Hydrol. Earth Syst. Sci. Discuss., 10, C2977–C2981, 2013
www.hydrol-earth-syst-sci-discuss.net/10/C2977/2013/

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Integration of remote sensing, RUSLE and GIS to model potential soil loss and sediment yield (SY)" *by* H. Kamaludin et al.

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Received and published: 3 July 2013

General Comments Generally this paper is very simple, straight-forward and easy to follow where an established method is applied in a watershed. However, the main issue is no validation on the RUSLE model had been undertaken. The paper is publishable only with validation.

Answer: In this study, RUSLE model was calculated using 2 approaches. The first approach is calculation of potential soil loss using ArcGIS and ERDAS and secondly, calculation of measured soil loss using field data for verification. For the feedback

for these comments, the data verification of each sub-catchment for the validation of potential soil loss and sediment yield will be added in the manuscript.

The field sampling and measurement were done for LS, K, C and P factor. For LS factor, the length and the steepness of slope at the field were measured and the data obtained were calculated using the formula of Wischmeir et al., (1975). Soil samples analysed to generated K factor was also done using the formula of Wischmeir et al., (1975). For C and P factor, the field measurement was done by observation at the study area such as land use type, crop practice and percentage of land cover. The R factor for the annually rainfall was obtained from the Meteorological Department of Malaysia and was calculated using the formula by Morgan et al., (1975).

Determination of sedimentation also used 2 approaches, potential sediment yield using GIS and measured sediment yield using field measurement. The field measurements to determined sedimentation were the length, wide and depth of the river and velocity of the river flow. Total suspended solid (TSS) was obtained by using gravimetric method.

Specific comments

Introduction: Introduction section should also discussed on the justification of using this method and also need to briefly discuss their advantages/disadvantages of utilising RUSLE method. Probably should also stressed on the how remote sensing image is previously utilised in soil erosion studies. The statement of "rate of erosion is determined using satellite images" seems to imply that erosion rate can be directly determined using remote sensing method which is not correct. Only land cover and cover management factors are extracted from remote sensing and the other factors are not from satellite imagery.

Answer: The statement of "rate of erosion is determined using satellite images" was removed. All correction was done in the manuscript.

Methodology: Derivation of the soil erodibility factor should be described in detail. Is

it derived from interpolation of actual field samples? If so, what is the justification in choosing the interpolation methods. Amount of samples utilised to verify the data and the method of validation utilised are not stated as well. Grid size which reflects the scale of the map is also not stated. Justification in choosing the size of grid should be included. Validation which is a crucial part of any similar studies is not been undertaken. Thus, how true is the erosion map remains unknown. It has previously shown that RUSLE soil loss estimation can be up to three times the actual soil loss (Hammad, A.A., Lundekvam, H., Borresen, T., 2005, Adaptation of RUSLE in the Eastern Part of the Mediterranean Region", Environmental Management, Vol. 34, Nr. 6, pp. 829-841,Springer)

Answer: The K factor was determined using the combination of actual field measurements and secondary data. The secondary data is the soil map at the study area obtained from Department of Agriculture Malaysia. The value of K factor had been determined for 74 soil series in Malaysia, together with soil texture and hydrological soil group as given in a table of guideline book for erosion and sediment control in Malaysia obtained from Department of Irrigation and Drainage Malaysia (DID)(2010). For the verification, 150 soil sampling station was chosen based on the soil series at the study area especially at the land use activity area. Analysis was carried out to determine K factor includes particle size, organic matter content, hydraulic conductivity and soil structure identification. The K factor values for verification were determined using the formula of Wischmeir et al., (1978).

Discussion: Each parameter of RUSLE had errors associated with each data sources. Interpolation techniques in GIS definitely introduce errors. RUSLE was calculated as the product of all these layers. Thus, the result will produce multiplicative combined effect of errors on the soil erosion map. Discussion on RUSLE limitation due to this error is suggested to be included. It is also suggested to relate the results of this study to similar studies.

Answer: A RUSLE limitation due to the whole process of modelling soil erosion map

was discussed in the manuscript.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 4567, 2013.

Sub-catchments	OM (%)	Hydraulic Conductivity (cm h-1)	Soil structure	N1	N2	K value
Lepar	1.29 - 8.39	0.91 - 6.88	2	14.47 - 42.40	41.39 - 85.94	0.086 - 0.243
Mentiga	1.81 - 6.64	2.99 - 63.16	2	6.70 - 20.72	63.25 - 101.03	0.004 - 0.101
Lekur	0.91 - 3.09	0.34 - 36.09	2	15.51 - 49.14	55.68 - 94.69	0.083 - 0.279
Chini	3.51 - 3.87	0.44 - 1.01	2	35.52 - 38.16	45.58 - 48.58	0.095 - 0.166
Temerlung	0.46 - 1.41	1.57 - 3.79	2	23.19 - 32.01	79.88 - 81.93	0.158 - 0.221
Luit	1.49 - 7.81	0.49 - 8.47	2	11.29 - 52.59	35.59 - 86.99	0.058 - 0.219
Jempol	1.73 - 4.81	0.52 - 3.83	2	18.14 - 35.02	69.92 - 90.23	0.112 - 0.185
Jengka	4.51 - 7.59	0.28 - 0.42	2	25.01 - 39.19	52.39 - 61.53	0.131 - 0.188

OM = Organic Matter

Soil Structure:
1 = Very Fine Granular
2 = Find Granular
3 = Medium or Coarse Granular
4 = Blocky, Planty or Massive

N1 = Clay + Very Fine Sand (0.002mm - 0.125mm)
N2 = Clay + Very Fine Sand + Sand (0.125mm - 2mm)

Fig. 1. K factor calculation of each sub-catchment from field measurement