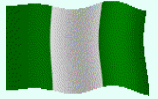


FUEL QUALITY PROGRESS IN NIGERIA FOR

NIGERIA NATIONAL AIR QUALITY MANAGEMENT PROGRAM

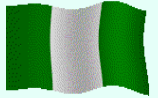


OUTLINE

- Preamble
- Introduction.
- Two major sources of Air Pollution in Nigeria.
- Factors affecting Air Pollution in Nigeria.
- Some air quality monitoring activities
- Some Field Results
- Way Forward.
- Proposed fuel quality
- Constraints



PREAMBLE



tion: Nigeria is located in West Africa bordering the Gulf of Guinea, and shares boundary with Benin , Niger, Cameroon, and Chad Republic.

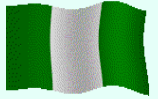
- Area: 923,768 sq km, .
- Capital City: Abuja.
- Population: Over 170 million people live in Nigeria.
- Tribe: there are over 370 tribes in Nigeria.
- Language: There are estimated 521 languages spoken across Nigeria. The major languages are English (the official language), Hausa, Yoruba, and Igbo .
- ☐Religion: Muslims , Christian and indigenous beliefs .
- ☐Climate: Nigeria's climate varies with equatorial weather in south, tropical in the center, and arid in north. Rainy seasons vary within the regions: May - July in the south, September - October in the west, April - October in the east and July - August in the north.



Federal Ministry of Environment, Department Pollution Control and Environment Health Department.

Mandates and activities of the Department

- Chemicals Management
- Sewage and Air Emissions Management
- Environmental Health and Sanitation
- Hazardous Waste Management and Cleaner Production and Extension Services.
- Marine Pollution Management and Contaminant Clean up and Remediation
- Solid Waste Management and Technology.

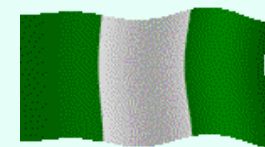


INTRODUCTION

- Nigeria, like most other African Countries, has witnessed a significant growth in population and urbanization especially in the last decades.
- Despite this, there appears to be imbalance between urban growth and availability of support infrastructure to reduce the impact of urbanization on the environment.
- One of the consequences of these imbalances is the emergence of accelerated urban air pollution which are most dominant in emerging potential mega-cities in the country.

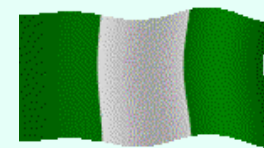


TWO MAJOR SOURCES OF POLLUTION



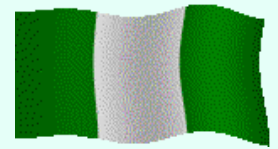
is is compounded by the fact that in the West African sub-region in general where Nigeria finds itself, is known to be among the most intensive atmospheric aerosols regions of the world,

- The two main pollutants and sources are : particles from the desertic zones of Sahara and biomass burning that produce huge amount of black and organic carbon. These accounts for over 70% of air pollution in the country
- The use of bio fuels usually results in concentrations of gaseous air toxics notably NO_x , CO , Volatile organic compounds (VOC), SO_2 , associated with combustions in vehicles, domestic power generators and industrial activities
- The effect of the concentration of these gases with respect to human health, protection of natural resources and the socio-economic development of the country may become an increasing challenge to science and technology.



Factors affecting air pollution

- increase in population density resulting in increase in transportation emissions/square kilometer;
- increase in the number of fairly used vehicles;
- increase in the number of house hold power generators
- road traffic system;
- maintenance system;
- control measures in place;
- Weak legislation
- lack of effective enforcement.



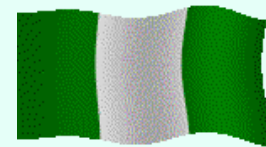
Road traffic emissions



A densely populated area in Lagos

Federal Ministry of Environment
Nigeria

18/5/2015

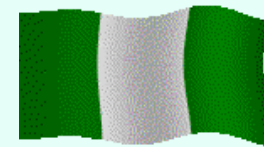


Motorcycles



18/5/2015

Federal Ministry of Environment
Nigeria

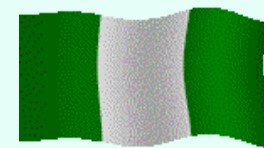


Power generating sets and smoky vehicles





Gas flaring and Industrial emissions



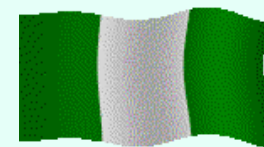
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Federal Ministry of Environment
Nigeria

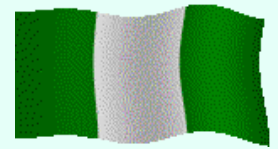
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Some National Pollution Monitoring Activities



- Over the years individuals, organisations and institutions have undertaken some emission inventories based on the objectives of exercise.
- Past inventories were restructured to emissions associated with greenhouse emissions at national level. Emission estimates were undertaken for the following inventory years: 1988, 1990 and 1994, before a re-computation of all earlier emissions were undertaken in 2004. which had re-calculations for all years between 1988 and 2000.
- Other emissions monitoring activities such as vehicular emissions measurement were undertaken for research purposes, such as conducted by Jerome 2000
- Detailed information and results of air emissions activities between 1998 and 2000 are presented in Annexure I

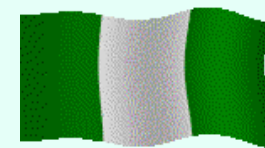


Phase-out of Lead in gasoline

- Following the 2001 Dakar declaration when it was agreed that lead should be phased of gasoline with 2005 as the deadline.
- Nigeria successfully phased out lead in her gasoline by 2003, almost two years ahead of the regional deadline.
- Nigeria has since maintained refining and importation of unleaded fuel in her fuel supply .



