Chapter Thirteen

Ambient Air Quality Assessment in Nigeria: Challenges and *Remedies*

Francis Olawale Abulude[1, 2] Samuel Dare Fagbayide[3], Akinyinka Akinnusotu[4], Adebola Elemide[5]
[1]Science and Education Development Institute, Akure, Ondo State, Nigeria
[2]Department of Chemistry, Federal University of Technology, Minna, Niger State, Nigeria
[3]Department of Agricultural and Bio-Environmental Engineering Technology, Federal Polytechnic, Ilaro, Ogun State.
[4]Department of Science Laboratory Technology, Rufus Giwa Polytechnic, Owo, Ondo State.
[5]Department of Agricultural and Bio-Environmental Engineering Technology, Federal College of Agriculture, Akure, Ondo State, Nigeria

Abstract

Worldwide air quality is a problem continuously attended to due to the health risk. Africa is not out of this, most especially Nigeria. According to a report, Nigeria is tagged as having most polluted cities in the world. Although efforts are being put into place to reduce the pollution problems, much could not be attained due to some challenges in the assessment. Thus, the aim of the paper was to identify some bottlenecks which hinder air quality assessments in Nigeria and to suggest the way forward. To this end, the problems were highlighted in the paper and the solutions were provided.

Keywords: Air Quality, health risk, Nigeria, indoor and outdoor pollution, standards, NESREA

Introduction

Air pollution (indoor and outdoor) is a problem throughout the world. Many lives have been lost, and many have serious defects in one way or the other. State of Global Air2019 (2018), noted that life expectancy on average a day old child is shortened by 20 months due to exposure to air pollution. It was noted that it ranked 5th out of the causes of health risks in the world. Longtime exposure has caused over 5 million deaths due to stroke, lung diseases and cancer, and diabetes. According to the SOGA2018 (2017) annual report, it was affirmed that people are exposed to burning of solid fuels in homes and in 2016 over 2.5 billion people (ratio 1:3) were exposed to fuels like charcoal, dungs, biomass, and wood, especially in low and middle countries.

According to WHO (2018), air pollution is one of the environmental risks to health. The health risk is associated with heart and respiratory diseases, lung cancer, and others. If air pollution levels are reduced, the effects of the diseases will be reduced. In another key fact by WHO, in 2016 over 90% of the world population lived in countries where WHO air quality standard levels were not attained. Air pollution, especially outdoor in rural and urban areas caused over 4 million untimely deaths in 2016, while indoor pollution has been found to pose a serious health risk to over 3 billion people.

According to Cunningham (2018), Nigeria was tagged 'as the most polluted cities in the world' and further showed that this may not change soonest. Ogundipe (2018) also pointed it out that Nigeria is ranked 4th deadliest in the world with about 150 deaths/ 100,000 people due to pollution. Ladan (2013) indicated the sources of pollution causing diseases and deaths be from vehicle exhaust, fuel from wood, industrial emissions, gasoline generator, burning of biomasses and domestic and industrial wastes. In a 2003 to 2008 release by River State Ministry of Health, it was noted that over 60 died due to diseases related to air pollution (Nwachukwu *et al.*, 2012).

The advanced world has reduced the problem of air pollution drastically and this has translated to the reduction in their health risks due to pollution. All their stakeholders in air quality management have put everything in place to forge ahead in the battle. For example, the US, UK, Germany, and others have invested several billion dollars in tackling this menace. Whereas, many developing countries are trailing behind – Nigeria inclusive. Thus, this paper has delved into the problems that affect the air quality assessment in Nigeria. To this end, the aim of the paper was to point out some challenges that hinder the air pollution assessment and the availability of data. Solutions were proffered which must be applied by the stakeholders in air quality management in Nigeria.

Lack of necessary equipment
One area of concern is the lack of equipment in our institutions and research institutes in Nigeria. For meaningful research to take place there must be working instruments in these citadels of knowledge. I was reliably informed (authentic source) that in a university in the US there are over twenty working instruments available for research, whereas there may be none in some universities and where there are they may be obsolete.

I remember when I visited a university down south of Nigeria, there was a little problem encountered while working with an instrument, the fixing of the problem could have been done using the instrument manual, unfortunately, there was none available. The whole day was wasted and the manual was difficult to

download on the net. It took us several months before a colleague could send it from the UK. Can you imagine the 'trauma' experienced before solving a minute problem? For equipment to be ordered, the procurement officer should endeavor to request for the complete booklet on the machine or equipment. Again, not just anybody should be put in charge of procurement, an expert on the use of the equipment should be saddled with the responsibility.

Secondly, the equipment should be ordered with important parts as spares. For example, if an Atomic Absorption Spectrophotometer (AAS) is needed in a laboratory, the AAS needs lamps for different elements. These elements lamps may not last before the damage, an alternative must already be on standby instead of waiting several months before the procurement of the replacement of lamps.

