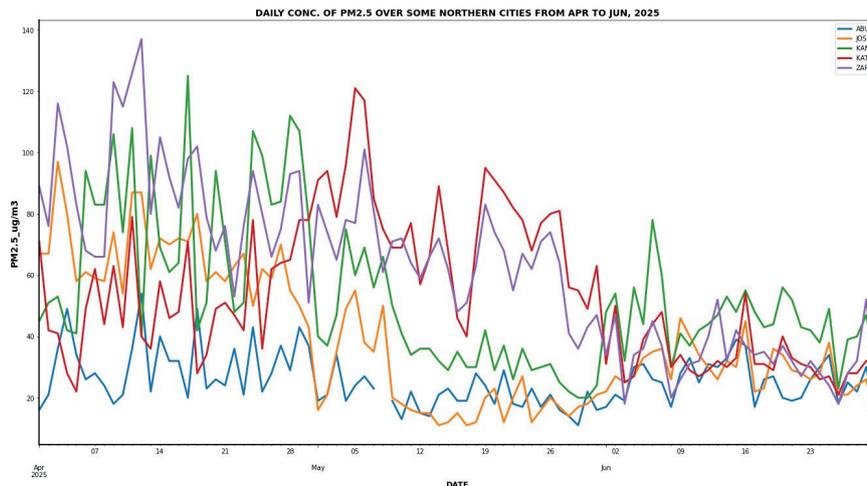


Figure 4.3: Daily Mean Concentration of Particulate Matter (PM<sub>2.5</sub>) over Cities in Northern Nigeria from April to June 2025

#### 4.4 Daily Mean concentration of Particulate Matter (PM<sub>2.5</sub>) over Some Cities in Southern Nigeria in the Second Quarter 2025

Over the northern region, PM<sub>2.5</sub> concentrations varied significantly during the second quarter of 2025 decreasing steadily from April to June as the region transitioned from the dry to the wet season. The highest daily concentrations above 100 µg/m<sup>3</sup> were recorded over Zaria and Kano in April (See Figure 4.3). The concentrations decreased slightly in May across the cities; however, they were still above 100 µg/m<sup>3</sup> over Katsina and Zaria during the 1<sup>st</sup> week of May. The lowest daily concentrations below 20µg/m<sup>3</sup> were observed over Jos and Abuja in June.

Across the southern cities, PM<sub>2.5</sub> concentrations were lower compared to the northern cities and attained daily peak concentrations in May over Enugu and Ado-Ekiti, unlike northern cities, which recorded peak concentrations in April. The lowest daily concentration of 8.0 µg/m<sup>3</sup> was, however, observed over Lagos on 15<sup>th</sup> of June. The observed daily concentrations generally exceeded the WHO 24-hour Air Quality Guideline threshold of 15 µg/m<sup>3</sup> during the 3-month period, indicating elevated health risks for residents, except over Lagos and Ado-Ekiti, where PM<sub>2.5</sub> concentrations were below the WHO standard limit from 15<sup>th</sup> to 30<sup>th</sup> of June (See Figure 4.4).

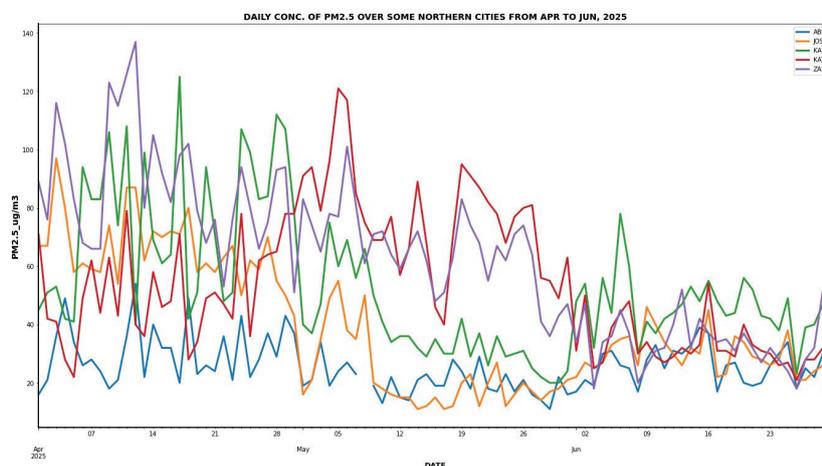


Figure 4.4: Daily Mean Concentration of Particulate Matter (PM<sub>2.5</sub>) over cities in Southern Nigeria During the second quarter of 2025

### 4.5 Daily Mean concentration of Particulate Matter (PM<sub>2.5</sub>) over Some Cities in Southern Nigeria in the Second Quarter 2025

Figure 4.5 compares the average PM<sub>2.5</sub> concentrations across major cities in Nigeria from April to June 2025. The analysis reveals that average PM<sub>2.5</sub> concentrations were highest in April over the northern cities such as Zaria, Yola, Sokoto, Maiduguri, Minna, Kano, Kaduna, Jos, and Abuja (Figure 4.5), while Kebbi, Katsina, Lokoja and southern cities of Ibadan, Osogbo, Benin, Calabar, Akure and Ado Ekiti observed the highest concentrations in May. Most of the cities recorded lower concentrations in June except Owerri, Umuahia, Uyo, Warrar,

Onitsha, Asaba, and Nguru, where the mean April-May-June concentrations were highest. Akure and Lagos recorded the lowest concentration of 17 µg/m<sup>3</sup> in June while Zaria recorded the highest concentration above 80 µg/m<sup>3</sup>, followed by Kano (75 µg/m<sup>3</sup>), all in April. The observed 3-month average concentrations across all the cities exceeded the WHO threshold indicating heightened health risks for the populations exposed to PM<sub>2.5</sub> pollution during the April, May, and June 2025 period.

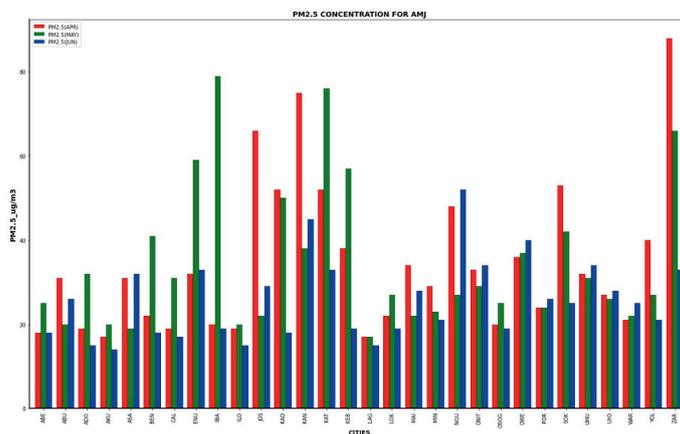


Figure 4.5: Average PM<sub>2.5</sub> Concentration over cities in Nigeria (April to June 2025)

Figure 4.6 shows the observed range of daily PM<sub>2.5</sub> concentrations in each of the selected cities across the country. The analysis confirms also that Zaria recorded the highest daily mean PM<sub>2.5</sub> concentration of 137 µg/m<sup>3</sup> during the April-May-June season, while Calabar and Lagos recorded the lowest single day concentration of 8 µg/m<sup>3</sup>.

