



Negative impacts of waste on human health and environment in Nigeria's urban areas: innovative solutions to the rescue

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Introduction

The problems of waste collection, disposal and environmental sanitation in Nigerian urban areas have occupied the attention of the federal, state and local government authorities for many years. Public concern on these issues continues to be expressed daily through the media, such as the newspapers, radio and television. Furthermore, the attention of national policy-makers is regularly called to health hazards and potential damage to natural resources (such as the air we breathe, the water we drink), from improper collection and disposal of waste.

Waste generation is an inevitable product of living. Wastes are produced from individual and family as well as from municipal, industrial, institutional and developmental activities. Technological advancement continues to lead to massive generation of wastes of all kinds. Sanitation (an aspect of waste management) is important to the extent of constituting part of Goal 6 of the Sustainable Development Goals. In Nigeria, an average citizen used to produce about 0.41 kg solid waste per head per day (Oluwande, 1974). In a later study by Sangodoyin and Osaigbovo (1992) an increased value of 1.66 kg solid waste per head per day was recorded. Many states and local governments devote meagre resources, both financial and human, to the possible solution of this intractable nationwide problem. Some states have established municipal authorities to handle urban solid waste problems, thereby seizing the constitutional responsibility of local government, which is, by law, charged with collecting and disposing solid waste in Nigeria. Despite concerted effort exerted over the decades on solving the problem of waste in Nigeria's urban areas, the conclusion that one will easily reach is that, no substantial improvement is evident as far as waste management in the country is concerned. This is because mountains of waste sometimes compete with human beings for space in some Nigerian cities and indeed their effects on the environment and health are obvious (Mokuolu et al., 2016a). Various kinds of waste have been implicated in environmental degradation and danger to human health (Mokuolu et al., 2016b). These include waste streams from massive congregations, leper colonies, hospitals, landfills, industrial and agricultural activities. The negative impacts also vary, from minor to major and indeed to lethal.

This article brings to the fore, the negative impacts of waste on human health and environment in Nigeria, and provides examples of innovation to address the menace.

Medical Waste

Nigeria has no specific environmental policy for managing hospital waste. The populace is adversely affected by ineffective management of healthcare waste, evident by littering of the environment with used sharps such as syringes, needles, scalpels, infusion sets, ampoules, surgical blades as well as plastics and empty prescription bottles (Sangodoyin & Coker, 2005). Healthcare facilities are over-subscribed and have therefore become substantial generators of waste (Coker & Sridhar, 2010). Furthermore, the composition of hospital waste is highly varied (Coker et al., 2009). Apart from refuse and sewage, hospital waste may also include radioactive waste, genotoxic wastes, chemical waste, expired pharmaceuticals, infectious waste such as cultures and stock of infectious agents, dialysis waste that has been in contact with patient blood, and anatomical and pathological waste including tissues that have been removed during surgery and autopsy. In consequence, these wastes pose a hazard to hospital patients and staff, as well as to the public. Visits to some waste disposal sites in Ibadan, Nigeria's largest city, reveal open dumping of hospital waste. To address this problem, our research group has devised a safe, simple, on-the-counter, needle disposal device that would effectively render needles unusable and allow them to be disposed of with medical grade waste. This technology, patented in Nigeria, would allow clinical staff and other healthcare workers to dispose of and destroy needles at the point of use and address the problem of needle stick injuries among hospital staff and the public (Akintunde et al., 2018). The device allows for the waste materials to be recycled. It is compact and affordable, therefore allowing for utilisation in low-resource settings.

The menace of improper solid waste disposal can be better appreciated by considering the study of Sangodoyin (1991) on the characteristics of refuse leachates and water sources adjacent to the Aperin-Oniyere refuse landfill site in Ibadan. The determined

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values of the pH, total alkalinity, total hardness, nitrate, chloride, magnesium, calcium, iron, silica, dissolved oxygen, biochemical oxygen demand and other physico-chemical and bacteriological parameters in most cases showed gross departure from those specified by the World Health Organization. The study suggested that the construction of houses close to the refuse site is ill-advised as there is the obvious possibility of short- and long-term damage to human health. Since it is difficult to evacuate residents from the established area, health education as it concerns simple water treatment processes has been recommended.