Thirdly, most of the equipment in our laboratories lack maintenance, although this may not come as a surprise because generally, we lack maintenance culture in Nigeria, even in our different homes. For a procurement to be made on specialized machines, I suggest a person, here a technologist to be trained on the use, maintenance, and even repairs. This person will be saddled with the handling of such a machine. In Nigeria, we make the mistake of allowing a lecturer or researcher to handle most of our equipment, whereas technologists and technicians will be left out. Anybody

trained on the machine should endeavor to retrain the users. Always, retraining workshops should be available.

Fourth and last, I want to delve on obsolete equipment present in our research and teaching laboratories. For any meaningful teaching and research, the present trends must be followed. In the advanced world, researching and teaching are at high speed. If at all, we cannot close these, we should not be far behind. Efforts should be geared towards the use of modern equipment.

Cost of purchase of equipment and chemicals

The cost of purchase of equipment and chemicals is quite ridiculous especially in Nigeria and other developing countries. Imagining the equivalence (exchange rate of Naira) to Dollar (₦360), for example for a purchase of an XRF instrument (Delta Pro) sold at a cost of $39,000 (thirty-nine thousand dollars) only (911 Metallurgist, Accessed, 2019), it will cost a Nigerian buyer, ₦14,040,000 (Fourteen million, forty thousand Naira) only. How many institutions can afford it? For the availability of this type and other types of instrument to be available in most of our institutions, I want to make case for the followings:

i. The government should reduce the exchange rate for the purchase of educational materials

ii. The purchase should be custom free. I am a victim of this. I have collaborative work

elsewhere outside the country. I was made to pay ridiculous custom fees on sensors and air sampler sent to me free.

iii. The government and private institutions should try as much as possible to make the cost of analysis at a reduced cost to students and researchers. They will assist in contributing to the knowledge of air pollution in Nigeria. The results will also be used by stakeholders in plans to reduce air pollution.

iv. It will be important to make a case for joint procurement of useful expense materials by two or more institutions (research centers inclusive). The availability will make researches worthwhile in Nigeria.

v. Individual persons can be useful in the funding of necessary laboratory materials needed for air pollution monitoring. The government and institutions should contact these people to fund the cost which I am sure some will do.

Little or no research funds available

Research fund available to monitor air pollution is either not available or little compared to other countries. For this reason, a major breakthrough in this area is slim. For Nigeria to reduce air pollution, there must be results to work with, this will assist in areas to focus on

and the methodologies to apply. Much has to be done in monitoring air pollution which ranges from planning and other logistics to publication of results for the necessary actions to be taken. All these needs funds which could be sourced from the government (TETFUNDS etc), wealthy individuals, NGOs, financial institutions, professional societies, international bodies (World Bank, UNICEF, UNESCO, etc), private sectors and companies involved in Research and Development, international donors just to mention a few.

The US National Science Foundation (NSF) budgeted$31.3 billion for research in 2016 (LeMieux, 2017), again in England Research Councils disbursed for approximately £724,919 (South East of England), £662,589 (London), and £67,691 (North East) for postgraduate funding in 2015/16 (Mason, 2018). These are lots compared to our research funding in Nigeria.

In Nigeria, the sad thing is that most researchers and academicians opportune to obtain the funds end up diverting them to areas not relevant to the cause of research in air pollution. Something must be done to curb this act.

Lack of collaboration

This is an area which can hinder the monitoring of air pollution in Nigeria. From my experience, it may not be possible to embark on the study alone. It will not be possible to be all in all. To

finance the research alone may not be feasible. To be vast and contribute to knowledge, one needs collaborative work. For example, I needed to carry out a research a few years back when I saw I do not have the funds, I invited a researcher from abroad who provided the sampler for the work, I sampled, sent them to another researcher's laboratory also abroad at the end, there were results and published.

For new and junior researchers or even colleagues, it is always good to look for mentors in your area of study. It could be within Nigeria and outside. This is how I started collaborating. It has helped me as an individual and the nation as a whole.

Collaboration can be in any form – writings, asking for references not easily found, statistical analyses and calculations, working in another person's laboratory that is well equipped and other areas deemed fit. Nigeria should seek international assistance in solving air pollution problems at regional or international (bilateral) levels in order to achieve considerable results.

Lack of cooperation from industries
Most times industries and companies do not cooperation with researchers by not granting access to their vicinities. There are industries which are not environmental compliance which is reluctant to allow easy access to their vicinities for research purposes because they do not want to be exposed by the

outcome of the research. There was a time we needed effluents from the textile industry, we applied officially, but before the permission was finally given, the time for the research work was almost gone due to sabotage from the industry. It is always advisable to work on this logistics several months or year prior to the commencement of the research.