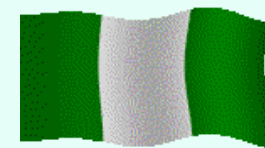
Nigerian Automotive Gas Oil (Diesel) Product Specification



parameter	Test Method IP ASTM	Limit	Actual from Nigerian Refineries
*Data from Mr R. I Suleiman, Tech. Asst. to the Group Exec. Director (Refining and Petrochemicals), NNPC.			
Specific Gravity 15/15 °C	160/D 1298	0.820min	0.871
Distillation: Recovered @ 357 °C % Vol. EBP °C	123/D 86	90 min. 385 max	>90 358
Colour (ASTM)	D 1500	3 max	1.5
Flash Point °C	34/D 93	65 min	100
Total Sulphur, % wt	x-ray	0.3 max	0.133
Copper Corroton (3 hr @100 °C)	154/D 130	No 1 strip max	1A
Kinematic Viscosity @ 38 °C, Cst	71/d 455	1.6-5.5	5.1
Cloud Point, °C	219/D 2500	4.0 max	+3
Carbon Residue, % wt	D 189	0.15 max	<0.01
Strong Acid Number (mg KOH/gm	139/D 974	Nil	Nil
Strong Acid Number (mg KOH/gm	139/D 974	0.5 max	0.02
Ash Content, % wt	D 482	0.01 max	<0.01
Water by distillation	74/D 95	0.05% vol. max	<0.05
Diesel Index	IP 21	47 min	50



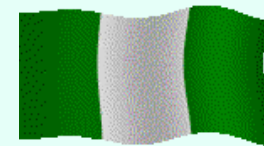
Nigerian Automotive Gas Oil (Diesel) Product Specification



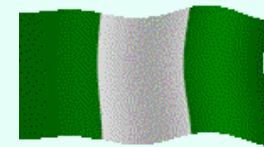
	Characteristics	requirement	Actual from Nigerian Refineries
i	Appearance	Clear and Bright	
ii	Colour, ASTM (Max)	3.0	
iii	Specific Gravity 15/15 °C	0.820-0.870	0.871
iv	Acidity (inorganic acid)	Nil	
v	Total Acid Number mg KOH/g (max)	0.5	
vi	DISTILLATION (a) Percentage recovery (b) at 357 °C v/v (b) final boiling point °C	 90 385	 >90 358
vii	Flash point °C (min)	66	100
viii	Kinematic Viscosity @ 37.8 °C, (cSt)	1.6-5.5	5.1
ix	Cloud Point, °C (max)	4.4	+3
x	Conradson Carbon residue on 10% residue,% wt (max)	0.15	<0.01
xi	Ash Content, % wt (max)	0.01	<0.01
xii	Copper strip corrosion (3hr at 100 °C)	Not worse than No 1	1A
Xiii	Sediment,% wt. (max)	0.01	
xiv	Total Sulphur, % wt (max)	0.3	0.133
xv	Water content, % vol (Mx)	0.05	<0.05
xvi	Diesel Index (min)	47	50



REQUIREMENTS FOR PREMIUM MOTOR SPIRIT (PETROL)



PROPERTY	LIMITS	TEST METHOD
Appearance	Clear and Bright	Visual
Colour	Ox blood red	Visual
Free Water	Nil	Visual
Suspended Matter	Nil	Visual
Specific Gravity at 15/15°C	0.72 - 0.76	ASTMD 1298
Distillate Evaporated at:		
70 °C, % v/v (max)	10	IP 123/78 D86/77
125 °C, % v/v (max)	50	
180 °C, % v/v (max)	90	
End Boiling Point, °C (max)	205	
Residue, % v/v (max)	2	IP. 154/78 ASTM D 130
Copper Corrosion, 3h at 50 °C (max)	Class I b	
Sulphur Content , % wt (max)	0.10	IP. 107 ASTM D1266
Existent Gum (solvent-washed), mg/100MI (max)	4	IP.131/77 ASTM D381/75
Oxidation Stability, °C (min)	360	IP40/79 D525/74
Reid Vapor Pressure, kPA (max)	62.0 (9psi)	ASTM.D.323
Lead Content (max)	5ppm	IP96 ASTM. D.3341/D526
Benzene, % (max)	2.0	
RON (min)	90	

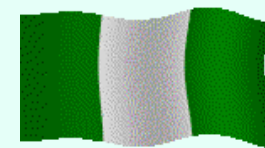


Current air quality monitoring activities

- Federal Ministry of Environment in 2009 on inventory of particulate matters $PM_{2.5}$ and PM_{10} in six cities, one in each geopolitical zones of the country. It was conducted on pilot basis.
- Results were also taken from recently acquired air quality monitoring station by the Federal ministry of Environment and NESREA
- Results were obtained by Federal Ministry of Environment and other regulators between 2009 and 2014.



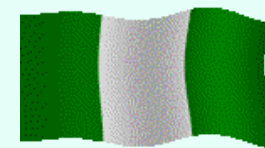
Result of Rapid Urban Air Quality Screening for PM_{2.5} and PM₁₀ in five States and the Federal Capital Territory of Nigeria



City	Sampling Site Classification									
	Site Class 1: Residential Low Density Area (the Affluent)		Site Class 2: Residential High Density Area (the Poor)		Urban Site Class 3a: Commercial/ Institutional (Govt area, and commerce)		Urban Site Class 3b: Commercial /High Traffic		Urban Site Class 4: Industrial/High Traffic)	
	PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀
Lagos	6	18	35	142	14	49	-	-	30	103
Abuja	12	25	24	41	10	48	13	23	10	42
Kano	85	757	83	413	41	124	-	-	18	62
Maiduguri	24	37	22	237	10	342	-	-	23	370
Port- Harcourt	36	192	68	123	20	56	-	-	65	178
Aba	53	285	30	577	248	422	-	-	78	926
Mean	36	219	44	256	57	174	13	23	37	280



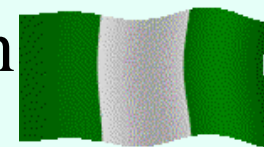
PM_{2.5} TO PM₁₀ Ratio for the Urban site Classes (Source FMEnv),



