

## 2. The nexus between indoor air pollution, electricity generation, waste management, and water supply in Nigeria

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### *Introduction*

Due to its regional influence and large population, Nigeria is a strategic country in Africa, the Commonwealth of Nations and the world. With a current population of more than 200 million people, which is expected to double by 2050, and an infrastructural growth that is not proportional to population growth (Omole & Ndambuki, 2014), Nigeria is on the precipice. The population's rapid growth has increased the demand for water and electricity (Omole & Ndambuki, 2014). It has also increased waste generation (Omole et al., 2016; Omole & Isiorho, 2011). Riding on the gap in providing needed public infrastructure, the citizens have had to cater to their infrastructural needs, albeit in unsustainable and environmentally unfriendly ways (Omole et al., 2016). Some of these practices have led to indoor air pollution and the attendant adverse effects on public health and the environment. In their literature review, Porta et al. (2009) summarised the associated health risks of living

within two to three kilometres of landfills and incinerators. They reported, with a high level of confidence, the incidences of soft-tissue sarcoma, lung cancer, low birth weight and Non-Hodgkin's lymphoma. They also noted, at moderate level of confidence, the incidences of other health problems such as neural tube defects, abdominal wall defects, and other forms of cancer. Johnke (n.d.) also estimates that 0.7 – 1.2 mg of CO<sub>2</sub> is released, besides other gaseous substances such as carbon monoxide, nitrogen oxides, and TOCs, for every milligram of waste incinerated. Therefore, this paper seeks to identify some of the less-discussed unwholesome practices that also trigger air pollution in the ambience of households. It also underscores possible remedies to these problems and investment opportunities that could be explored in solving the issues.

### *The Infrastructural Gap and the link to Indoor Air Pollution*

The provision of infrastructure has a direct impact on the quality and standard of living in every country. It is a significant cause of rural-urban migration (Omole & Ndambuki, 2015). Basic infrastructure includes the

provision of potable water, electricity and waste management services. In Nigeria, however, these three basic infrastructures are grossly inadequate.

### *Power and Water Supply*

It has been reported that the peak electricity supply from the national grid is just 5.4 GW (AE2I, 2019). The shortfall is bridged, mostly with the use of power generators in individual homes and businesses. It is estimated that there are 60 million power generators in Nigeria, and the combined power generated from these individual generators is 42 GW (AE2I, 2019). It is also estimated that these generators' purchase and fuelling cost \$14 billion annually (Fakoyejo, 2020). These generators are the lifelines for the citizens and their businesses. It is critical to their lifestyles. In effect, most Nigerians are responsible for generating their power supply, mostly through fossil fuel-powered generators. Ordinarily, a generator ought to be kept outdoors at a safe distance from the household and with appropriate ventilation because of the fumes they emit. Emissions from the generators include carbon monoxide, which is colourless, odourless and toxic.

However, some users keep these generators too close to their already poorly ventilated habitations (Fig. 1). Some keep these generators indoors during use to prevent them from getting stolen or having to go out of the house-stead late at night to turn them off. It is not uncommon to read about entire families dying indoors while they sleep due to these practices. It is estimated that about 1500 persons die annually from generator gas fumes (AE2I, 2019).

In their article, Omole & Ndambuki (2015) reported that only about 24% of the population is reached by public water supply. The others source for water through other means, including boreholes and groundwater sources. The pumps in these wells are powered using generators in most instances, thus further compounding the air pollution problems around such homes.



*Fig. 1: Power generator placed close to an occupied business enclosure  
(Photographer: Pius Utomi Ekpei/AFP via Getty Images)*

### *Waste Management*

Studies in different States of the country show that over 36 metric tons of solid wastes are generated annually, but the waste collection capacity ranges from 50 to 80% (Omole et al., 2016). Because the rate of generation of wastes surpasses the collection rate, the net wastes are disposed of by the citizens using different methods such as burial, open dumps and burning. For those who set fire to their wastes within the neighbourhood, the fumes often go on for days,

causing severe discomfort to neighbouring household inhabitants (Fig. 2-3). The impact of these fumes on public health is enormous. It can lead to chronic obstructive respiratory problems, cataract, diabetes, heart diseases, neurological disorders, and gestational problems such as pre-eclampsia (Manisalidis et al., 2020). Children below the age of five are mostly the victims.



