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## Slope stability of landfill with waste degradation (Article) (Open Access)

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## Abstract

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Nowadays, a large amount of municipal solid waste (MSW) is generated due to the rapid urbanisation in developing countries leads to the demand for larger and higher capacity landfills. Bioreactor landfill technology has been introduced to accelerate the stability of landfill and to solve the issue of limited landfill area. However, the accelerated degradation of the refuse in bioreactor landfills also considerably changes the geotechnical characteristics of the waste in the landfill and thereby increases the concern for waste stability. Hence, this study aims to analyse the stability of both conventional and bioreactor landfill slope with the effects of waste degradation. Finite element method has been used in the slope stability analysis and the stability is presented by the factor of safety. The objectives of this study are i) to determine and assess the main parameter which influences the stability of the waste slope, ii) to determine the effects of waste degradation to the waste properties and iii) to obtain the factor of safety of the landfill slope using numerical analysis by finite element method. From the literature review, it is found that slope stability of a landfill mainly depends on the geotechnical properties of waste, such as moisture content, unit weight, shear strength parameters and hydraulic conductivity of waste. After the degradation process, engineering properties of field refuse are affected which includes the increased pore-water pressure and unit weight, decreased strength and lower hydraulic conductivity. Based on the analysis of conventional landfill slope stability by using Plaxis software, slope ratio of 1:3, 1:4 and 1:5 calculated safe with 1.69, 2.3 and 2.8 whereas the analysis of bioreactor landfill slope stability calculated safe only for slope ratio of 1:4 and 1:5 with 1.60 and 1.97. Moreover, the factor of safety for steeper slopes is lower and vice versa. From the parametric analysis, it is found that the full height of slope and unit weight of waste input affect the result analysis. This study is significant to evaluate the landfill slope stability with the effects of waste degradation and to ensure both conventional and bioreactor landfill slope stability for long periods. © BEIESP.

## SciVal Topic Prominence

Topic: Municipal solid waste | Landfill | Bioreactor landfills

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Norinah Abd Rahman received the B.Eng. degree in civil engineering from Universiti Kebangsaan Malaysia (UKM), in 2007, and the M.Eng. and Ph.D. degrees in civil engineering from the Chung Ang University (CAU), Seoul, South Korea, in 2011 and 2015, respectively. In 2007, she joined the Department of Civil and Structural Engineering, UKM, where she was a tutor, became a lecturer in 2011, and a senior lecturer in 2016. Her current research interests include non-destructive testing by stress wave primarily for civil engineering materials characterization such as soil, pavement and concrete, in-situ and laboratory geotechnical testing, finite element modelling and artificial neural network. She received research grant from the industry to improve the current practice and analysis of spectral-analysis-of-surface wave (SASW) test. Dr Norinah is a member of Board of Engineers Malaysia (BEM) and Institutional of Engineers Malaysia (IEM). She was the recipient of Chung-Ang University Young Scien... View all

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