Overall, the average daily PM<sub>2.5</sub> concentrations across the country during the April to June period (second quarter) exceeded the WHO 24-hour Air Quality Guideline threshold of 15 µg/m<sup>3</sup>. The maximum, minimum and mean concentrations for different cities in April, May and June are shown in Table 5.

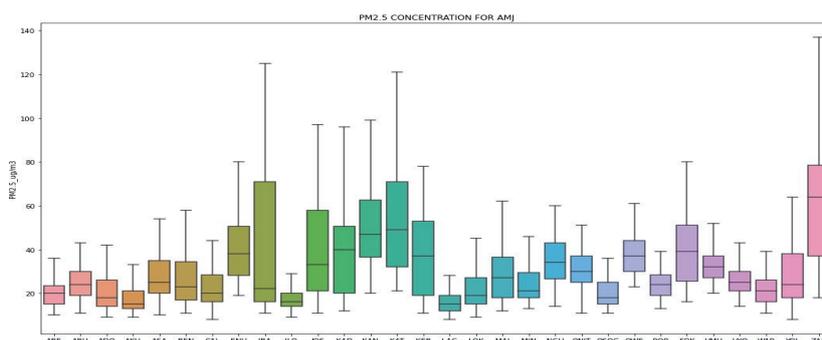


Figure 4.6: Average Daily Particulate Matter (PM<sub>2.5</sub>) Concentration across Nigerian cities (April to June 2025)

**Table 5: Maximum, Minimum and Mean Concentration of Particulate Matter Pm2.5 ( $\mu\text{g}/\text{m}^3$ ) in Second Quarter 2025**

CITY	APRIL			MAY			JUNE		
	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
<b>ABEOKUTA</b>	36	12	18	43	18	25	38	10	18
<b>ABUJA</b>	54	16	31	34	11	20	39	15	26
<b>ADO EKITI</b>	41	12	19	61	16	32	38	9	16
<b>AKURE</b>	49	11	17	36	11	20	33	9	14
<b>ASABA</b>	59	18	31	45	10	19	54	18	32
<b>BENIN</b>	46	13	23	77	20	41	37	11	19
<b>CALABAR</b>	44	10	19	52	23	31	40	8	17
<b>ENUGU</b>	63	19	33	95	30	59	57	20	34
<b>IBADAN</b>	55	12	20	125	44	80	42	11	19
<b>ILORIN</b>	43	12	19	48	10	20	34	9	15
<b>JOS</b>	97	43	66	55	11	22	46	13	29
<b>KADUNA</b>	84	38	53	96	25	50	43	12	18
<b>KANO</b>	125	40	76	75	20	38	78	23	45
<b>KATSINA</b>	79	22	52	121	40	76	54	21	33
<b>KEBBI</b>	61	19	38	78	34	57	51	11	19
<b>LAGOS</b>	51	10	17	51	10	18	37	8	16
<b>LOKOJA</b>	45	13	22	59	14	27	50	9	19
<b>MAIDUGURI</b>	62	18	34	52	12	22	55	16	28
<b>MINNA</b>	50	16	29	44	13	23	46	13	21
<b>NGURU</b>	114	26	48	53	14	27	30	22	52
<b>ONITSHA</b>	68	20	33	49	11	29	60	16	34
<b>OSOGBO</b>	47	13	20	70	13	25	42	11	19
<b>OWERRI</b>	56	23	36	53	24	37	68	24	41
<b>PORT HARCOURT</b>	64	13	25	47	15	24	43	14	26
<b>SOKOTO</b>	80	33	53	80	24	42	49	16	25
<b>UMUAHIA</b>	54	20	33	52	23	31	56	20	35
<b>UYO</b>	49	14	27	43	17	26	46	14	28
<b>WARRI</b>	49	12	21	37	14	22	60	11	25
<b>YOLA</b>	60	25	40	61	14	27	64	8	21
<b>ZARIA</b>	137	51	88	101	36	66	52	18	33

#### 4.5 Spatial Distribution of Mean Nitrogen Dioxide (NO<sub>2</sub>) Concentration During the Second Quarter of 2025

The second quarter (April to June) of 2025 showed a persistent variation in the average distribution of NO<sub>2</sub> concentrations from the northern to southern parts of Nigeria (See Figure 4.7). Elevated NO<sub>2</sub> concentrations above 8 µg/m<sup>3</sup> were observed over the Federal Capital Territory (FCT). This could be attributed to anthropogenic activities in the area. Concentrations ranging from 4.0 to 8.0 µg/m<sup>3</sup> were predominant across most of the southern states and northern states such as Katsina, Kano, Jigawa, Bauchi, Kaduna, Plateau, Nasarawa and the Federal Capital Territory (FCT).

Conversely, the northern and central states such as Sokoto, Kebbi, Zamfara, Niger, Kwara, Kogi, Benue, Taraba, Adamawa, Borno, Gombe, Yobe, and parts of Plateau, and Nasarawa states record comparatively low concentrations ranging from 2.0 to 4.0 µg/m<sup>3</sup>, attributed to enhanced atmospheric dispersion. Overall, the spatial pattern indicates that NO<sub>2</sub> pollution during this period remained concentrated over the southwestern and central states. However, the observed mean monthly concentrations were below WHO standard limit.

