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Climate Change and Landslide Risk Assessment in Thailand

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Abstract : The incidents of sudden landslides in Thailand during the past decade have occurred frequently and more severely. It is necessary to focus on the principal parameters used for analysis such as land cover land use, rainfall values, characteristic of soil and digital elevation model (DEM). The combination of intense rainfall and severe monsoons is increasing due to global climate change. Landslide occurrences rapidly increase during intense rainfall especially in the rainy season in Thailand which usually starts around mid-May and ends in the middle of October. The rain-triggered landslide hazard analysis is the focus of this research. The combination of geotechnical and hydrological data are used to determine permeability, conductivity, bedding orientation, overburden and presence of loose blocks. The regional landslide hazard mapping is developed using the Slope Stability Index SINMAP model supported on Arc GIS software version 10.1. Geological and land use data are used to define the probability of landslide occurrences in terms of geotechnical data. The geological data can indicate the shear strength and the angle of friction values for soils above given rock types, which leads to the general applicability of the approach for landslide hazard analysis. To address the research objectives, the methods are described in this study: setup and calibration of the SINMAP model, sensitivity of the SINMAP model, geotechnical laboratory, landslide assessment at present calibration and landslide assessment under future climate simulation scenario A2 and B2. In terms of hydrological data, the millimetres/twenty-four hours of average rainfall data are used to assess the rain triggered landslide hazard analysis in slope stability mapping. During 1954-2012 period, is used for the baseline of rainfall data at the present calibration. The climate change in Thailand, the future of climate scenarios are simulated by spatial and temporal scales. The precipitation impact is need to predict for the climate future, Statistical Downscaling Model (SDSM) version 4.2, is used to assess the simulation scenario of future change between latitude 16o 26’ and 18o 37’ north and between longitude 98o 52’ and 103o 05’ east by SDSM software. The research allows the mapping of risk parameters for landslide dynamics, and indicates the spatial and time trends of landslide occurrences. Thus, regional landslide hazard mapping under present-day climatic conditions from 1954 to 2012 and simulations of climate change based on GCM scenarios A2 and B2 from 2013 to 2099 related to the threshold rainfall values for the selected the study area in Uttaradit province in the northern part of Thailand. Finally, the landslide hazard mapping will be compared and shown by areas (km2) in both the present and the future under climate simulation scenarios A2 and B2 in Uttaradit province.

Keywords : landslide hazard, GIS, slope stability index (SINMAP), landslides, Thailand
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