

The case of Lagos – Air quality improvement project

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Introduction: Background of study area

- Lagos state was formerly the capital of Nigeria
- It is the smallest state in size and the land mass is only 3577 sq.km
- It is the commercial pulse of Nigeria, about 70% of the nation's industries and commercial activities are carried out in the state
- About 40 percent of all new vehicle registration in Nigeria are also in Lagos
- The city also account for about 40% of the total fuel consumption in Nigeria

Background of study area (contd.)

- Overpopulation is prevalent in Lagos state: while Nigeria's population density is 100 persons per square kilometer that of Lagos is about 2,400 persons/km²
- Annual rate of population growth of the state is between 5.0 to 5.5%. The population of the State was estimated at 14.4 million in 2002 (United Nations Estimates)
- It is projected that by the end of this decade, the population would be over 20 million

Background of study area (contd.)

- The state is under severe environmental pressure due to a combination of:
 - i. a high population,
 - ii. high level of commercial activity and
 - iii. limited landmass.
- Certain areas of the state such as Mushin, Oshodi-Isolo, Suru-lere and the Mainland Local Governments have a population density of over 15,000 persons per/km each

Background of study area (contd.)

- The consequences of overpopulation in the city are noise pollution, waste generation blockage of drainage, high level of vehicle emission because of the use of leaded petrol.
- A rail transport system exist, but it is underdeveloped and has been overtaken by the road system which is operated mostly by private operated buses.
- There are about 2,600 km of roads in Lagos that are frequently congested, with over 1 million vehicles plying the roads on a daily basis.

Background of study area (contd.)

- Lagos has the highest National vehicular density – over 222 vehicles/km against Country Average of 11/km (1998)
- The state is also the hub of national aviation activities (handles 82.6% of international departures and 47.3% domestic connections) (2000)
- In view of enormous consumption of fuel in Lagos, it is believed that the daily lead injection, until recently, into the city environment amounts to about 3 tonnes.
- This is considered high for the small land area occupied by the city.

Status and Sources of air pollution in Lagos

- No systematic measurement of the air quality in Lagos, however a few studies have reported measurements of particulates, carbon monoxide and sulphur dioxide.
- Sources of air pollution arise from combustion processes in industry, commerce and at home.
- There is also substantial contribution from mobile sources (motor cars, motor-cycles (*okada*), trucks, commercial buses and power generating sets).

Status and Sources of air pollution in Lagos (contd.)

- Road traffic is a major source of air pollution in Lagos.
- Over 60% of all activities are carried out using motor vehicles
- Sources of air pollution other than industrial plants include solid waste dumpsites within the city.
- The latter produces carbon monoxide and nitric oxide at contaminant level due to incomplete combustion.

Correlates of air pollution in Lagos

- It is possible to establish a relationship between the level of poverty in the country and the quantum of urban air pollution.
- Poverty has prevented car owners with faulty internal combustion engines from putting them right.
- It is common to find rickety, old, smoke-belching cars on Lagos roads.
- There is astronomical increase in the use of two-stroke engine motor-cycles (*okada*) as a means public transport in the city. At least half a million of them ply the nooks and crannies of the city

Vehicle emission as a major source of air pollution in Lagos

- Nigerians have had to import used imported cars whose fitness for purpose are in doubt, especially since most of these vehicles are either to be crushed as scraps or are off the road because of their harmful nature to the environment.
- Cars that should have been fitted with catalytic converters are sold to the Nigerian market where they pollute the environment, indiscriminately.

Profile of air pollution in Lagos

- The table below provides a description of atmospheric emissions of pollutants obtained from a study carried out in 1992. Data from 3 sources of air pollution were collected: stationary, mobile and industry.
- Road traffic is identified to be the major source of air pollution in the state.
- Notable atmospheric pollutants – NO_2 , CO and VOCs generated by roadside vehicles contribute to the greenhouse effect.
- Some VOCs are toxic and carcinogenic

Source	Particulates	Sulphur Dioxide	Nitrous Oxides	Carbon Monoxides	VOCS
Stationary power plant.	2	10	23	5	2
Industry/Commercial	205	7290	4811	467	29
Domestic	6049	8618	7794	986	513.
Mobile					
Road vehicles	4084	3,378	29,700	308,840	52,741
Rail Movements	1	4	3	3	2
Aircraft	27	33	297	1,794	1,137
Marine	6	461	139	21	70
Total	4,1118	3,876	30,139	310,618	53,950.

Findings of a recent study on air pollution in Lagos

- Results obtained over a period of about 10 months from selected three dumpsites, three industrial estates and six heavy traffic stations using the *in situ* method is to the following effect:
- Average concentrations of carbon-monoxide (CO) in heavy traffic stations was 49.32 ppm, while at industrial estates – 36.75 ppm and at dumpsites: 10.76 ppm.
- Sulphur dioxide (SO₂) average were 0.166 ppm at the traffic stations, and 0.670 ppm levels were detected at both industrial and dumpsites. The NO_x concentrations were 0.220 ppm at the dumpsites and 0.333 ppm at both industrial and traffic stations.

