

Modelling distributed hydrological and sediment processes to assess land use effects in Chao Phraya River Basin

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Abstrak

Soil loss and its transport processes were coupled with an existing distributed hydrological model to assess the effects of land use change on stream flow and suspended sediment load in the Chao Phraya River basin, Thailand. The simulation period spanned from 2001 to 2010. The results indicate that the Nash-Sutcliffe efficiency of upper sub-basins fluctuated in the range 0.51- 0.72, indicating the applicability of the model for longterm simulation at the monthly scale. Land use change during 2001-2010 caused a 1.6% increase in suspended sediment load based on the present trend. The changes were particularly pronounced in the Wang River basin, where the delivery ratio was highest. Moreover, the urbanization and conversion of farm land from paddy fields exerted negative effects on sediment runoff in Chao Phraya River basin. The proposed model has the ability to quantitatively evaluate the heterogeneity of sediment runoff in the basin, demonstrating the benefits and trade-offs of each land use change class. The results of this study can support basin and local land development policy to control sediment losses during development.