

Measurement of Radiation Level in Refuse Dumps Across Lagos Metropolis in Southwestern Part of Nigeria

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Abstract: The menace of waste dumps in most of our urban centres or cities cannot be over emphasized and its subsequent health hazards needs to be determined for public enlightenment. This motivated the present study in which the authors employed radiation detection method to examine the total intensity and interaction with matter on dumps sites in Lagos metropolis. The results of our investigation on the dumpsites showed that no dump site radiates up to one half of the United Nations Scientific Committee On Effect of Atomic Radiation of 70 $\mu\text{Sv/y}$. The mean annual absorbed dose rate of 21.8 $\mu\text{Sv/y}$ obtained in the study is minimal and that the effect on human health would be very low. Our recommendation is that these waste sites should be effectively managed and re-cycled to reduce the negative aesthetic appeal it has on the environment.

Key words: Waste dumps, lagos metropolis, hazards, radiation detection, annual absorbed dose, re-cycled

INTRODUCTION

The arbitrary and indiscriminate waste dumps in most of our urban centres cause environmental pollution of high magnitude which is of great concern to the society. It contaminates both air and water; hence aerobic respiration becomes difficult for living creatures and potable water becomes scarce for drinking.

The menace of waste dumps also affects the environment aesthetically and more importantly the populace is being subjected to serious health hazards. More so, there is unsustainable and wasteful utilization of resources which gives rise to dwindling wide life, more land degradation and increasing generation and indiscriminate disposal of commercial, industrial and domestic wastes (Phiri *et al.*, 2005).

Lagos as a commercial and industrial city popularly called "Centre of Excellence" in Nigeria encounters serious waste dumps on land and effluents discharges into ocean and Lagoon. Most of the waste dumps from the industries are subjects of contaminant of materials that are radioactive.

Some industries like paint industry, textile industry foot wear industry, tyre industry and related companies use various chemicals that contain traces of radioactive elements or materials. The recent research of Jibiri *et al.* (2007) has shown that staple food stuffs consumed in

Nigeria contain traces of radionuclide. The refuse dump sites are liable recipient of any such failure in containment of radioactive materials (Farari *et al.*, 2007).

However, it is important to develop and apply strategies to reduce or control the refuse dumps in the environment of Lagos metropolis. Thus measurements using radiation survey meter were carried out in major dumpsites in Lagos to examine the interaction of radiation with matter on dumps sites in Lagos State.

MATERIALS AND METHODS

Study area: The study was conducted in 20 locations around Lagos metropolis. Lagos State, which is the commercial nerve centre of Nigeria was created in 1967 and presently has a population of 9,013,534 as adopted by the recent head count in Nigeria (NPC, 2007). It has land mass area of 3577 km^2 and lies approximately between longitudes 2° 42' E and 3° 42' E and latitude 6° 22' N and 6° 52' N. The southern boundary of the state is formed by the 180 km long Atlantic coastline while its northern and eastern boundaries are bordered by the Republic of Benin. Figure 1 shows the map of Lagos metropolis and the locations where measurements were carried out.

Measurement technique: The use of a radiation survey meter to detect and measure the radiation absorbed dose

