Landslide risk assessment for the Toktogul region of Kyrgyzstan, Central Asia

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The Toktogul hydroelectric and irrigation scheme is the largest in Central Asia. It is now recognized that the Toktogul scheme sits astride a major fault structure, the Talas – Fergana fault, which extends for over 700 km, bisecting the Tien Shan mountain range. In addition, the area is also associated with numerous deep-seated slope deformations, landslides, disruptions to superficial deposits and long run out debris flows. These have been related both to the geological setting and ground shaking from strong recent and paleoearthquakes. Although landslides have been identified in the Toktogul area, no detailed landslide inventory is available to assist in the risk assessment for the Toktogul area. Understanding the nature, location and recurrence patterns of landslides that pose to the environmental security of this region, as well as ways of mitigating against these threats, is crucial to planning and ensuring continued economic development and stability. Moreover, since the Toktogul scheme was constructed, there has been a dramatic improvement in the techniques available for evaluating threats to such regions, such as the quantitative assessment of landslide hazards thorough the employment of optical and topographic data available from a range of satellite platforms. The aim of the project is to generate a spatial landslide hazard model for the Toktogul region of Kyrgyzstan to contribute to the geo-environmental study of the region. The project methods are 1) detect and map landslides at all scales using high resolution imagery and DEM data; and to generate a GIS landslide inventory database for the area from this image analysis, 2) ground truth this landslide inventory using field reconnaissance, 3) integrate topographic, geological, hydrological and seismic data within a GIS environment. DEM data from SPOT will form an important component of this dataset, and 4) derive statistical landslide hazard models through the integration of landslide inventory with the GIS datasets. The project is reliant upon the use of remote sensing for the detection and delineation of landslides. The provision of high resolution optical and topographic data will therefore be integral to the project, whereby the data will contribute to the generation of the landslide inventory and provide part of the spatial dataset for the GIS based spatial landslide hazard modeling. Emphasis is being placed on the application of remote sensing techniques for inventory of landslide events together with landslide recognition and classification, the integration of spatial datasets for the generation of a spatial landslide hazard models; and development of quantitative risk model for landslides in the Toktogul region of Kyrgyzstan.