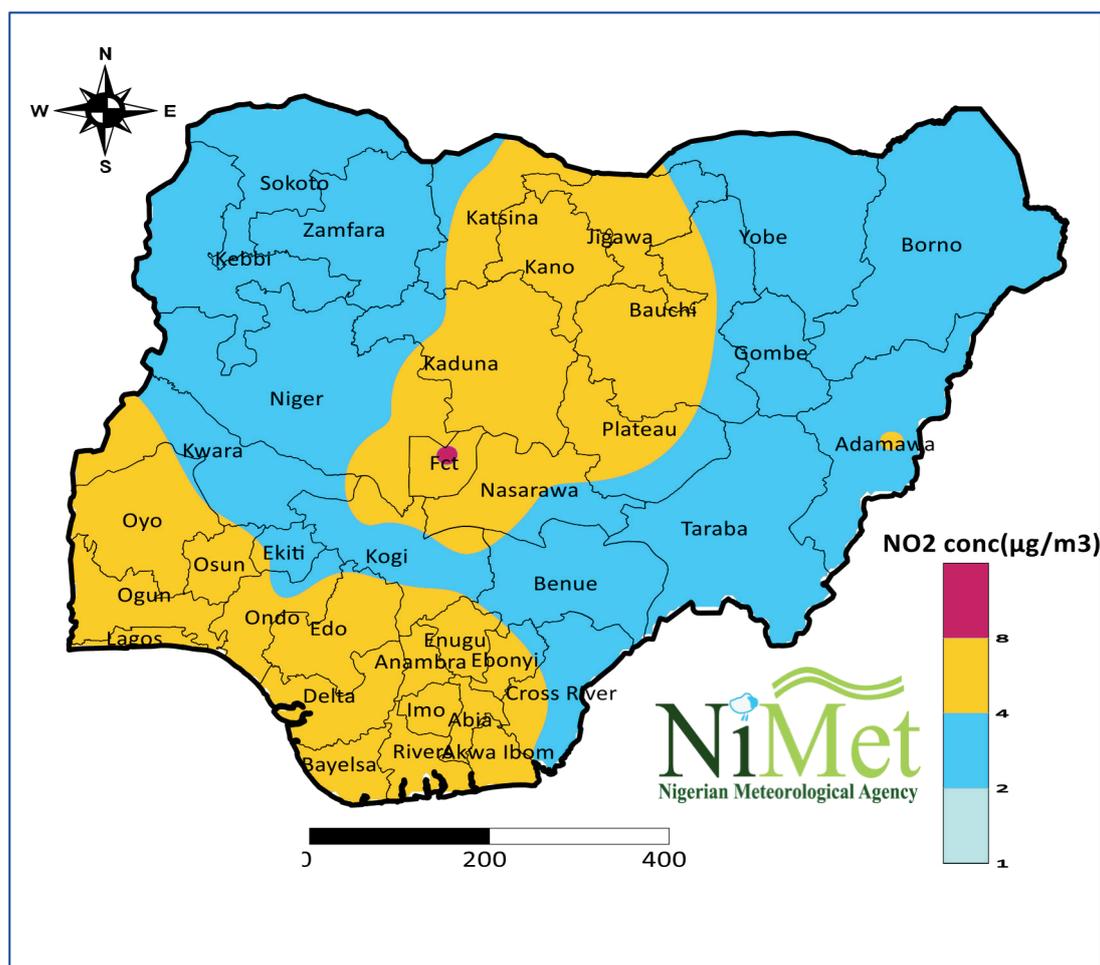


Figure 4.7: Mean Concentration of Nitrogen Dioxide (NO<sub>2</sub>) across Nigeria in Second Quarter of 2025

#### 4.6 Daily Concentration of Nitrogen Dioxide (NO<sub>2</sub>) over Cities in Southern Nigeria from April to June 2025

The daily average NO<sub>2</sub> concentration over the southern part of the country during the second quarter of 2025 showed highest concentration of approximately 16.0 µg/m<sup>3</sup> over Benin in April; decreasing till the end of June (Figure 4.8). Few peaks below 14.0 µg/m<sup>3</sup> were also observed over Port Harcourt, Ibadan, Awka and Benin in May and June.

The peaks are common during the beginning, middle and sometimes at the end of the month. This may be attributed to intense vehicular traffic and industrial emissions in these cities. The observed concentrations were generally the lowest over Abeokuta during the quarter under review in most of the locations. The observed daily NO<sub>2</sub> concentrations remained below the WHO daily limit.

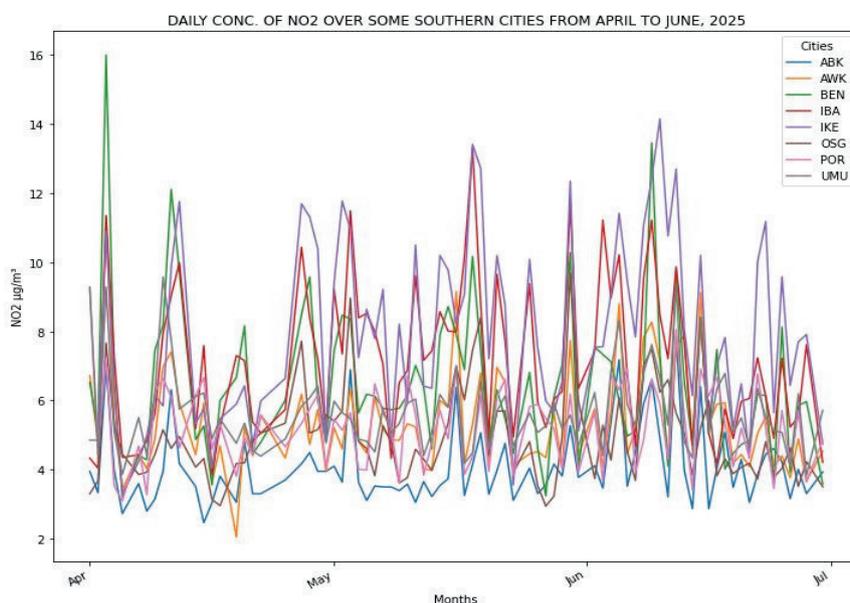


Figure 4.8: Daily Concentration of Nitrogen Dioxide (NO<sub>2</sub>) over Cities in Southern Nigeria from April to June 2025

#### 4.7 Daily Concentration of Nitrogen Dioxide (NO<sub>2</sub>) over Cities in Northern Nigeria During the Second Quarter of 2025

Between April and June 2025, daily average NO<sub>2</sub> concentrations across selected cities in northern Nigeria exhibited marked temporal variability without a well-defined pattern (See Figure 4.9). However, the concentrations were observed to be lower in June compared to April and May over most of the cities, except the Federal Capital Territory (FCT), Abuja where concentrations were higher in May and June than in April.

The FCT also recorded the highest daily concentration of 18.7 µg/m<sup>3</sup> and consistently maintained higher concentrations over other cities particularly in May and June. This may be attributable to dense urban population and high vehicular traffic, and construction activities. The maximum, minimum and mean NO<sub>2</sub> concentrations observed in April, May and June over some cities are shown in Table 6.

