Leachate and Surface Water Characterization and Heavy Metal Health Risk on Cockles in Kuala Selangor

Ahmad Razali Ishak[a,b*], Sharifah Mohamad[b], Tey Kheng Soo[b], Fauziah Shahul Hamid[b]

aDepartment of Environmental Health, Faculty of Health Sciences, UiTM Puncak Alam, 42300 Kuala Selangor, Malaysia
bChemistry Department, Faculty of Sciences, Universiti Malaya, 50603 Kuala Lumpur, Malaysia

Abstract

Characterization of physicochemical parameters including concentration of heavy metals in landfill leachate, surface water and cockles (*Anadara granosa*) were analyzed in Kuala Selangor, Malaysia. The effects of location and seasonal variation of surface water and cockles were determined. In addition, the target hazard quotients (THQ) were calculated to determine the potential health risk. Heavy metals concentrations were analyzed by ICP-MS and the result were compared with the national permissible limit. There was a little variation in heavy metal concentration between location and season for surface water and cockles samples. THQ value was found lower for all heavy metal and shows no potential risk.

*Keywords:*Leachate; surface water; *Anadara granosa*; health risk

* Corresponding author. Tel.: +0-000-000-0000 ; fax: +0-000-000-0000 .
  E-mail address: arazali2012@gmail.com

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Peer-review under responsibility of AMER (Association of Malaysian Environment-Behaviour Researchers) and cE-Bs (Centre for Environment- Behaviour Studies, Faculty of Architecture, Planning & Surveying, Universiti Teknologi MARA, Malaysia.
doi:10.1016/j.sbspro.2016.05.156

1. Introduction

The world is facing the largest trend of urban growth in history. More than 50% of the world's population nowadays are living in the cities, and the number will keep expanding to almost 5 billion by the year of 2030 (United Nations Population Fund, 2011). In economic point of view, creating more cities will generate more job opportunities and eventually higher economy level will follow. Therefore, this phenomenon challenges governance and authority in providing infrastructure, transportation system, food and ultimately the management of solid waste. Evaluation of the urban system such as by using economic input output analysis could observe those resulting impacts because the resulting impact of a city system are not always immediate and direct (Shafie et al, 2013). Urban society tends to produce the high volume of solid waste from a variety of sources including from domestic, commercial and institutional wastes. Urbanization process directly contributes to waste generation and unscientific waste handling causes health hazards and urban environment degradation (Dimpal, 2012).

Heavy metals have been suggested to disturb biochemical mechanisms and prone to bio accumulate in the ecosystem (Fairus et al., 2011). Food consumption has been identified as the major pathway of human exposure, accounting for more than 90% of the exposure compared to other ways of exposure such as inhalation and dermal contact (Loutfy et al., 2006). A number of studies have shown the tendency of heavy metals in water and food to accumulate in human body either by ingestion or via dermal contact absorption (Alkarkhi et al.; 2008, Luis et al.; 2013, Etelvina et al.; 2011, Khan et al., 2008).

The working concept of this study was to characterize physicochemical parameters in raw leachate from Jeram Sanitary Landfill (JSL), surface water in the upstream and downstream of Sungai Sembilang and the level of heavy metal in the cockles collected from Jeram beach. The potential health risk was also calculated to determine whether any likelihood of cockle consumption to the surrounding population was present.

2. Methodology

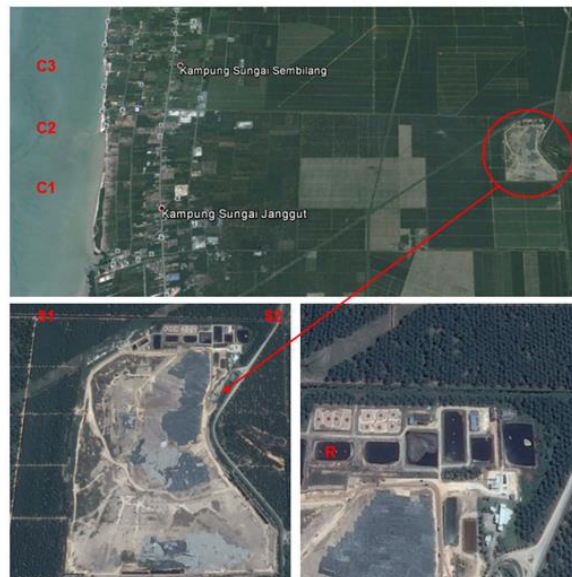### 2.1. Sampling location

Fig.1. The details of sampling point

Jeram landfill is one of the sanitary landfills in Malaysia. It is located in Kuala Selangor District and was opened in January 2007 with estimated disposal capacity of 8.5 million tonnes. This landfill has replaced Air Hitam Sanitary landfill that was closed in December 2006. It is equipped with leachate treatment facility including Sequential Batch