ASSESSMENT SEDIMENT YIELD IN SONGKHLA PROVINCE OF THAILAND

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Introduction

Soil is one of important natural sources on Songkhla province of Thailand. Information on soil loss is an important to agricultural efficiencies and natural resources management (Pimentel and Burgess, 2013). Therefore, this research was aimed to estimated and map the mean annual soil erosion and sediment deposition using Geographical Information System (GIS) techniques. The soil loss in each grid was analyzed by the Revised Universal Soil Loss Equation model (RUSLE). The parameter of RUSLE were calculated by digital elevation model including rainfall, soil, and land use information on each grid with resolution 1 square kilometer. Furthermore, the concept of sediment deposition was formulated from RUSLE method and used in GIS software for generating the soil loss capacity of maps. The results show that soil erosion occurred overall part of Songkhla province especially in the western part and the Songkhla Lake due to the topography, geology and land cover. The deposition of sediment was found occur at grid cell where elevation was low in the central plain of Songkhla province. However, these results can be support local land control policy to management sediment yields in the future.

Study area

Songkhla is located in southern part of Thailand, in western Gulf Coast (Fig 1.). The highest elevation is Khao Mai Kaeo at 821 meters. The Songkhla Lake is located in Songkhla province, which it a very important natural resource for the people living in Songkhla province (Yoyrurob and Liengcharernsit, 2011). This lagoon covers and areas of 1040 km^2. The economic in the Songkhla province is a major from fishering such as white bass, shrimp, Mussels and etc. The soil erosion produced sediment which it effect on aquaculture activities.

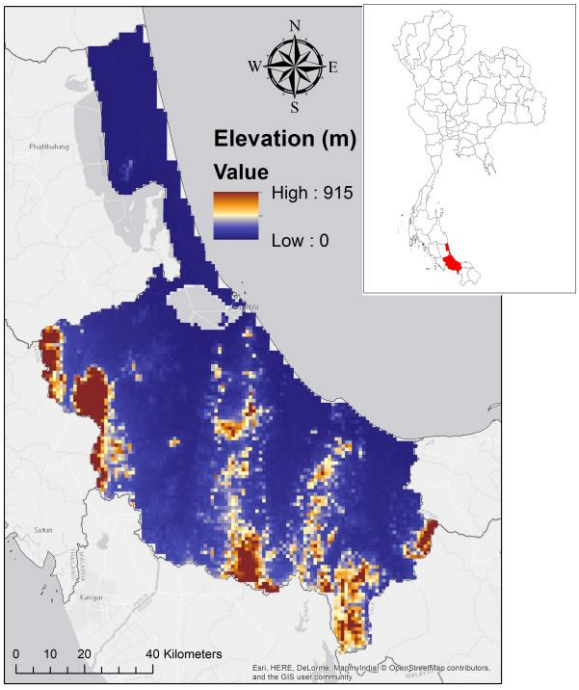

Fig. Elevation of Songkhla province

Methodology

The Revised Universal Soil Loss Equation (RUSLE) is the method (Renard et al., 1997), most widely used around the world for forest mountains and agricultural to predict average annual soil loss. RUSLE is an empirical model, method is expressed as show in Eq. 1.

$$A = R \times K \times L \times S \times C \times P$$

Where,
A : Annual soil loss per unit area ($TON \cdot ha^{-1} \cdot year^{-1}$)
R : Rainfall erosivity factor ($MJ \cdot mm \cdot ha^{-1} \cdot hr^{-1} \cdot year^{-1}$)
K: Soil erodibility factor ($TON \cdot hr \cdot MJ^{-1} \cdot mm^{-1}$)
LS: Slope length factor
C: Cover-management factor
P: Conservation practice factor

Key words: Deposition, GIS, RUSLE, Soil Erosion

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Furthermore, we modified new method for analyzing sediment yield or sediment deposition by applying the original RUSLE method. It was assumed that the amount of sediment flow from one grid cell to another downstream grid cell depends on the sediment yield of the original grid cell (L_y) compared to the average sediment yield capacity of the whole catchment (L_c). If L_y is greater than L_c, transportation occurs. Conversely, when L_y is less than L_c, sediment is deposited. L_c was calculated by the original RUSLE with the area-averaged parameters (Equation 10).

$$L_C = f\left(\frac{\sum_{i=1}^{n} I_1}{A}, \frac{\sum_{i=1}^{n} I_2}{A}, \ldots, \frac{\sum_{i=1}^{n} I_5}{A}\right) \quad (10)$$

$$D_i \; if \; L_y < L_C \quad (11)$$

$$T_i \; if \; L_y > L_C \quad (12)$$

Result and discussion

In this research, soil erosion in Thailand was estimated using RUSLE model which the value of some variable was determined from experiment of the Land Development Department of Thailand. The results showed that the GIS software can use for analyzing soil erosion in Songkhla province by the RUSLE model. The results shown that calculating and evaluating the required parameters for RUSLE, annual soil loss is 89 $m^3 \cdot km^{-2} \cdot year^{-1}$. Most erosion areas occurs in upstream of basin in Songkhla province more than downstream area due to the topography of upstream area have high slope area and covered by mountain and plateau. The spatially averaged potential of annual sediment deposition in Songkhla province is an approximately 101 $m^3 km^{-2}\, year^{-1}$. Relatively higher sediment deposition may occur in the mountain areas of S, with approximate average values of 600 $m^3 \cdot km^{-2} \cdot year^{-1}$ (Fig. 2). Furthermore, it is evident that sediment is moved from the mountainsides by run off and deposited in plain areas (Rangsiwanichpong and Kazama, 2016).

Conclusions

This study determination using RUSLE model for Thailand has revealed the severity of soil erosion. The results showed that high of erosion occurred in the upstream of watershed in Songkhla province more than other area due to the topography. Because in the upstream area have high slope and covered by mountain and plateau area. Furthermore, there is significant evidence that the upstream area of basin in Thailand has the potential to release sediment during erosion to downstream. However, the present investigation has demonstrated that GIS techniques are simple and cheap cost tools for modeling soil loss, with the purpose of assessing erosion potential for Thailand.

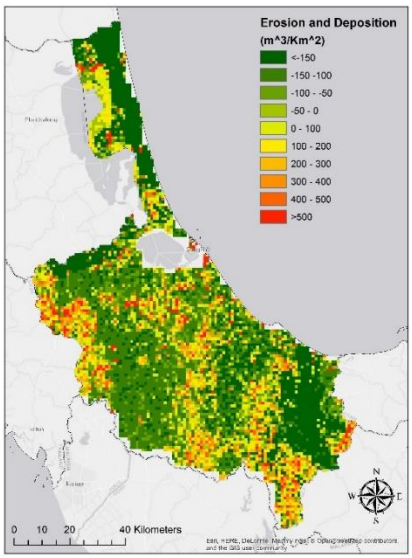

Fig. 2. Soil Erosion and sediment deposition in the Songkhla Province

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