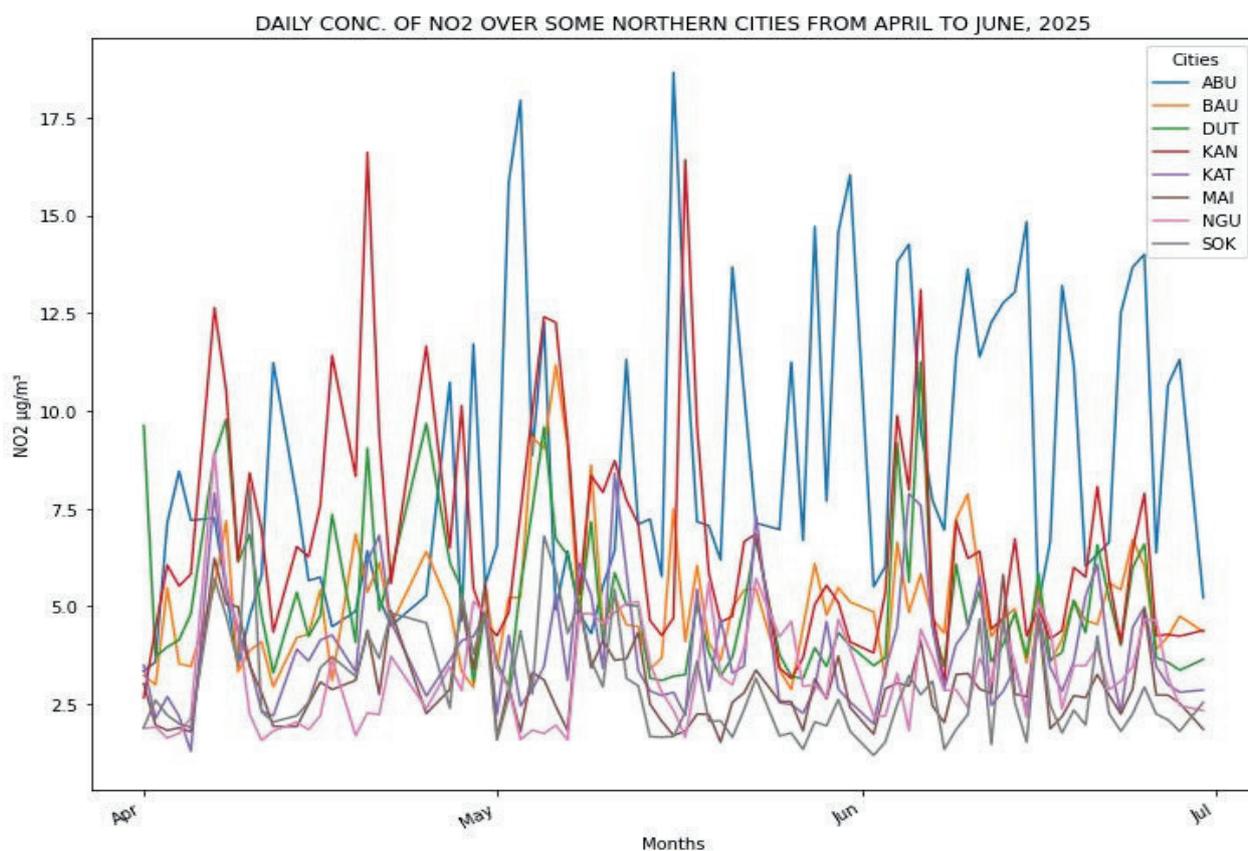


Figure 4.9: Daily Concentration of Nitrogen Dioxide (NO<sub>2</sub>) Over Northern Cities in the Second Quarter of 2025

**Table 6: Regional Daily Concentration of Nitrogen dioxide (NO<sub>2</sub>) (in µg/m<sup>3</sup>) over Cities in Nigeria from January to March 2025**

CITY	April			May			June		
	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
Abeokuta	10.32	3.78	6.31	12.53	4.37	7.72	11.98	4.15	7.10
Abuja	11.71	3.46	6.26	18.65	4.30	9.51	14.84	5.06	10.07
Ado Ekiti	7.12	2.54	3.79	9.80	2.64	4.24	6.85	2.62	3.69
Akure	6.20	2.23	3.39	8.22	2.29	3.90	6.32	2.31	3.43
Asaba	10.47	2.65	5.53	7.35	2.49	5.06	9.40	3.67	5.63
Benin	15.99	3.22	6.76	10.28	3.24	6.53	13.45	3.58	6.18
Calabar	6.43	2.46	4.13	5.70	2.63	3.54	5.08	2.18	3.25
Enugu	10.09	3.15	4.73	9.50	2.75	4.75	9.42	3.46	5.13
Ibadan	11.35	3.88	6.54	13.31	4.33	7.90	11.22	4.16	7.01
Ilorin	6.12	2.09	3.13	7.15	1.90	3.43	5.10	2.30	3.12

Kaduna	8.94	2.60	4.85	9.70	2.30	4.02	5.76	2.72	3.84
Kano	16.60	4.34	7.65	16.42	3.16	6.80	13.09	3.00	5.80
Katsina	7.89	1.29	3.91	8.40	2.21	3.80	7.88	1.99	3.98
Kebbi	5.44	1.74	3.32	5.37	1.12	2.00	5.55	1.20	2.43
Lagos	11.76	3.31	6.74	13.41	3.56	8.45	14.14	4.35	8.49
Lokoja	5.64	1.89	3.04	8.18	1.90	3.13	6.34	2.02	3.07
Maiduguri	6.23	1.79	3.32	5.08	1.53	2.76	5.81	1.73	2.95
Minna	5.85	1.46	2.91	7.20	2.25	3.85	8.80	2.45	4.44
Nguru	8.95	1.57	3.00	5.72	1.58	3.51	5.10	1.82	3.29
Osogbo	7.72	2.96	4.71	9.69	2.95	5.24	7.49	3.50	4.76
Owerri	10.23	3.79	6.27	8.51	4.19	6.08	10.30	4.24	6.54
Port Harcourt	9.21	3.09	5.28	6.94	3.61	5.17	8.05	3.41	5.36
Sokoto	8.07	1.90	3.58	6.80	1.34	2.90	4.77	1.19	2.50
Umuahia	9.57	3.86	5.87	7.02	4.18	5.39	9.37	3.83	5.91
Uyo	9.05	3.24	5.49	7.33	3.75	5.10	7.94	3.38	5.27
Warri	5.62	2.15	3.93	6.70	2.72	4.10	8.04	2.47	4.20

#### 4.8 Spatial Distribution of Mean Carbon Monoxide (CO) Concentration During the Second Quarter of 2025

Average April, May, and June (AMJ) concentration of CO generally ranged from 180 to over 465 ppbv (0.21 to 0.53  $\mu\text{g}/\text{m}^3$ ) across the country. The lowest concentrations of 180 to 250 ppbv (0.21 to 0.29  $\mu\text{g}/\text{m}^3$ ) was observed over parts of Abia, Kogi and Borno states (Figure 4.10), while the highest concentration of 464 (0.53  $\mu\text{g}/\text{m}^3$ ) ppbv was observed over parts of Anambra and Delta states. Concentrations of 250 ppbv to 320 ppbv (0.29 to 0.37  $\mu\text{g}/\text{m}^3$ ) were observed over

most states of the country while Bauchi, Plateau, Kaduna, Taraba, Osun and part of Niger, Nasarawa, Benue, Cross River, Delta, Edo, Ekiti, Oyo, Rivers, Bayelsa, Zamfara, and Katsina recorded CO concentrations of 320 to 460 ppbv (0.37 to 0.53  $\mu\text{g}/\text{m}^3$ ). The observed AMJ seasonal average across the country was below WHO 2021 suggested limit of 4.0  $\mu\text{g}/\text{m}^3$  in 24 hours.