Industrial Waste

In Nigeria, industries, especially small and medium size enterprises, are springing up at a high rate. Their wastewater is a potential source of risk to human health and environment. If such wastewater is not adequately pre-treated and efficiently disposed, public health is compromised. In addition, untreated industrial waste released into water bodies, threatens the survival of aquatic organisms. The regulatory bodies charged with monitoring environmental pollution in Nigeria - the Federal Ministry of Environment and the National Environmental Standards and Regulations Enforcement Agency - have guidelines for industrial effluent discharge. But despite these, industry actors escape from being sanctioned on their unsanitary environmental practices and haphazard disposal of untreated spent water from their industrial operations.

Prospecting activities in the oil-rich Niger Delta Area of Nigeria have resulted in several environmental, health and social problems via alteration of land surfaces, destruction of fishing sites, and contamination of water and farmlands. This has led to restiveness and militancy in this part of the country. It reached a crescendo of misery in 1995 when there was an international outcry over the execution of nine members of the local community who were in the vanguard of the showdown with the oil processing companies (Saale & David, 2014). Other major sources of pollution from the industrial sector in Nigeria include chemical plants, coal-fired power plants and those producing plastics, metals, steel and automobiles. Nigeria has been reported by the World Health Organisation as having four of her cities (Onitsha, Kaduna, Aba and Umuahia) belonging to the rank of the fifty most polluted cities in the world (Parke, 2016).

The current methods being used to manage industrial waste, such as septic tanks, trickling filters and wetlands systems, are not adequate as they fail to provide complete treatment of industrial wastes which are usually far more toxic than household liquid wastes. The best global practice is to pre-treat industrial waste on site before releasing it into water bodies. Simple technologies such as algae photo bioreactors have the potential to pre-treat industrial waste, albeit at a relatively small scale

Waste-to-wealth and Waste-to-energy

Waste-to-wealth and waste-to-energy are integrated waste management strategies wherein every component of the waste is taken into consideration in waste management practice so as to minimize the negative impact on the ecosystem. For example, in a waste-to-wealth initiative, palm kernel waste which would otherwise have constituted a menace to the environment, was composted with the use of goat manure, while poultry droppings served as a nitrogen supplement for the process. This composting technology is a potential solution to the problem of managing palm kernel waste in the country (Kolade et al., 2006).

Urine harvesting is another example of a waste-to-wealth strategy. A system to harvest human urine was developed using materials which are locally available in Nigeria. The system was constructed to flow under gravity. The study confirmed that urine could be a good source of fertilizer and irrigation water and that indeed it compares favourably with other chemical fertilisers with regard food crop growth and yield (Sridhar et al., 2003).

Household composting of food waste also provides a means of harvesting waste. As an example, a simple household composting waste bin was constructed from a used drum (Coker, Sridhar & Akinyele, 2005). A cutting and stirring device was devised for the residuals within the waste bin. Household food waste could be collected in the bin for about 4 weeks. The resulting compost is useful for household gardening.

As part of research effort on waste-to energy, a household biogas digester for Nigerian communities was developed by our research group and has been patented in Nigeria (Sridhar et al., 2005). A simple device for storing the biogas was designed using a used truck tyre tube and a burner made from local materials was also produced.

Conclusion

Waste of all forms has contributed substantially to reducing the quality of human health and environment. This article has highlighted these negative impacts and has described innovations to address them; these innovations are home-grown, affordable and feasible. It is noteworthy that these wastes could constitute an asset, yielding wealth and also generating energy - an invaluable resource in Nigeria.

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