National Standards and information
Worldwide there are standard limits that are recommended which are compared with eg USEPA, WHO, UNICEF, and others. There are those of nationals too which governs the pollution limits of each country. Nigeria has to be given by the Environmental Quality Control Department, National Environmental Standards and Regulations Enforcement Agency, Abuja, Nigeria. The standard is should be updated and be more feasible like those of other countries. If one checks the website of this agency, hardly will one see the standard limits if it is even there. If one checks the publications by Nigeria both in international and local journals hardly will you find the results obtained compared with our national limits, international recommendations were usually used especially WHO and USEPA.

Part of the challenges in air pollution assessment in Nigeria are poor exchange information and lack or inadequate public awareness programs of agencies saddled with the responsibility of air quality monitoring in Nigeria. Agencies

like Nigerian Meteorological Agency (NiMET), National Environmental Standards Regulations and Enforcement Agency (NESREA), Ministry of Environment at the State level, Universities, Centre for Atmospheric Research (CAR), ARIAL Laboratory, National Space Research and Development Agency (NASRDA), and others. They are performing, but efforts should be geared to pass their outcome to ordinary citizens of Nigeria rather than confining it within the academics and research. If the average citizen should be carried along, air pollution will be reduced because they are part of the cause of pollution.

Lack of private sectors' and companies' involvement
In Nigeria, few private sectors and companies involved in research and development are few. Even, where they are, they are the profit-oriented outfit. To assist in research activities this may be difficult. Unlike the advanced world where a certain percentage of the budget will go for research (R & D) that will benefit the nation and its sectors. In the same vein, they allow their facilities to be shared or used by outsiders for research purposes, even accept students for their industrial training and award fellowships for post-doctorate programs in their companies, universities, and research institutions. Nigerian government should promulgate laws mandating private sectors and institutions to earmark a certain

percentage of their annual budget for air quality assessment.

Lack of data
In air pollution assessment in Nigeria, there are not enough data available to assist in proper planning. Definitely, this will affect policies on air quality management. Like it was pointed out on the case of collaboration, no doubt data are always generated, but how much of these are shared within the stakeholders, students, and others. When there is no public awareness, whom do we go to for partnership. In air pollution assessment efforts should be geared towards networking and data sharing. Free article sharing should be adopted too within the Nation, Nigeria.

Trends in air quality assessment
Air quality assessment trend is kept with rapid development especially in the developed countries of the world. Major breakthroughs have been recorded in air quality management. In the time past, the bulk of the elemental measurements were based on AAS later, versatile instruments were introduced – like ICP-MS, XRF, PIXE, INAA, just to mention a few. Also, developments in methodologies (techniques) of sampling and analyses were introduced. All these made assessments easy, fast, and reliable. It is now possible to detect a large number of air pollutants in ever-decreasing concentrations (Nu´ñez-Alonso et al., 2019). For Nigeria to make a breakthrough in air quality assessment too new instrumentations and

methodologies should be a thing of concern.

Monitoring networks in China and India are expanding rapidly, many African countries (Nigeria inclusive), and South Asian countries except India do not have monitoring networks (McNeil, 2019). According, to Zimmerman (2018), networks of low-cost air-quality sensors to replace or complement the costly research-grade monitors are in the vogue. The sensors generally are not all that accurate, data science techniques for merging low-cost sensor data with remote sensing data, models, and data from ground-based monitors have indicated a high trend in air quality measurement. The use of low-cost sensors should be imbibed by Nigerian researchers because, it is useful where power is limited, and also it may provide observations with high spatial resolution. Another area where Nigerian researchers should improve upon is the area of Remote measurements from satellites. This can assist in the provision of data where there no ground-based ones.

Buckley and Mitchell (2010) noted the evaluation of past trends of pollution in industrialized nations is useful in indicating the recent air quality improvements and also in gaining knowledge of what could be the result in air pollutant controls in those developing nations currently experiencing high levels of pollution.

NESREA and other agencies saddled with the pollution monitoring in Nigeria should endeavor to review and revise, constantly, the air pollution standards based on the trends in air quality management and science. The agency should be vast with the recent revisions that are made to the ambient air standards for ozone, airborne particles, sulfur dioxide, nitrogen dioxide, and lead, resulting in greater health protection.

Conclusion

In Nigeria, it is not overemphasized if it is concluded that air pollution problem is above the control of individuals, and this demands the action and efforts of stakeholders at the national, regional, and local levels. No doubt, air pollutions are generated in agricultural, waste management, transport, urban planning, individual homes, energy and the like. All the stakeholders should make sure that the policies put in place are successfully implemented to the letter. For example, clean technologies that can reduce industrial smoke/emission (the use of biogas) should be in place and implemented. Lighting, cooking, and heating should be overseen through the use of affordable clean household energy. In the area of urban planning, concerted efforts should be geared towards making the cities green and compact. Vehicular emission should be clean by the use of clean and low-emission vehicles and fuels. Agricultural

and municipal wastes should be recycled, reused, and reprocessed.

Generally, if the remedies outlined in this paper and others are strictly followed, the challenges will be a thing of the past on air quality, Nigeria will compare well with the developed world.

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