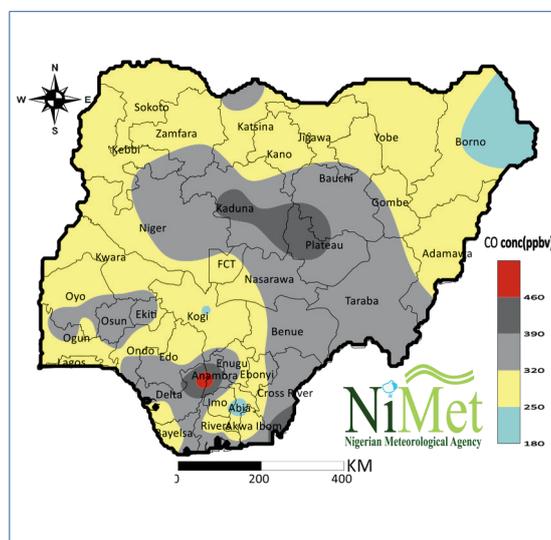


Figure 4.10: Mean Carbon Monoxide Concentration Over Nigeria in the Second Quarter of 2025

A comparison of monthly mean CO concentration during the quarter under review across cities in the country (Figure 4.11) reveals that concentrations were highest in April over Onitsha, followed by Jos, Katsina, Nguru, Owerri, Kano, and Maiduguri compared to other months. Abeokuta, Ado-Ekiti, Akure, Asaba, Enugu, Kaduna, Minna, Osogbo, Port Harcourt, Sokoto, Uyo, Warri, and Zaria observed higher concentrations in June than April and May implying that the

increased rainfall in June played no significant role in reducing the CO emissions over most of the northern and southern cities in June. The highest monthly mean concentration above 600ppbv was recorded over Onitsha in April, while Owerri and Maiduguri recorded the lowest monthly mean concentration of about 200ppbv in May. The observed monthly mean concentration over most cities were all lower than the WHO 2021 recommended standard limit

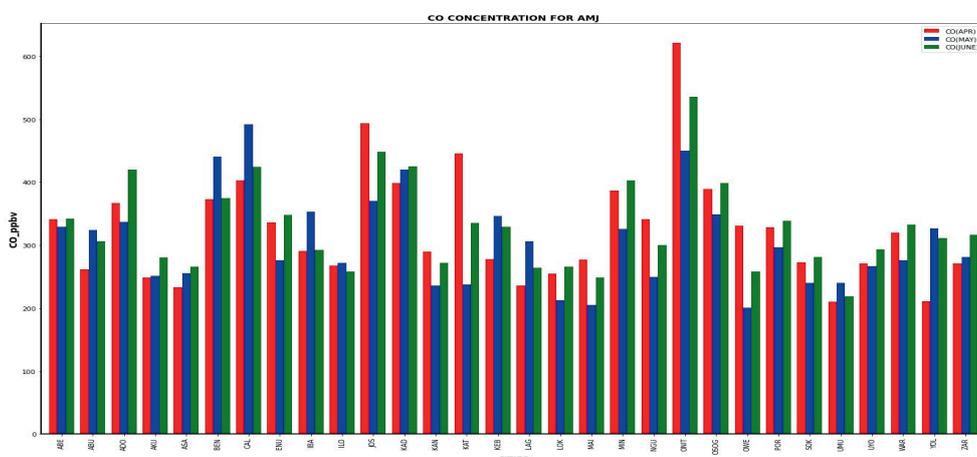


Figure 4.11: Mean CO Concentration over Cities in Nigeria During the Second Quarter of 2025

#### 4.9: Daily Mean Concentration of Carbon Monoxide (CO) over Northern Nigeria During Second Quarter 2025

As shown in Figure 4.12, the daily mean concentrations of CO in April, May, and June remained lower over Abuja, Kano, and Sokoto and higher over Kaduna and Katsina during the period.

Kaduna recorded the highest single-day concentration of 1060 ppbv on 18<sup>th</sup> of June followed by Katsina with about 900 ppbv in April (Figure 4.13). Kano, however, recorded the lowest concentration of 90 ppbv in June.

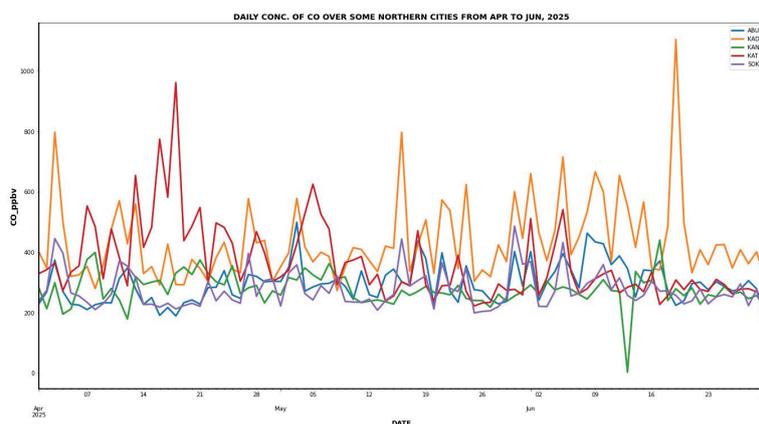


Figure 4.12: Daily Concentration of CO over Cities in Northern Nigeria During the Second Quarter of 2025

#### 4.10: Regional Daily Mean Concentration of Carbon Monoxide (CO) over Southern Nigeria During the Second Quarter 2025

Daily mean CO concentrations over cities in southern Nigeria ranged from 185 to 815 ppbv (0.21 to 0.94 mg/m<sup>3</sup>) during the quarter under review. The observed concentration over Benin was significantly higher than other selected cities in southern Nigeria during the period (Figure 4.13). Lagos recorded the lowest concentration of 185 ppbv (0.21 mg/m<sup>3</sup>) on the 24<sup>th</sup> of May, while the highest concentration of 815 ppbv (0.94 mg/m<sup>3</sup>) was observed over Benin on the

13<sup>th</sup> of June 2025. Generally, the observed concentrations during the period under review were all below the WHO threshold of 4 mg/m<sup>3</sup> in 24 hours, indicating reduced health risk due to carbon monoxide exposure. The maximum, minimum, and mean concentrations of CO for cities across Nigeria during the second quarter of 2025 are shown in Table 7

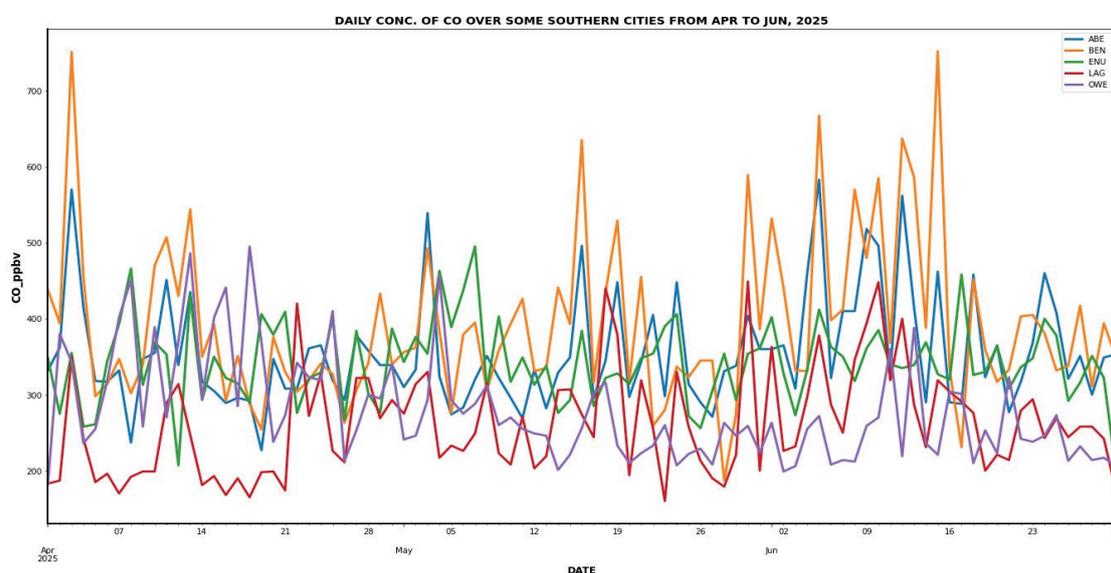


Figure 4.13: Daily Concentration of CO over Cities in Southern Nigeria During the Second Quarter of 2025

