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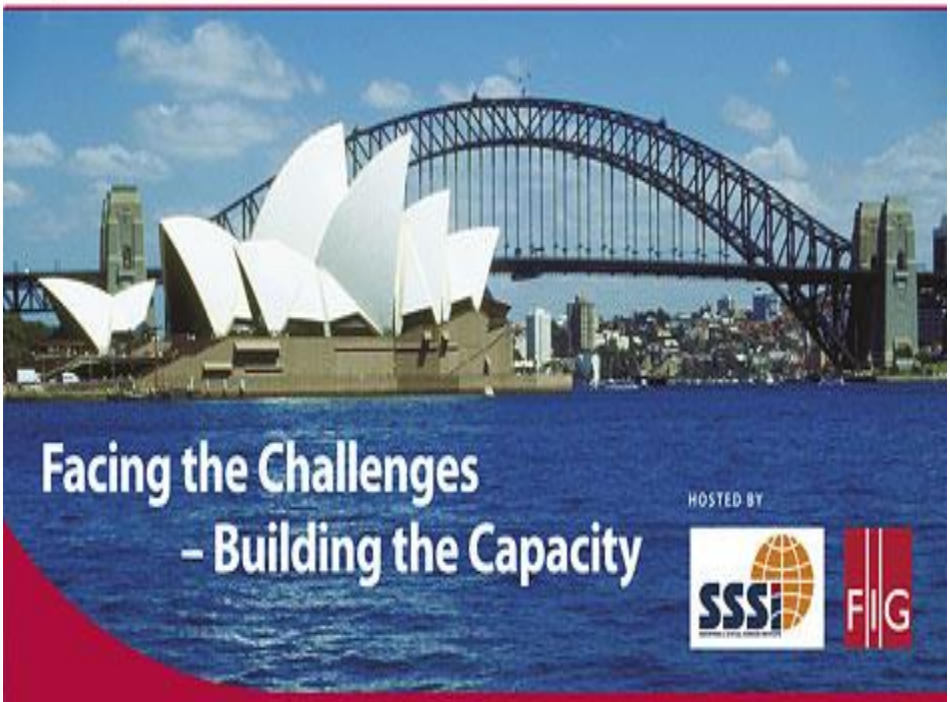

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The Erosion Model Based on Grainsize Distribution Ratios of Weathering Product of Quaternary Volcanic Deposits (4218)

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Key words: erosion model, soil erodibility, Quaternary volcanic deposits

SUMMARY

This summary on the paper on erosion model based on grainsize distribution ratios of weathering product of Quaternary volcanic deposits in Bandung Basin, West Java, is the latest development in these issues in Indonesia. USLE formula known as formula for annual erosion prediction is no longer accurate, which needs a modification, in term of involvement of soil variables determining erosion for the validation of the formula before being used for the prediction of annual erosion in the area of distribution of weathered Quaternary volcanic deposits. This modification of USLE was conducted during a research in southern Bandung Basin using deterministic and probabilistic approaches.

Based on the ratio between silt to clay content of soil mass, the validation of the erosion formula mentioned above generated the modification of USLE for both silt soils (symbolized MH) E_{MH} = 0.77 RKLSCP and clay soils (CH) E_{CH} = 0.51 RKLSCP respectively. These new formulas, possessing the errors about 6%, represent the grainsize distribution proportion and also cohesion of soil mass which explain the characteristic of its erodibility. Large erodibility of silt soil is also indicated by large correlation coefficient between silt content and coefficient of erosion r = 0.93.

RINGKASAN (Summary in Indonesian)

Ikhtisar model erosi yang didasarkan atas perbandingan distribusi besar butir dari pelapukan endapan volkanik Kuarter di Cekungan Bandung, Jawa Barat, adalah pengembangan mutakhir tentang isu ini di Indonesia. USLE sebagai formula untuk prediksi erosi tahunan sudah tidak teliti sehingga memerlukan modifikasi sebelum digunakan untuk prediksi erosi tahunan di wilayah penyebaran hasil pelapukan endapan volkanik Kuarter. Validasi rumus melibatkan variabel-variabel tanah yang menentukan erosi. Penelitian ini dilakukan di Cekungan Bandung bagian selatan menggunakan pendekatan deterministik dan probabilistik.

Berdasarkan perbandingan kandungan lanau dan lempung, validasi menghasilkan modifikasi USLE untuk tanah lanau (MH) E_{MH} = 0,77 RKLSCP dan lempung (CH) E_{CH} = 0,51 RKLSCP. Formula baru ini dengan sesatan sekitar 6% mewakili proporsi distribusi ukuran butir dan kohesi massa tanah yang menjelaskan karakteritik erosinya. Eroribilitas tanah lanau juga ditunjukkan oleh koefisien korelasi yang tinggi antara kandungan lanau dan koefisien erosi r = 0,93.

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ABSTRACT

The erosion problem is an important subject of interest to be studied. Natural disasters occur in many places due to erosion. Flood, landslide, and dam silting are hazardous which may become natural disaster because of uncontrollable erosion in highlands. USLE is a formula for annual erosion prediction, especially used for sheet erosion cases. In many cases this formula is no longer correct that needs to be calibrated before being used for estimating the erosion in many areas of distribution of different type of soils. This paper discusses the result of research conducted in the drainage basins on Quaternary volcanic deposits in Bandung Basin, West Java, Indonesia. This modification of the USLE was conducted using deterministic and probabilistic approaches.

As the result of this research, it is known that erosion modeling depends on the characteristic of the soil it self. This gives us a guideline that USLE can't be implemented for every kind of soil of different characteristic. Total erosion can't be generalized for every type of soil. Soil erodibility is determined by silt ratio than clay ratio; the larger the silt ratio the larger the soil erodibility. This phenomenon is also indicated by either the correlation coefficient r between coefficient of erosion and silt ratio or clay ratio. Silts exhibits r is 0.92, whereas clay shows 0.44, which means that silts produces larger total erosion than clays in the area of same geomorphology. Based on the silt and clay ratios, the validation of the erosion formula mentioned earlier generated the modification of USLE for both silt soils E_{MH} = 0.77 RKLSCP and clay soils E_{CH} = 0.51 RKLSCP respectively. These formulas, possessing the errors about 6%, represent the grainsize distribution proportion and also cohesion of soil mass which explain the characteristic of its erodibility. Large erodibility of silt soil is also indicated by large correlation coefficient between silt content and coefficient of erosion r = 0.93.

The modified USLE generated through this research enables us to assume total erosion accurately in areas of distribution of weathered Quaternary volcanic deposits. It is very important for the support of land management, erosion hazard mapping related to spatial planning, and mitigation strategy.

1. INTRODUCTION

The intensity of erosion is a function of rainfall erosivity, soil erodibility, morphology, and land use. These variables determining the erosion formula formulated as Universal Soil Loss Equation or known as USLE (Wischmeier & Smith, 1978 in El-Swaify *et al*., 1982). USLE already been used widely as model of erosion prediction. Currently, the USLE applications