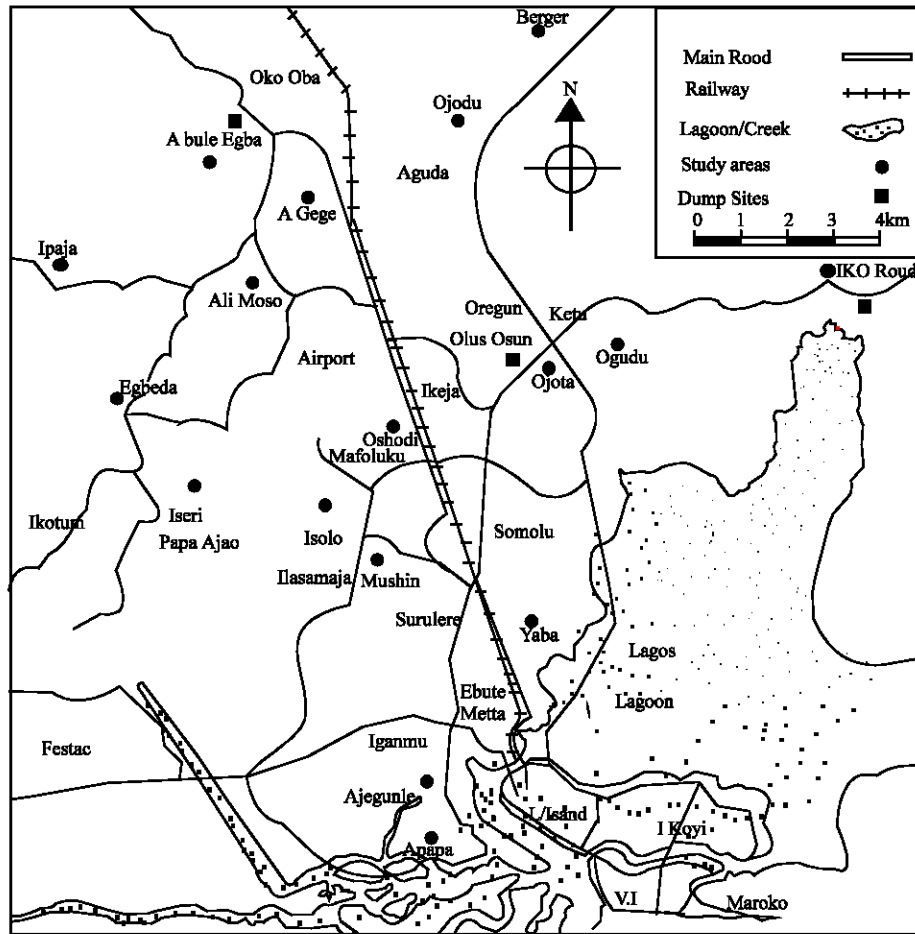


Fig. 1: Map of Metropolis Showing of the Dump sites

rate is a rapid method of assessing radiation intensity but will give only the total dose rate or exposure rate in a mixed field. So, a portable scintillation survey meter, Panoramic Victoreen, Model 470A, Serial number 4093, made in U. S. A. was used to examine and determine the mean source of radiation emission (spectrum) at the dumpsites. The meter uses a 3 v. battery and measures in either mrad/hr or $\mu\text{rad/hr}$ depending on the level of radiation. At each dumpsite, the meter was held at the gonad level i.e., about 1.0 m above the ground level, switched on and $\mu\text{rad/hr}$ unit was selected. Since, radioactivity measurement or process is statistical, 5 readings were taken on each dumpsite and the average of the readings was calculated.

The absorbed dose in $\mu\text{rad/hr}$ from the meter was converted to Gy/hr using the relation (James, 1995):

$$1 \text{ rad/hr} = 1 \times 10^{-2} \text{ Gy/hr}$$

However, the annual dose from each location was determined using

$$D = \delta \times u \times k \times 24 \times 365.25 \text{ S v/yr}$$

where, δ is the absorbed dose in G y/r, the outdoor occupancy factor $u = 0.2$ and the conversion factor to convert from Gy to Sv, $k = 0.7 \text{ Sv/Gy}$.

RESULTS AND DISCUSSION

The results of authors' measurements are as in Table 1. Related experimental work in the by Farari *et al.* (2007) using Gamma spectroscopy assay of soil samples from waste dumpsites in Port-Harcourt in the South-South geopolitical zone of Nigeria, a biological dose rate of $24.6 \mu\text{Sv/y}$ was obtained. In Obed *et al.* (2005) an average of $24.5 \mu\text{Sv/y}$ was reported, while a regional average of $34.6 \mu\text{sv/yr}$ was obtained in *in-situ* gama spectroscopic measurement for the communities of the Niger-Delta area of Nigeria.

Table 1 also shows the total annual absorbed dose rate in mixed field of each dumpsite in Lagos metropolis.

Table 1: Measurement at the 20 dumpsites identified in lagos metropolis

Site location	dose rate) ($\mu\text{rad/h}$)	dose rate) (ngy/h)	annual dose rate ($\mu\text{sv/y}$)
Ikorodu	1.80	18.0	22.09
Berger	1.30	13.0	15.95
Ojodu	1.20	12.0	14.73
Ojota (A)	1.90	1.90	23.18
Ojota (B)	1.70	17.0	20.86
Ikeja	2.40	24.0	29.45
Mushin	1.90	19.0	23.18
Charity	1.40	14.0	17.18
Oshodi (A)	2.50	2.50	30.68
Oshodi (B)	1.50	15.0	18.41
Ipaja (A)	1.20	12.0	14.73
Ipaja (B)	2.20	22.0	27.00
Alimoso	1.70	1.70	20.86
Egbeda	17.0	17.0	20.86
Agege	1.20	12.0	14.73
Isolo	2.10	21.0	25.77
Iseri	2.30	23.0	28.23
Abule Egba	17.0	1.70	20.86
Apapa	1.50	15.0	18.41
Yaba	2.30	23.0	28.23

The absorbed dose rate from the dumpsites ranges from 14.7 $\mu\text{Sv/y}$ to 30.70 $\mu\text{Sv/y}$ and the mean annual absorbed dose rate was obtained as 21.8 $\mu\text{Sv/y}$.

The absorbed dose rate values reported by Farari *et al.* (2007) were higher than the mean value obtained from the dumpsites in Lagos metropolis. This must be as a result of the indiscriminate dumping of radioactive materials by the oil companies or 98 \pm 15 $\mu\text{Sv/y}$ industries while the world average is 70 $\mu\text{Sv/y}$ (UNSCEAR, 2002). These values are far greater than the value obtained from the dumpsites in Lagos metropolis.

CONCLUSION AND RECOMMENDATIONS

Although, no matter how small radiation exposure or dose may be, it has effect on human beings. The result in this research work shows that the radiation exposure in the Lagos metropolis is still minimal and hence there should be no fear of any hazard from radiation exposure or dose emanating from the dumpsite in the metropolis. In effect, the waste from the refuse dumpsite could be recycled for a purposeful use so as to improve aesthetically the environment of a waste site.

It is recommended that a 3-4 year programme is targeted to giving Lagos Metropolis a face-lift by the Ministry of Environment which involves the elimination of all forms of environmental nuisances and aberration in specific local government councils without neglecting other areas.

ACKNOWLEDGMENT

The authors are grateful to the University Senate Research Committee for their financial support for this study most especially to Professor E. K. Adesogan through Professor Tunde Ogusnsanwo, the Dean, Faculty of Science Olabisi Onabanjo University, Ago-Iwoye, ogun state, Nigeria.

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