

Estimated Annual Discharge Rates of Heavy Metals from Industrial Sources around Lagos; a West African Coastal Metropolis

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Abstract

A survey to determine the physico-chemical characteristics and heavy metal content of industrial effluents collected from different categories of industries around the Lagos metropolis, Nigeria, was carried out over a 12-month period. The annual discharge rates of the identified heavy metal species were estimated using results of the chemical measurements and other relevant information. The most prominent heavy metals occurring at the first four highest concentrations in the sampled effluents were Fe (1.82–4.4 mg l⁻¹), Mn (0.099–0.295 mg l⁻¹), Cu (0.011–0.27 mg l⁻¹) and Co (0.156–0.49 mg l⁻¹). Mercury, occurring at 0.004 mg l⁻¹, was only detected in effluents of the chemical and allied category of industries. Using appropriate relationships and information, and taking all investigated categories of industries into account, a total of 161,717.9 kg of Fe was discharged into the environment around metropolitan Lagos, followed by Cu (22,341.4 kg), Mn (20,589.6 kg), Co (15,682.6 kg), Cr (5,285.1 kg), Pb (2,258.6 kg), Zn (702.2 kg), Ni (613.7 kg), Cd (537.8 kg) and Hg (277.8 kg) in descending order of total discharge per annum. The importance of such data in environmental management is discussed while stressing the need to combine such information with results from bio-monitoring studies to avoid misleading conclusions.

Introduction

Industrialization remains an extant need to meet the increasing demands of the world's teeming millions for more food, energy, goods and services. However, pollution inevitably arises therefrom. Although the economic benefits of industrialization are incontestable, there is the need to make industrialization compatible with a reasonably healthy environment in which contaminant levels are minimized. Consequently, there has been a number of studies aimed at understanding relevant characteristics of the environment and man-made inputs as benchmarks for judicious management (Flos *et al.*, 1987; Clements *et al.*, 1990; Ayodele *et al.*, 1991; Chen *et al.*, 1991; Bryan &

Langston, 1992; Ortego & Benson, 1992).

The focus of most of these studies is usually the determination of ambient concentrations of critical contaminants and pollutants and, sometimes, aspects of their biological effects but in most cases without attempts at quantifications of the magnitude and rate of mobilization. Yet, for proper environmental management, it is also useful to know the rate of discharge of these contaminants or pollutants into the environment.

In this regard, studies such as the one reported in this work should provide useful information on rates of mobilization of heavy metals into the environment and also serve as useful inputs into the global quantitative inventory of land-based sources of pollution