City	Sampling Site Classification									
	<u>Site Class 1:</u> Residential Low Density Area (the Affluent)		<u>Site Class 2:</u> Residential High Density Area (the Poor)		<u>Urban Site</u> Class 3a: Commercial/ Institutional (Govt area, and commerce)		<u>Urban Site</u> Class 3b: Commercial /High Traffic		<u>Urban Site</u> Class 4: Industrial/High Traffic)	
	PM _{2.5} / (%)	PM ₁₀	PM _{2.5} / (%)	PM ₁₀	PM _{2.5} / (%)	PM ₁₀	PM _{2.5} / (%)	PM ₁₀	PM _{2.5} / (%)	PM ₁₀
Lagos	33		25		29				29	
Abuja	48		59		21		57		24	
Kano	11		20		33				29	
Maiduguri	65		9		3				6	
Portharcourt	19		55		36				37	
Aba	19		5		59				8	
Mean	10		17		33				29	



Mobile Air Quality Monitoring Station



Gas Analysers inside the station



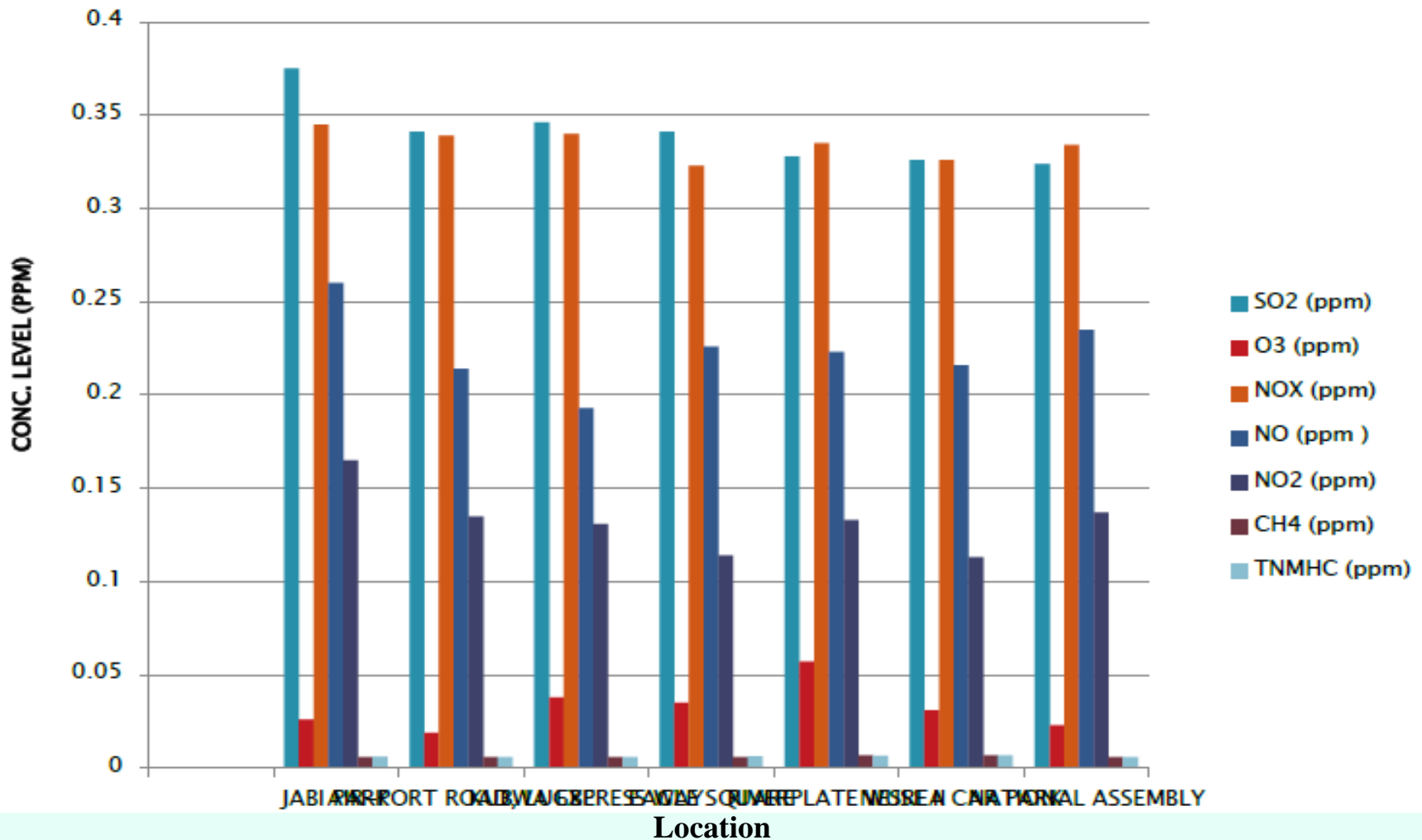
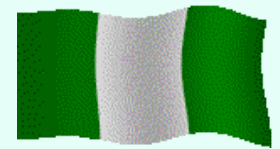
18/5/2015