#### 4.11: Spatial Distribution of Mean Sulphur Dioxide (SO<sub>2</sub>) Concentration During the Second Quarter 2025

Mean SO<sub>2</sub> concentrations in April, May and June across the country generally ranged from 1.5 to 3.4 µg/m<sup>3</sup>. Concentrations above 2.0 µg/m<sup>3</sup> were observed over Kebbi, Kano, Jigawa, Yobe, Cross River, Ebonyi, Akwa Ibom, Rivers, Imo, Abia and part of Ondo, Benue, Taraba, Kaduna, Niger, Gombe, Bauchi, Sokoto, Zamfara and Katsina states. The rest of the country recorded concentrations of 1.5 to 2.0 µg/m<sup>3</sup> (Figure 4.14).

The lowest concentration of 1.5 µg/m<sup>3</sup> was recorded over Ado Ekiti while Calabar recorded the highest SO<sub>2</sub> concentration of 3.4 µg/m<sup>3</sup>. The April-May-June period coincides with the rainy season in many parts of Nigeria, which may have contributed to the lower SO<sub>2</sub> concentrations. Even though most cities reported SO<sub>2</sub> concentrations that were below WHO thresholds, continuous monitoring is essential to detect rising levels and prevent long-term exposure and health risks.

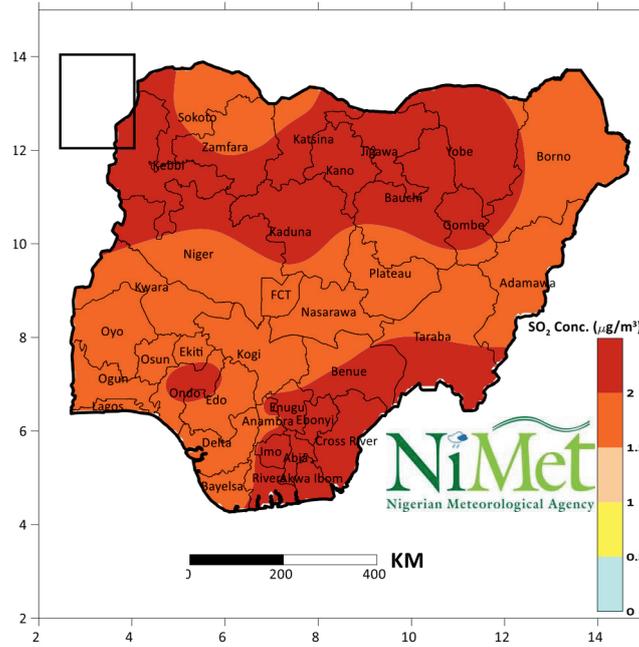


Figure 4.14 Mean Concentration of SO<sub>2</sub> across Nigeria in the Second Quarter of 2025

### 4.12 Daily Mean Concentration of Sulphur Dioxide (SO<sub>2</sub>) over Northern Nigeria During the Second Quarter 2025

Most of the selected stations in northern parts of Nigeria recorded daily SO<sub>2</sub> concentrations between 1.0 and 4.0 µg/m<sup>3</sup> (Figure 4.15). However, few spikes occurred over Abuja, Maiduguri and Kano in during the quarter under review. The highest daily concentration of 6.8 µg/m<sup>3</sup> was observed over Abuja around mid-June. SO<sub>2</sub> concentrations above 5.0 µg/m<sup>3</sup> were also recorded over Kano in early April and late May. Jos, Abuja and

Maiduguri recorded the lowest concentrations below 1.0 µg/m<sup>3</sup> in late June. The elevated SO<sub>2</sub> concentrations over Abuja, Kano and Maiduguri may be linked to increased industrial activity and vehicular emissions.

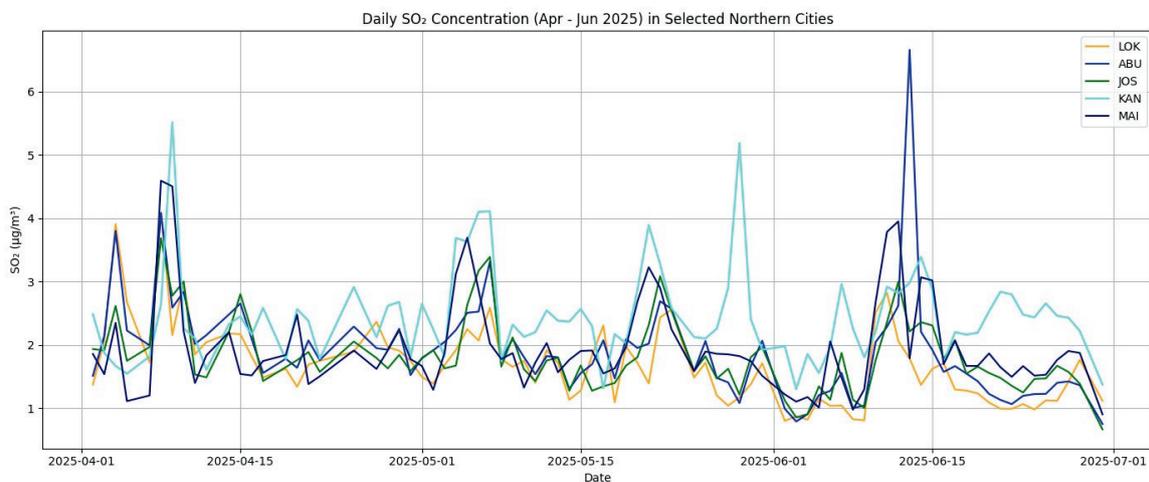


Figure 4.14: Observed Daily Mean Concentration of Sulfur Dioxide (SO<sub>2</sub>) across Cities in Northern Nigeria in the First Quarter of 2025

### 4.13 Daily Mean Concentration of Sulphur Dioxide (SO<sub>2</sub>) over Southern Nigeria During the Second Quarter 2025

The pattern of daily SO<sub>2</sub> daily concentrations over cities in southern Nigeria during the quarter under review was similar to the observed pattern over the northern cities during the same period. There were a few spikes seen in each month (Figure 4.16). Most of the selected cities recorded concentrations which ranged from 1.0 to 6.0 µg/m<sup>3</sup>. Calabar recorded the highest SO<sub>2</sub> spikes, with concentrations exceeding 6.0 µg/m<sup>3</sup> in late April and early June 2025. Uyo and Port Harcourt also recorded concentrations exceeding 6.0 µg/m<sup>3</sup> on 13<sup>th</sup> June.