Location		Gaseous level			Detected PPM	
		C0	N0	N0 ₂	N0 _x	S0 ₂
Dumpsites	Olusosun	0	0	0	0	0
		12	0	0	0	1
		0	0	0	1	1
	Oke - Odo	0	1	0	1	0
		13	1	0	1	0
		0	1	0	1	1
	Solus	0	0	1	1	0
		9.0	0	1	1	0
		8.0	0	1	0	1
Industrial Estate	Apapa	60	0	1	1	0
		9	0	1	1	1
		85	0	0	0	0
	Eric Moore	18.5	0	0	1	1
		40	0	1	1	0
		25	0	1	0	1
	Oba Akran	22	0	0	1	0
		50	1	1	1	1
		75	0	1	1	1

Traffic Station	Yaba	45	1	0	0	0
		45	0	0	0	1
		29	0	0	0	0
	Oju-elegba	30	0	0	0	0
		84	0	0	0	1
		94	0	3	1	0
	Mile 2	24	0	0	0	0
		60	0	0	1	0
		44	0	0	1	0
	Oshodi	50	1	0	0	0
		55	0	1	0	1
		60	1	0	0	0
	CMS	60	0	1	0	1
		40	0	0	1	1
		50	0	1	1	0
	Obalende	62	1	0	1	0
		45	0	0	0	1
		40	1	0	1	0

Findings of a recent study on air pollution in Lagos (contd.)

- The average concentrations for SO₂ at Dumpsites were 0.555 ppm, Industrial estate 0.515 ppm and Traffic situations 0.097 ppm. Average concentrations for NO_x were Dumpsites 0.190 ppm, industrial estate 0.225 ppm and traffic stations 0.113 ppm.
- Comparing the results of both methods, it can be noticed that the in-situ methods give slightly higher concentrations for sulphur dioxide and nitrogen oxides. **The values obtained by either of the methods were all higher than the Nigerian national standards (FEPA standards) for ambient air**, which are as follows: CO – 10 ppm, SO₂ – 0.01 ppm and NO_x – 0.04-06 ppm

Table 3: Chemical methods results

Locations		Conc. In mg/L S02	Conc. In mg/L N0x
Dumpsites	Olusosun	0.990	0.210
	Oke-odo	0.540	0.195
	Solus	0.134	0.165
Industrial Estates	Ikeja	0.767	0.240
	Eric Moore	0.412	0.232
	Apapa	0.270	0.270
Traffic Situations	Yaba	Nil	0.150
	Oshodi	0.153	0.075
	CMS	0.041	0.090
	Obalende	0.081	0.135
	Oju-elegba	0.125	0.065
	Mile 2	0.094	0.058

Quality of vehicle fuel in use

- The Standards Organization of Nigeria (SON) has changed petrol specification to specify zero lead since June 2002
- The Department of Petroleum Resources (DPR) has also ensured that all petrol coming into Nigeria as from June 2002 is unleaded.
- Nigerian National Petroleum Corporation (NNPC) refineries have been producing petrol with zero lead since December 2002
- Except in few cases of scarcity of fuel, there is near absence of informal fuel market in the city of Lagos.
- This factor has invariably reduced the incidence of adulteration of fuel in Lagos

Impact of pollutants on human health

- 95% of inhaled high concentration of SO_2 is absorbed in the upper part of the respiratory system. It acts as an irritant and increases symptoms for patients with bronchitis, emphyxina, chronic lung disease and pulmonary fibrosis
- CO shows a high affinity for the haemoglobin in the blood leading to brain damage, impaired perception, and asphyxiation or in lower doses weaknesses, fatigue, headaches and nausea
- Symptoms of acute poisoning often expressed by people in traffic jams include headache, loss of vision, decreased muscular coordination and nausea
- We can safely conclude here that costs of pollution in metropolitan Lagos has increased medical costs such as medicines and hospital visits and on productivity losses.

Status of urban air quality management in Lagos

- Presently, there is neither a legislative framework nor a set standard in the State to monitor emission from mobile sources.
- The regulatory framework put in place by the Federal government through the then Federal Environmental Protection Agency (FEPA) in 1991 is limited to emission generated through stationary sources
- We understand that the Ministry of Transport is working with the Ministry of Environment to set guidelines on vehicular emissions, but this has not come to fruition.

Proposed Action Plan

1. To conduct a study, which should be comparative in nature of how vehicular emission standards are set and monitored in societies with similar level of development as Nigeria and a city with shared urban air quality situation like Lagos.
2. To advocate for a legislative framework for the control and regulation of vehicle emission in the State.
3. Identify strategies which would stipulate the *modus operandi* of the day-to-day execution of the program.

Conclusion

- We can safely predict that the state of air quality will continue to be worse in the city because of the state of economy of the country which necessitate that the average ages of most cars on the roads to be about 15 years old
- In view of the catastrophic health implication of the identified pollutants emanating from vehicle emission in the city of Lagos, it is imperative that an urban air quality study should be given an urgent attention.
- It is imperative that the study should look into how to build a sustained capacity for effective monitoring of air pollutants.