Federal Ministry of Environment
Nigeria

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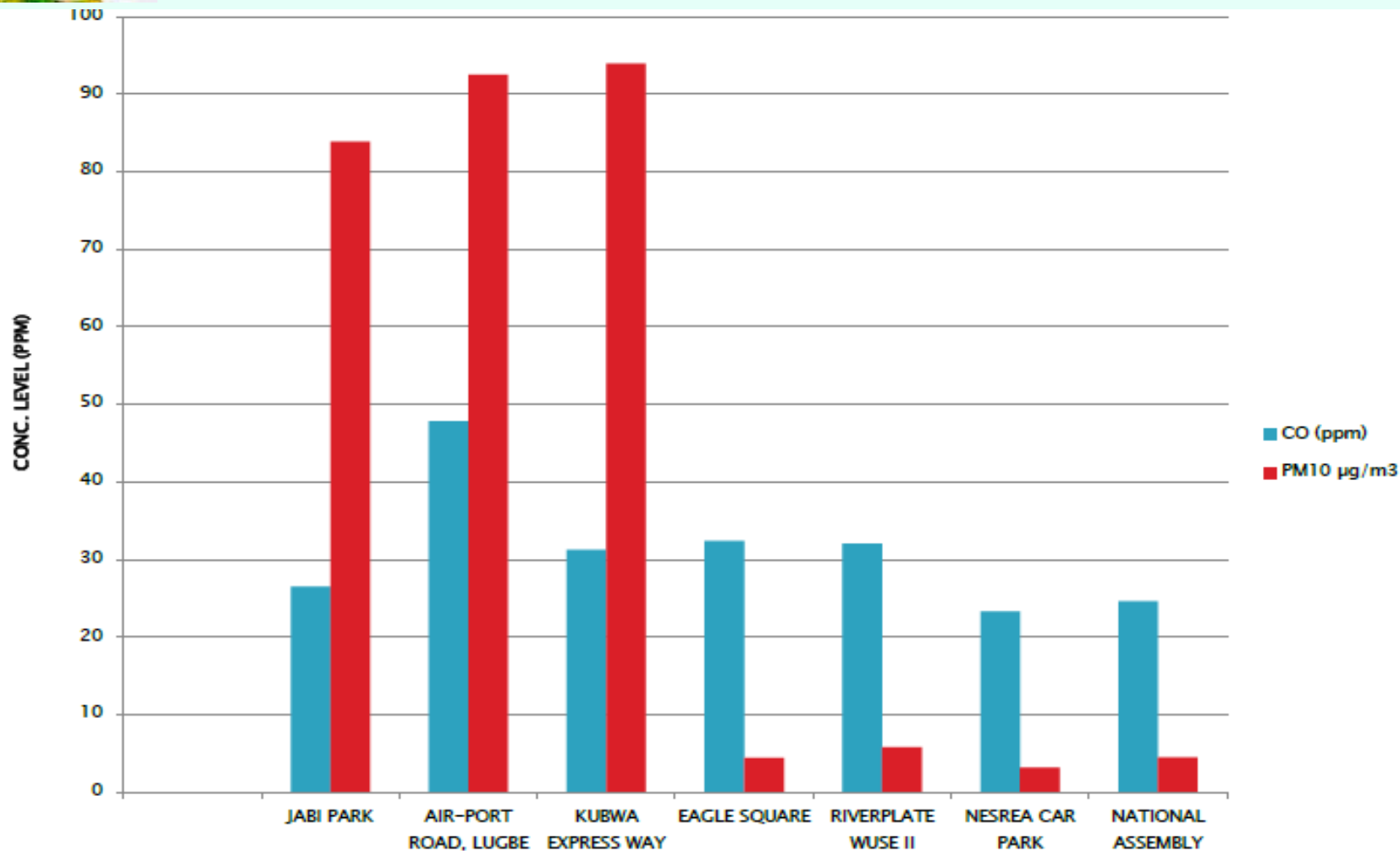
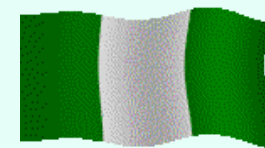


Levels of pollutants at some locations in Abuja June- July 2013



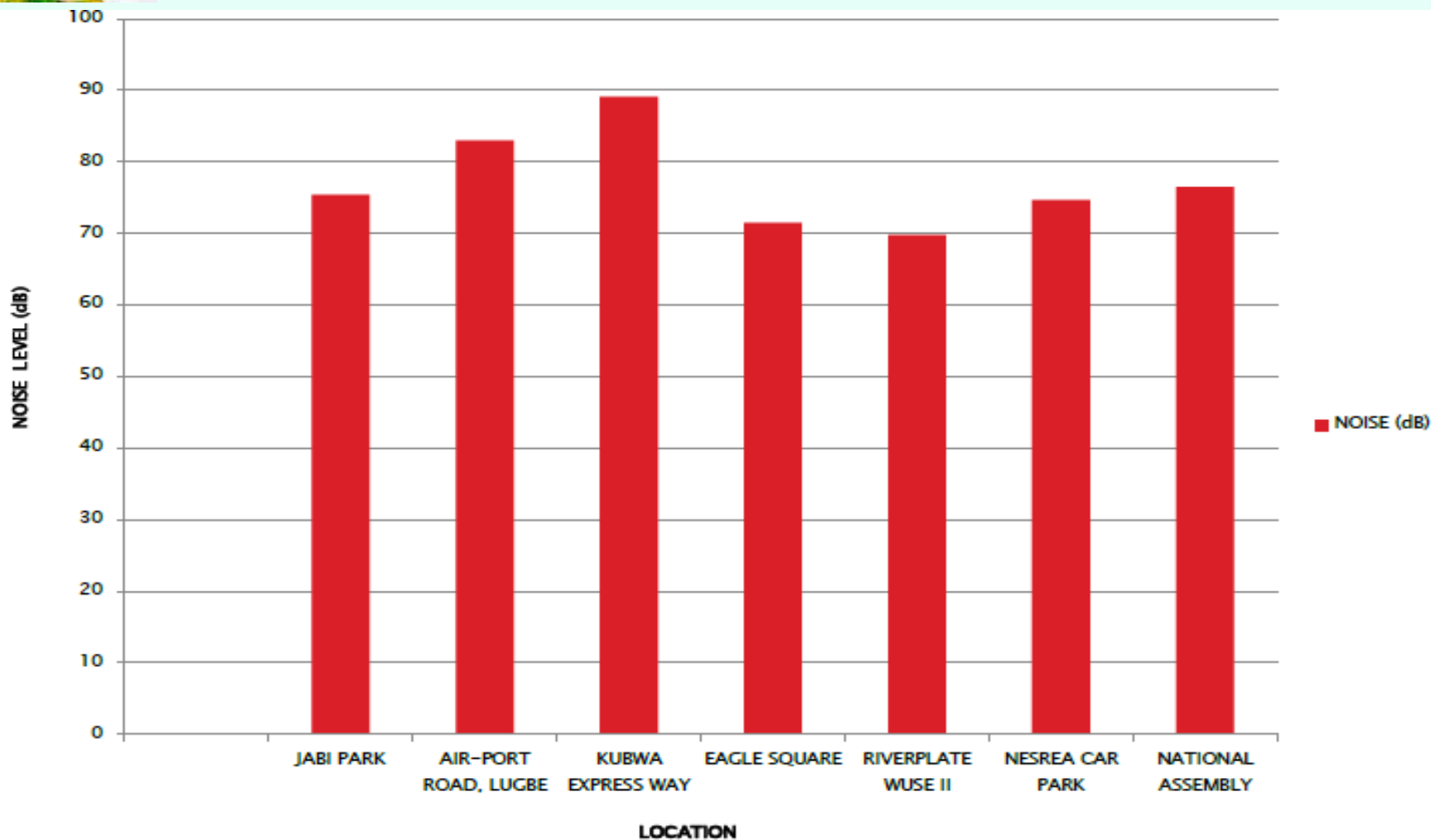
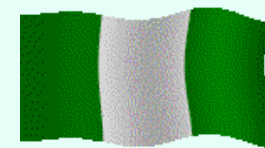


