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Proposal for a probabilistic local level landslide hazard assessment model: The case of Suluktu, Kyrgyzstan

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Landslides are a significant threat to human life and the built environment in many parts of Central Asia. To improve understanding of the magnitude of the threat and propose appropriate risk mitigation measures, landslide hazard mapping is needed both at regional and local level. Many different approaches for landslide hazard mapping exist depending on the scale and purpose of the analysis and what input data are available.

This paper presents a probabilistic local scale landslide hazard mapping methodology for rainfall triggered landslides, adapted to the relatively dry climate found in South-Western Kyrgyzstan. The GIS based approach makes use of data on topography, geology, land use and soil characteristics to assess landslide susceptibility. Together with a selected rainfall scenario, these data are inserted into a triggering model based on an infinite slope formulation considering pore pressure and suction effects for unsaturated soils. A statistical model based on local landslide data has been developed to estimate landslide run-out. The model links the spatial extension of the landslide to land use and geological features.

The model is tested and validated for the town of Suluktu in the Ferghana Valley in South-West Kyrgyzstan. Landslide hazard is estimated for the urban area and the surrounding hillsides. The case makes use of a range of data from different sources, both remote sensing data and in-situ data. Public global data sources are mixed with case specific data obtained from field work. The different data and models have various degrees of uncertainty. To account for this, the hazard model has been inserted into a Monte Carlo simulation framework to produce a probabilistic landslide hazard map identifying areas with high landslide exposure.

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