The Analysis of Heavy Metal Concentration per Distance and Depth around the Vicinity of Open Landfill

¹Zaini Sakawi, ²Mohd RozaimiAriffin, ³S.A. Sharifah Mastura and ²Mohd Fuad Mat Jali ¹Earth Observation Centre, Faculty of Social Sciences and Humanities, UKM ²Department of Social, Development and Environmental Studies, FSSK, UKM ³Institute of Climate Change, University Kebangsaan, Malaysia

Abstract: Heavy metal is a source of environmental pollutant affecting the aquatic and terrestrial ecosystems. The sources of heavy metal pollution are the industries, domestic sewage and landfills. Landfill operation is a source of heavy metal pollution which not only affected the biospehere, hydrospehere and athmosphere, but also the litosphere systems around it. This study aims to analyse the heavy metals concentration around the landifill vicinity for indication of heavy metal pollution. This study analysed the soil content of the heavy metal based on the distance and depth around the vicinity of the landfill. Field sampling of the soil and laboratory analysis were used. The field study involved 20 stations and 60 samples according to the wind directions: North, East, South and West. The analysis was conducted through the use of Inductively Coupled Plasma Mass Spectroscopy (ICP-MS). Seven types of heavy metals were identified as indicators for pollution namely Mg, Ca, Mn, Fe, Cu, Zn and Pb. The results indicated that the concentration of Fe was the most dominant per specific distances and depths and exceeded the DOE minimum standard (301 mg/L) in North, East and West directions. While Cu was the second most dominant, with concentration exceeding minimum DOE standard (19.8 mg/L) per specific distance and depth, mainly in the West direction.

Keywords: Heavy metals, land contaminated, land contaminated guidelines, open landfill site, waste management

INTRODUCTION

Heavy metal pollution is a component of environmental pollutant closely related to human activities. Studies on the pollution have been conducted by various researchers of various fields such as chemistry, biology, geography, engineering and environment. Among studies on the heavy metal pollution were those conducted by Kendrick *et al.* (1992), Costa (2000), Baker *et al.* (1994), Chen *et al.* (2004), Callender (2004), Brad and Xenidis (2005), Ward *et al.* (2005), Albina *et al.* (2008), Rodriguez *et al.* (2009), Machado *et al.* (2002) and Long *et al.* (2011).

Other than general studies on heavy metal, heavy metal pollution studies also covered various sources of ecosystem such as the aquatic ecosystem (Denton *et al.*, 2007; Elmaci *et al.*, 2007; Sabihin *et al.*, 2008a; Bronius and Vaida, 2009; Shuhaimi-Othman and BarzaniGasim, 2005; Abderahman and Abu-Rukah, 2006; Buccolieri *et al.*, 2006; Udomporn *et al.*, 2008; Kar *et al.*, 2008) and terrestial ecosystem (Prabpai *et al.*, 2009; Sabihin *et al.*, 2008a; Urase *et al.*, 1997).

Studies on heavy metal pollution also combined analysis of specific metal concentration and aspects on

management of the sources of pollution. Examples are studies on relationship between heavy metal pollution and its management by Mico *et al.* (2007), Sahibin *et al.* (2008b) and Natrah *et al.* (2009). Specific study on factors influencing distribution, management and control of heavy metal pollution was conducted by Hsu *et al.* (2005).

There is still a dearth of studies on heavy metal pollution in Malaysia, particularly those related to soil pollution and its management. Among a few studies conducted on soil pollution around the dumpsite were by Jain *et al.* (2005), Erses *et al.* (2005), Oluyem *et al.* (2008), Kasassi *et al.* (2008), Zaini *et al.* (2009), Esmail *et al.* (2009), Zaini *et al.* (2010), Akoteyun *et al.* (2011), Chaari *et al.* (2011), Zaini *et al.* (2011) and MohdRozaimi (2012).

It was only recently that any guideline for management and control of soil pollution in Malaysia was made available. The Contaminated Land Management and Control Guidelines 2002 was gazetted only in 2009, fifty two years after independence. The guidelines were of three series, namely Malaysian Recommended Sites Screening Levels for Contaminated Land, Assessing and Reporting Contaminated Sites dan Remediation of Contaminated Sites (DOE, 2009a, b and c).

Corresponding Author: Zaini Sakawi, Earth Observation Centre, Faculty of Social Sciences and Humanities, UKM, Tel.: 603-89213623