CO & PM₁₀ levels at some locations in Abuja June-July, 2013



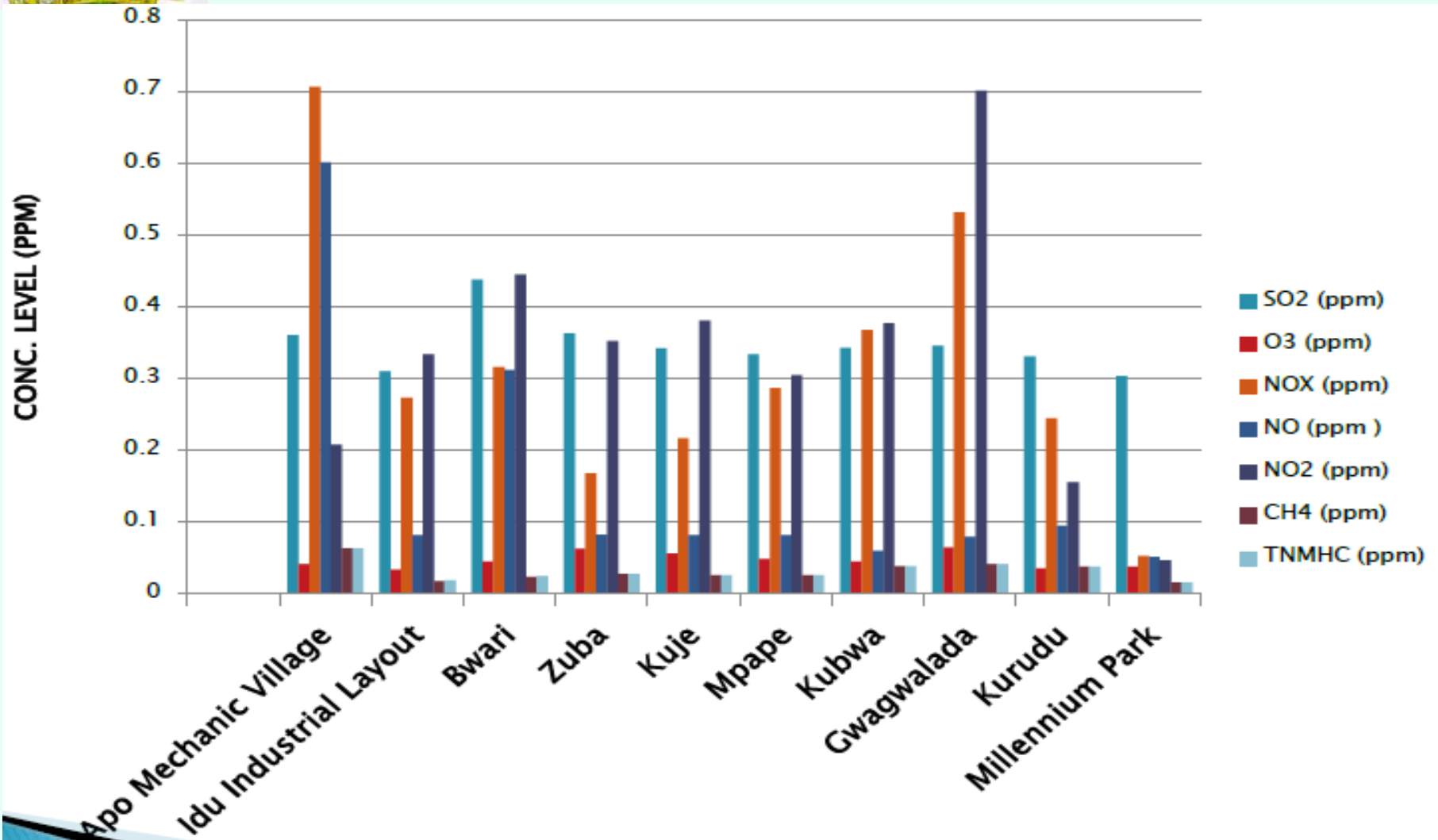
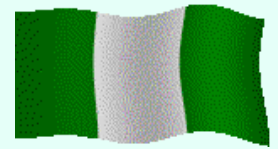


