

Soil Erosion and Sediment Yield of a Sanitary Landfill Site – A Case Study

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Abstract - This research presents the results of a study on soil erosion rates and sediment yields of a proposed Level 4 Sanitary Landfill construction site located in Sibul, Sarawak. Assessments on potential soil erosion rates and sediment yields during pre-construction, construction and operation stages were carried out using the Revised Universal Soil Loss Equation (RUSLE) and Modified Universal Soil Loss Equation (MUSLE), respectively. It was found that soil erosion rates during construction and operation stages fell under “Moderately High” category, whereby highest sediment yield occurred during construction and operation stages. Comparative analysis on with and without Best Management Practices (BMPs) during construction stage demonstrated that BMPs could significantly reduce the rate of soil erosion, and thus sediment yields.

Keywords: Soil erosion rate, sediment yield, construction, RUSLE, MUSLE, BMPs

1. INTRODUCTION

In Malaysia, there has been an increasing concern over soil erosion due to deforestation, land conversion for highway, logging activities, industrial or urbanization purposes [1]. Runoff erosivity has been the most significant erosion factor due to high mean of annual rainfall, storm frequency and density [2]. The objectives of this research are to estimate and compare soil erosion rates and sediment yields during pre-construction, construction, and operation stages of a sanitary landfill at Sibul, Sarawak.

The proposed Level 4 Sanitary Landfill is located approximately 26 km from Sibul Town centre (Figure 1). It is a Level 4 Sanitary Landfill located at Jalan Kemuyang, Sibul, Sarawak. Comprehensive assessments on the rates of erosion and sediment yields were carried out during pre-construction, construction and post-construction stages. The topography of the region comprises of generally rolling and flat lands, well-drained by tributaries of Sg. Lukut running along the northeast boundary of the proposed landfill site (Figure 1). There are relatively lower spots at the north part of the landfill site, mainly swampy land. The landfill area is predominantly underlain by Tertiary Eocene sediments; namely Pelagus Formation and a small portion by Pleistocene-Holocene sediments.

The two main streams draining the site catchment are Sungai Lukut and Sungai Pasai, whereby Sungai Lukut is the tributary of Sungai Pasai. The annual rainfall pattern varies from year-to-year with distinct dry and wet seasons, which shows the characteristic influence of the monsoon seasons. The region experiences rather heavy rainfall during the peak of the Northeast monsoon, receiving more than 400 mm in December and 500 mm in January. The total annual rainfall is relatively high that varies between 110.2 mm during the El Nino years to above 4,500 mm during the wet years.

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