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RESEARCH ARTICLE

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Urban air pollution from the open burning of municipal solid waste

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Abstract

This study estimates the contribution from the open burning of municipal wastes in some of Nigeria's major cities to atmospheric levels of air pollutants. Information obtained on open burning emission factors and municipal solid waste (MSW) generation estimates was combined to estimate annual levels of the pollutants from the open burning of MSW. Per capita distributions of pollutants were calculated on the basis of cities' populations. The estimates of inorganic emissions across the cities studied were from 913.73 to 81,600 tons per year (TPY) of particulate matter; 4,797 to 428,400 TPY of oxides of nitrogen; 342.65 to 30,600; and 57 to 5,100 TPY of sulfur dioxide, while the estimates for methane ranged from 742 to 66,300 TPY and for other nonmethane organic compounds ranged from 1,713 to 153,000 TPY. Given the composition of MSW in these cities, the nonmethane organic compounds are likely to be composed of polycyclic aromatic hydrocarbons and volatile organic compounds. Given the wide varieties of both inorganic and organic air pollutants released during the open burning of MSW and the associated human health and environmental impacts, it is high time that stakeholders at all levels of government came up with policies and regulatory measures for the management of MSW in the country.

KEYWORDS

emission factors, inorganic pollutants, per capita distribution, polycyclic aromatic hydrocarbons, volatile organic compounds

1 | INTRODUCTION

The rapid increase in population in Nigeria has brought about a tremendous increase in municipal solid waste (MSW) generation in the country, the management of which has become a Herculean task. According to the National Population Census (NPC) of Nigeria, the population of the country has witnessed tremendous growth from a little above 100 million people in 1991 to about 140 million people in 2006 (NPC, 2006). At an annual growth rate of 2.5%, the population of the country at the moment is often put at about 175 million people, although the 2006 figure is still used officially, as no other population census has been conducted since then.

MSW management has emerged as one of the greatest challenges facing the state environmental protection agencies in Nigeria. The volume of solid waste being generated continues to increase at a faster rate than the ability of the agencies to improve on the financial and technical resources needed to parallel this growth. This phenomenal increase in the volume of MSW generated on a daily basis calls for proper handling in order to protect the populace and environment. Information on the annual amount of MSW generation in some of Nigeria's cities is summarized in the table in **Exhibit 1**. Solid waste management in Nigeria is presently characterized by improper disposal of the wastes.

However, as a result of the serious and daunting challenge posed by the large amounts of MSW in most cities, especially where the populations are large, both the people and government entities have settled for a quick, and supposedly cheap, way out—open burning. Open burning is described as the unenclosed combustion of materials in an ambient environment (Persson & Simonson, 1998) and includes the burning of material in drums, skips (containers), fields, or large open spaces (U.S. Environmental Protection Agency [EPA], 1995).

Although open burning as a means of disposing of MSW has been phased out in many developed nations, it is still the practice in the majority of Nigerian cities, where it is frequently considered the