NOISE levels at some locations in Abuja June-July 2013



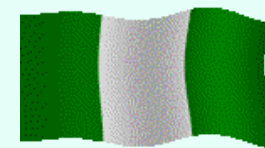


Levels of pollutants at some locations in Abuja November-December, 2013

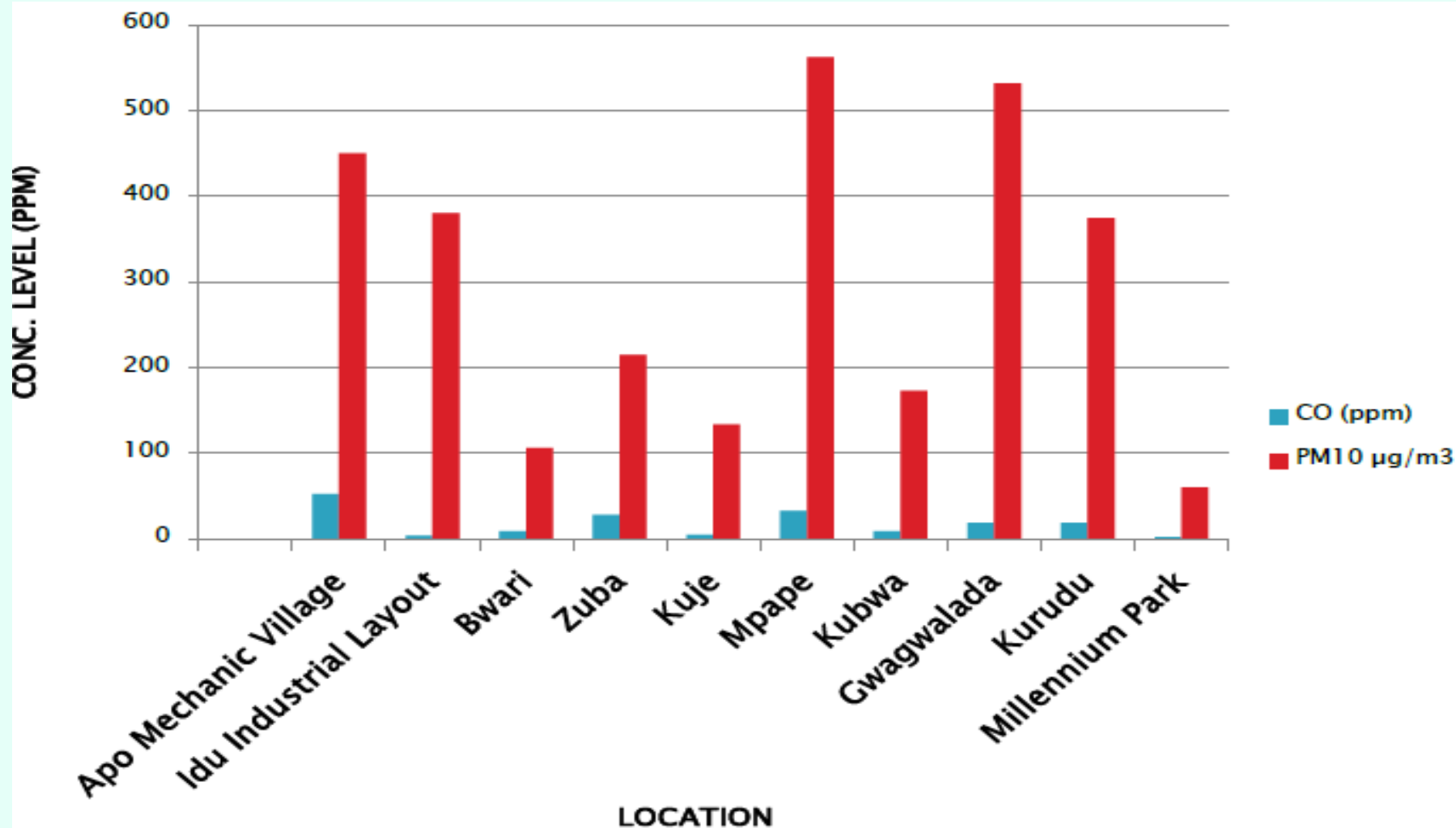




CO & PM₁₀ levels at some locations in Abuja

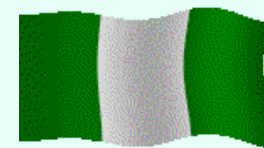


November- December, 2013

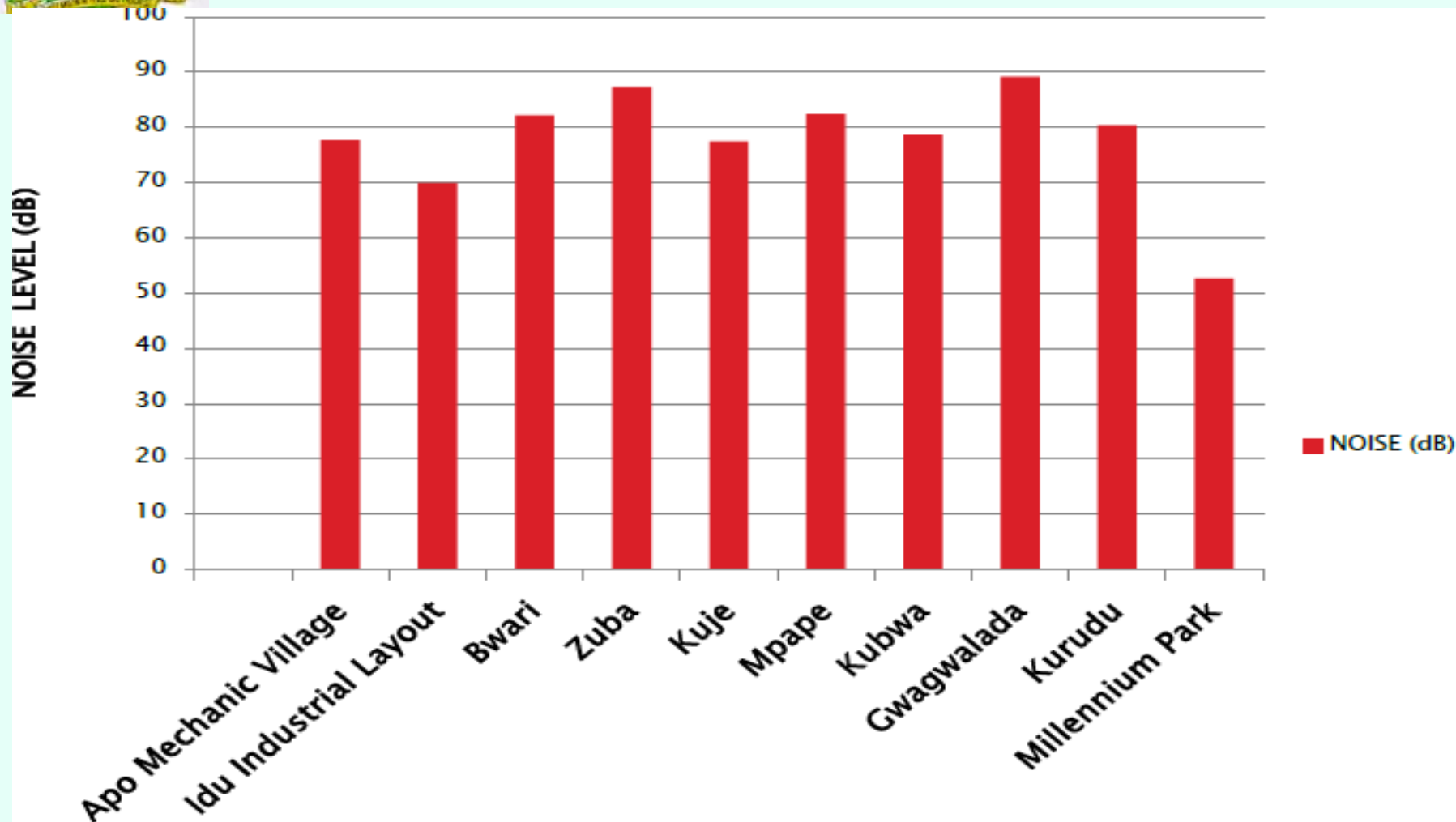


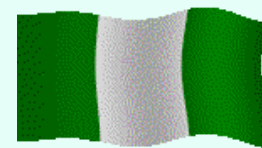


Noise levels at some locations in Abuja

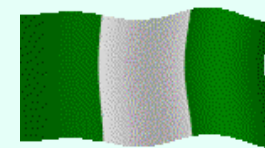


November-December, 2013.





