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SUSTAINABLE ENVIRONMENT MANAGEMENT PRACTICES IN LANDFILL SITES AND THE POTENTIAL SIGNIFICANT IMPACTS

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ABSTRACT

Sustainable solid waste management is a major issue in Malaysia due to poor environmental management of landfills due to lack of enforcement and poor sustainable management and practices that created untenable situation. Based on the findings, seven parameters of leachate in EIA Landfill were non-compliance to the standards; pH (3.75±0.45), suspended solids (102.80±10.43), cadmium (0.08±0.01), lead (1.11±0.11), manganese (0.25±0.08), chromium hexavalent (0.07±0.02) and phenols (0.01±0.04). Non-EIA Landfill showed highest number of incompliances with parameters such as pH (11.18±0.84), suspended solids (187.4±10.97), COD (682.2±65.01), cadmium (0.72±0.067), lead (1.58±0.42), manganese (0.88±0.27), arsenic (0.08±0.07), zinc (2.91±0.07), iron (5.37±1.00), chromium hexavalent (0.26±0.07), cyanide (0.32±0.07), phenols (0.07±0.05) and formaldehyde (1.04±0.013) were found contravened to the standards. In river analysis, EIA River, there were four parameters that not comply to the standard were BOD_5 (22.20±1.30), suspended solids (79.8±9.68), iron (Fe) (1.58±0.23) and chromium hexavalent (0.11±0.01) while Non-EIA river showed seven parameters were not comply to the standards which were pH (9.20±1.90), COD (213.00±3.67), cadmium (0.030±0.01), arsenic (0.166±0.02), zinc (2.540±0.17), chromium hexavalent (0.68±0.01) and cyanide (0.68±0.01). In toxicity testing, it showed the mean 96-h LC_{50} of EIA landfill and Non-EIA landfill was found to be 13.01% and 8.19% respectively while the mean for EIA river and Non-EIA river in acute toxicity testing were estimated to be 333.50% and 368.43% respectively. The respondents at Semeling site showed the symptom like headache and shortness of breath due to a landfill exposure (odour) while in Tanjung Dua Belas landfill, there was no major issue raised by the respondents. Based on descriptive and statistical analysis, it showed that Tanjung Dụa Belas Landfill has been performing above average in terms of practising sustainable environment management while Semeling Landfill has been underperforming at the time of the study. It can be concluded that management of both landfill fails to practice in optimum phase of sustainable landfill management practices and prove to be problematic to the environment and human health. Thus, a proactive or leading indicator such as the environmental impact assessment (EIA) and environmental management system (EMS14001) should be introduced to the landfill sites to reduce the impact to environment and human health and to optimize the landfills management which is a realistic approach to improve the management of the landfills towards sustainable development.

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1.1 INTRODUCTION

Generation of solid waste cannot be ignored as long as human life continually exists on earth. Anthropogenic activities covered the totality of derived benefits from the raw materials and left behind the unwanted materials and associated complexities to the environment and human health (Maria, Pervaiza, Afzala, Hamida, & Yasmin, 2013).

Solid waste can be easily defined as useless or unwanted materials which are derived from industrial and manufacturing process and human population activities (Hakami, Sedek, & Abu, 2015). This complexity is interrelated to the factors of increasing earth population, improving living standards, and rapid economic development to the country.

The Earth's population is expected to reach seven billion soon and it was indicated that the population will be close to 8.5 billion by 2030, 9.7 billion in 2050 and 11.2 billion in 2100 (UNDESA, 2015). The increased population combined with rapid economic development leads to increased amount of solid waste generation at alarming rate in all countries. The increased in solid waste generation was expected to burden the local governments who is responsible to sustain the management of waste from collection to disposal (landfill) services.

Governments around the world is expected to conform to the "cradle to grave" principle and ensure that the "polluter pay principle" is complied with. In developed countries like United Kingdom the practice of 'life cycle assessment" is incorporated into sustainable waste management by including design, built, operate and decommission concepts (Pires, Graca, & Chang, 2011).

In developing countries, these services fell short from the desired level, as the waste management systems being adopted are out-dated and inefficient. Despite having poor waste management, extremely low priority has been given by developing countries to the area of waste handling and disposal resulting due to budget limitations and weak