The pattern generally indicates variable SO<sub>2</sub> emissions likely from industries and vehicles. The observed elevated SO<sub>2</sub> concentrations on certain days of the month were however, lower than the WHO standard limit of 40 µg/m<sup>3</sup> in 24 hours, although prolonged exposure could pose respiratory health risks, especially for children, the elderly, and individuals with pre-existing conditions. The maximum, minimum and mean concentration of SO<sub>2</sub> for cities across Nigeria are shown in Table 7

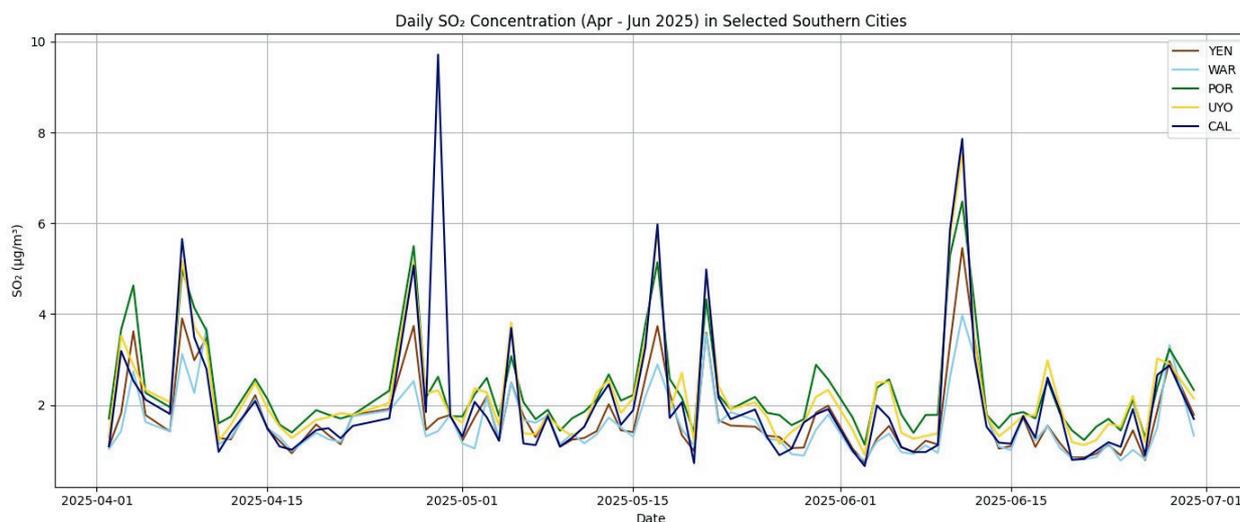


Figure 4.16 Observed Daily Mean Concentration of Sulphur Dioxide (SO<sub>2</sub>) Across Southern Cities in the Second Quarter of 2025

**Table 7: Maximum, Minimum and Mean Concentration of Sulphur Dioxide SO<sub>2</sub> (µg/m<sup>3</sup>) in the Second Quarter of 2025**

CITY	APRIL			MAY			JUNE		
	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
Abeokuta	3.14	1.39	2.08	2.51	0.89	1.80	3.09	1.03	1.47
Abuja	4.08	1.51	2.23	3.32	1.08	1.93	6.66	0.75	1.60
Ado Ekiti	3.09	1.14	1.88	2.49	0.77	1.53	2.30	0.66	1.18
Akure	7.36	1.09	2.04	2.37	0.78	1.49	6.23	0.65	1.38
Asaba	3.87	1.34	2.13	3.23	0.83	1.85	3.25	0.91	1.57
Benin	3.40	1.13	1.86	2.72	0.86	1.58	2.85	0.69	1.29
Calabar	9.72	0.96	2.46	5.98	0.72	1.96	7.86	0.65	1.87
Dutse	4.93	1.47	2.19	3.99	1.45	2.47	3.56	1.25	2.35
Enugu	4.96	1.45	2.40	4.47	1.29	2.13	4.78	0.99	1.73
Ibadan	3.08	1.29	2.05	2.37	0.83	1.73	2.62	0.85	1.37
Ilorin	2.61	1.26	1.94	2.58	0.82	1.74	2.20	0.54	1.27
Jos	3.69	1.43	2.05	3.39	1.22	1.88	3.00	0.67	1.58
Kaduna	4.10	1.75	2.43	9.49	1.58	2.53	2.92	0.92	1.80
Kano	5.52	1.55	2.33	5.19	1.32	2.66	3.39	1.30	2.34
Katsina	4.49	1.23	1.88	3.71	1.07	2.07	2.60	0.95	1.85
Kebbi	2.81	1.53	1.92	4.53	1.22	1.97	2.22	0.82	1.48
Lagos	3.25	1.27	1.97	2.65	0.82	1.69	3.57	0.92	1.42
Lokoja	4.10	1.34	2.12	2.59	1.04	1.70	2.83	0.80	1.31
Maiduguri	4.59	1.11	2.01	3.69	1.29	2.03	3.95	0.91	1.85
Minna	3.14	1.46	2.27	3.34	1.12	1.99	2.62	0.79	1.49
Nguru	4.83	1.07	1.74	3.81	1.27	2.13	3.61	1.08	2.27
Onitsha	3.92	1.35	2.21	3.68	1.09	1.97	4.10	0.93	1.66
Osogbo	3.16	1.22	1.98	2.51	0.86	1.69	2.22	0.73	1.27
Owerri	4.49	1.55	2.40	4.87	1.36	2.29	5.82	1.06	2.02
Port Harcourt	5.50	1.39	2.58	5.14	1.39	2.30	6.48	1.12	2.22
Sokoto	2.73	1.31	1.83	3.68	1.23	1.92	2.26	1.06	1.65
Umuahia	4.93	1.48	2.53	4.89	1.53	2.34	6.68	1.11	2.14
Uyo	5.17	1.21	2.38	5.83	1.14	2.20	7.56	0.90	2.16
Warri	3.70	0.98	1.74	3.56	0.88	1.62	3.97	0.77	1.42
Yola	4.97	1.26	2.07	3.34	1.21	1.91	2.70	0.55	1.48
Zaria	4.12	1.72	2.33	3.92	1.49	2.27	2.97	0.85	1.83

#### 4.14 Mean Air Quality Index During the Second Quarter of 2025

The air quality across most states of Nigeria during the second quarter of 2025 was moderate, with the Air Quality Index (AQI) ranging from 51 to 100. Consequently, the chances of air-quality-related health risks were therefore low during the period. Air quality over Kano, Katsina, Jigawa, and parts of Bauchi and Kaduna states was slightly poor due to the presence of Saharan dust in the atmosphere over these states, particularly in April and May. Such air quality, with AQIs in the range of 101 – 150, was unhealthy for sensitive group of persons residing in the aforementioned states. The sparse vegetation, dry loose soils and strong winds at lower levels of the atmosphere during this period facilitated dust uplift, transportation, and deposition of particulate matter that was responsible for the observed poor air quality in the few northern states. Vulnerable populations such as asthmatics, the elderly, and pregnant women were at higher risk of prolonged exposure. Ondo and its environs, however, reported good air quality with AQI of 1 to 50 during the period (Figure 4.17).