Air Quality Monitoring Station located at the International Conference Centre Abuja Nigeria installed by FMEnv.

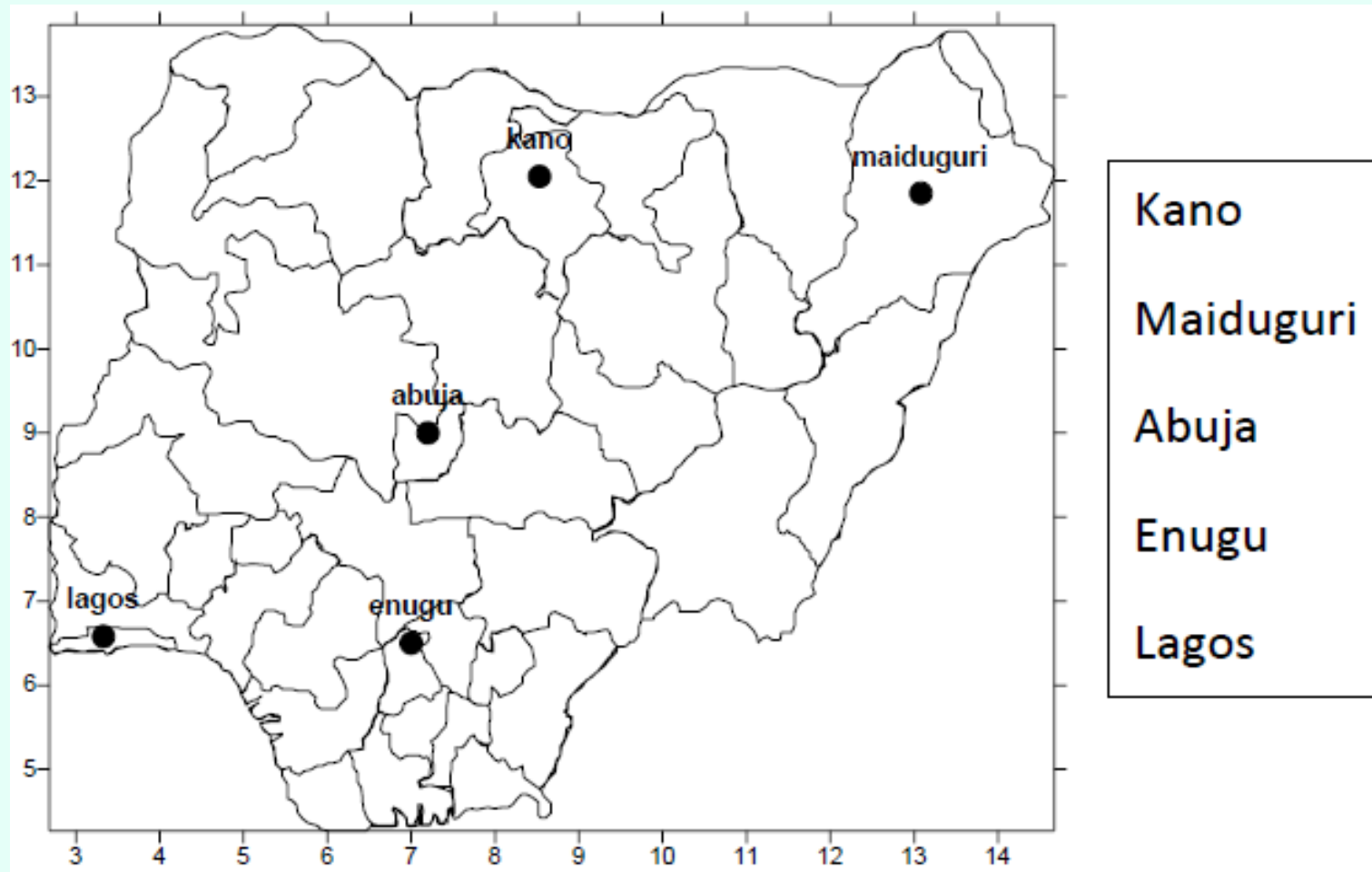
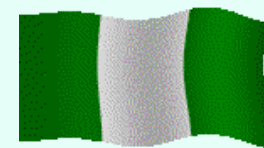


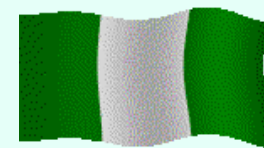
Feld results continued

- The air quality monitoring station brought from Umwelttechnik MCZ GmbH Germany currently can measure two parameters namely; CO SO₂ .
- Some of the current data generated are given in Annexure II.
- Nigerian Meteorological Agency (NiMet) currently has air-quality measuring equipment strategically located in Abuja, Lagos, Enugu, Kano and Maiduguri. Each station is also equipped with Automatic Weather Station to monitor Meteorological parameter like Wind speed & direction, Air temperature, Relative humidity and Solar radiation.
-



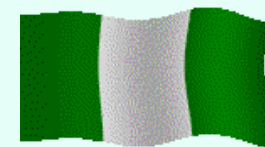
Field result continued





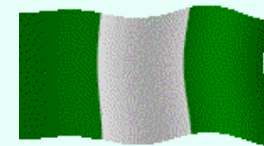
Field results continued

- Pollutant monitoring and data measurement started in March 2013. The data on the pollutants are being collected and archived for investigation and analysis.
- The pollutants currently being monitored are;
 - 1. Nitrogen-oxides (NO_x): NO_x is the sum of Nitrogen-oxide (NO) and Nitrogen-dioxide (NO_2). SO_2 and CO .
- A preliminary analysis of SO_2 , NO & NO_2 , CO and Particulate Matter (PM_{10}) is presently being carried out. Sample of such is given in Annexure III



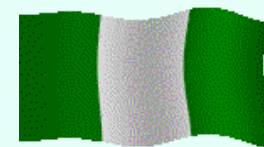
National Environmental Regulations and Acts

- The summary of the results of all studies carried out on air quality in the last few years indicate that CO , NO_x , SO_2 and VOC (including benzene, PAH etc) associated with combustion and industrial activities are many times higher than national and WHO standards during the substantial part of the year,
- The Federal Government has gazetted 28 National Environmental Regulations.
- Implementation of the provisions contained in the Regulations is to effectively address the problems of air quality in Nigeria.