*Fig. 2: Waste burning at Olusosun waste dump in Ojota, Lagos State (Credits: BernardKalu.com)*



*Fig. 3: Waste dump in Lagos City-centre, awaiting burning (source: Omole et al., 2016)*

### *On-Going and Recommended Solutions*

Judging by the fact that the Government is overwhelmed by the challenges confronting the nation, it is only rational to consider alternative solutions. In their article, Omole and Ndambuki (2014) strongly proposed the triologue model, which discussed the dynamics of relationship among society's stakeholders - the Government, the private investor or non-governmental organisations and the citizenry. It was showed the importance of private sector participators (PSP) in resolving societal problems. it also demonstrated the economic gains that could be tapped while solving these problems that cause environmental pollutions. The Government is cash strapped to provide these solutions; however, private sector investors can come in with their investments while the Government provides regulatory oversight and an enabling environment for the PSP to operate. A successful example of this model can be found in past Lagos State Governments' attempt to introduce PSP to the solid waste management chain (Jijoho-Ogun, 2011). Lagos has an average waste generation rate of 0.65kg/capita/day (Jijoho-Ogun, 2011). This results in 13,000 metric tonnes of solid wastes per day, going by the current population. The use of PSP in waste management in Lagos was very successful, going by the fact that the streets became cleaner, and there were general satisfaction and good feedback (Agboje et al., 2014). The PSP in waste management majored in waste collection and transport to designated landfills, recycling points, and incineration points, as the case may be. However, this model was not sustained as the succeeding Government (2015 and 2019) decided to

replace the numerous PSPs with a single company (Ihua-maduenyi, 2016). Of course, the single operator became overwhelmed, the system failed, and the State reverted to heaps and waste accumulation in the environment (Awodipe et al., 2019). The accumulated waste led to sustained air pollution from large heaps of burning wastes within the metropolis. This example thus underscores the responsibility of the Government in ensuring consistency in policy. Otherwise, investor confidence is eroded, and working solutions are lost.

In the energy sector, solar energy is gaining increasing attention in Nigeria (AE2I, 2019). Although the initial investment in solar energy solutions is high, and it may be beyond the reach of the average Nigerian, the PSP model in waste management could also be adopted as the way out. Private investors could be invited to create modular solutions for communities, housing estates, and industries. These investors will earn a return on their investments by selling energy in units to consumers. This will lead to less air pollution arising from fossil fuels used in electricity generators. It will also eliminate noise in the environment. However, strong regulations from Government are required in the PSP model. This is to control the exploitation tendencies of some investors. However, the Government itself also has the responsibility of maintaining an enabling environment through policy consistency, regardless of changes in administration.

Furthermore, the citizenry must also be carried along in the implementation of any proposed solution. User perception and acceptability must be gauged

before a solution is implemented. This is because a proposed solution can fail if user acceptability is not gauged before implementation. For instance, in a study conducted to gauge public willingness to pay for public piped water services, only 54% of the sampled population were willing to pay (Omole, Ndambuki, et al., 2016). About 40% believe that it should be free, and

it was found that some persons vandalised the water pipes to access illegally tap the water. This led to significant revenue losses for the water service company. Thus, it can be a considerable problem to embark on any solution without working along with the end-users, either by harvesting their input or re-orienting them through advocacy programs.

### Conclusion

There are substantial environmental, health, and economic gains to be had if the solutions to air pollution problems arising from open waste dump fires and generator fumes are implemented. Due to the limited funds available to the Government, it was

suggested that the input of PSP should be encouraged through the provision of consistent policy-making, fair regulations, and public advocacy. These three sectors of society need to play their respective roles to have workable solutions to indoor air pollution problems.

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