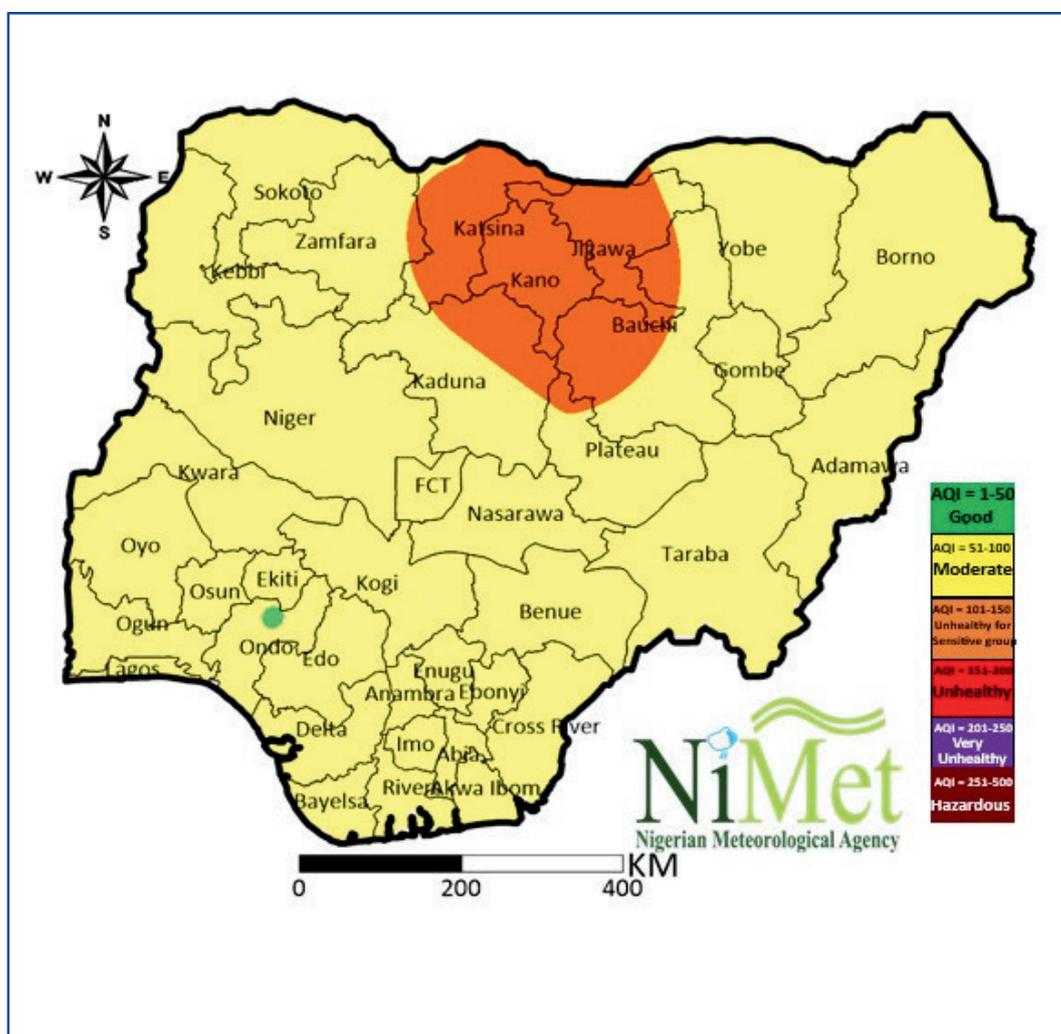


Figure 4.17: Mean Air Quality Index across Nigeria in Second Quarter of 2025

## 5.0 Summary and Conclusion

April, May, and June 2025 marked a transitional period from the dry Harmattan to wet (rainy) season in Nigeria. The period also witnessed a shift in atmospheric dynamics such as winds, mean sea level pressure, humidity, and position of the ITD, which played pivotal roles in rainfall distribution and pollutant dispersion across the country. The ITD steadily advanced northward from a mean monthly position of latitude 11.6°N in April to 18.4°N in June. The observed positions throughout the period were more northerly compared to the climatological mean position of the ITD for that period. The predominant wind over the country at lower levels of the atmosphere changed from the continental northeasterly to the southwesterly maritime airmass. The mean monthly Azores core pressure fluctuated between 1024 and 1026 hPa while St. Helena fluctuated between 1022 and 1024 hPa during April, May, and June 2025. These features enhance rainfall over the country, especially in the South. Air quality also improved significantly, particularly towards the end of June. Particulate Matter (PM<sub>2.5</sub>) concentrations remained above the WHO standard limits of 15.0 across the country due to Saharan dust transport and urban emissions. Places in the southern parts of the country recorded significantly lower PM<sub>2.5</sub> concentrations compared to the northern parts of the country. The observed concentrations of Nitrogen Dioxide (NO<sub>2</sub>), Carbon Monoxide (CO) and Sulphur Dioxide (SO<sub>2</sub>) were variable but generally below WHO thresholds nationwide. Air Quality was generally moderate (AQI of 51-100) without serious health risks across most of the country, while Ondo state experienced good air quality (AQI 1-50) during the period. Few northern states (Kano, Katsina, Jigawa, Bauchi, Kaduna), however, experienced

air quality that was considered unhealthy for sensitive group of individuals.

NiMet remains committed to providing timely, science-based insights to support national development, environmental obligations and reduction of emissions. Clean air is a shared responsibility, and with informed action, the goal can be achieved.

# Acronyms

<b>AQGs</b>	Air Quality Guidelines
<b>CAMS</b>	Copernicus Atmospheric Monitoring System
<b>CO</b>	Carbon monoxide
<b>hPa</b>	Hectopascal
<b>ITD</b>	Inter-Tropical Discontinuity
<b>kt</b>	Knot
<b>MSLP</b>	Mean Sea Level Pressure
<b>mg/m<sup>3</sup></b>	Milligram per cubic meter
<b>NO</b>	Nitrogen dioxide 2
<b>O<sub>3</sub></b>	Ozone
<b>PM</b>	Particulate Matter
<b>ppbv</b>	Part per billion by volume
<b>ppm</b>	Part per million
<b>SO<sub>2</sub></b>	Sulphur dioxide
<b>WHO</b>	World Health Organization
<b>µg/m<sup>3</sup></b>	Microgram per cubic meter
<b>µm</b>	Micrometre