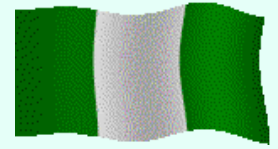
Implementation Committee of Air Quality Monitoring in Nigeria

- The air quality program is being implemented by National Air Quality Management Committee (NAQMC), an Inter-Agency Committee on Air Quality Management (IACAM) comprising of the following members:-
- **Federal Ministry of Environment:** The National Focal Point for Air Quality Management providing the management system for the implementation air quality projects and programs in Nigeria;
- **Nigerian Environmental Standards, Regulation and Enforcement Agency (NESREA):** The enforcement organization of Federal Ministry of Environment;
- **Standards Organization of Nigeria. (SON)** In charge of regulation of fuel standards in Nigeria.
-



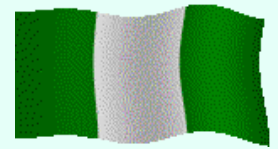
Implementation committee of Air Quality Monitoring in Nigeria Cont'd

- **National Automotive Council (NAC):** The Automobile Council (NAC) Automotive Development Research and Maintenance Institute.
- **Nigeria National Petroleum Corporation;** National Producer and coordinator of suppliers of fuel in the country.
- **Department Petroleum Resources (DPR).** Immediate Regulator of Oil and Gas Industries
- **Nigeria Meteorological Agency;** To provide guide on Metrological components of air quality management programs.



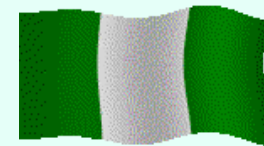
Implementation committee of Air Quality Monitoring in Nigeria.... (Cont'd)

- **Federal Ministry of Justice:** to provide all legal framework for air quality management programs and project implementation process.
- **Federal Ministry of Health:** Coordinate all health related issues of air emissions and .
- **Federal Road Safety Commission and the Directorate of Road and Transport Agency:** Enforcement bodies for Vehicular emission Regulations and Standards.



Government's Action Plan

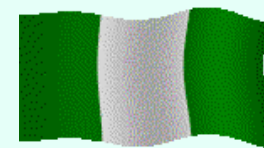
- Federal Government of Nigeria has banned the use and importation of 2-stroke engines.
- Use of 4-stroke engines as alternatives (fuel-efficient; less pollution; more durable).
- Ban on the importation of two stroke engines and motor vehicles with no emission reduction technology.
- Cleaner fuels;
- Mass transit system;
- Establishment of emission testing centres
- New models of motor vehicle shall comply with the emission standards of pollutants as prescribed in the developed Regulations.



Recognition of effects of Sulphur in fuels

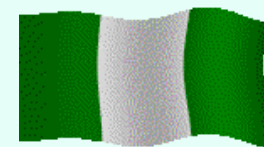
Sulphur in fuel has numerous effects on vehicles and machineries running on such as:-

- Increases particulate emissions in all engines;
- Fuel sulphur has a significant effect on Nox emissions from vehicles with Nox catalyst;
- Leads to corrosion and wear of engine systems;
- Efficiency of some exhaust after-treatment systems is reduced as fuel sulphur content increases, while others are rendered permanently ineffective through sulphur poisoning



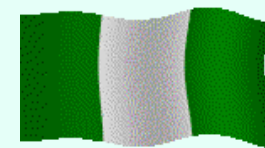
Way Forward

- Awareness creation, e.g.
- Enforcement of relevant Regulations on air pollution control.
- production and distribution of Information, Education and Communication (IEC) materials on air pollution control, noise control in public places.
- There is need to address demand issues, including measures to improve energy efficiency.



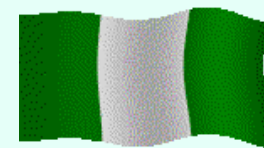
Way Forward... Cont'd

- The need for international co-operation for appropriate technology sharing and transfer between countries to boost innovation and technology development in the country.
- There is need for an integrated approach to tackle air pollution, industrial development, energy and climate change, to identify the most cost-effective measures and win-win situations that will bring benefits across the various policy areas.



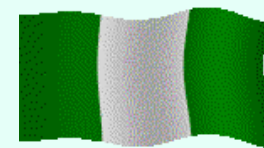
Way Forward...Cont'd

- Introduce the use of intelligence traffic system
- Encourage non-motorized transport system which is pollution free and a great means to exercise, but not having proper infrastructure could lead to accidents and mishap.
- Reduce the sulphur content of Nigerian fuels.
- Proposed fuel specification is in Annexure IV



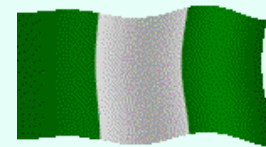
Constraints

- Capacity building including human resources development and transfer of technology.
- Huge investment required for sulphur reduction in fuels
- Inadequate public awareness and education.
- Lack of Sectorial policy on Air Quality Management.
- High level of illiteracy.



Constraints...Cont'd

- Poor exchange of information and networking between and among member States, at sub-region, region and global levels.
- Inadequate medical data relating to problems associated with air pollution both indoor and outdoor.
- Poor availability of alternative sources of renewable and clean energy.
- Equipment for monitoring air quality
- Inadequate funds.



APPRECIATION

THANK YOU FOR YOUR ATTENTION

