PRELIMINARY ASSESSMENT OF ROCK FALL HAZARD AND RISK IN THE CENTRAL PART OF THE NERA VALLEY, UMBRIA REGION, CENTRAL ITALY

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Rock falls are one of the most common types of fast moving landslides in mountain areas. They represent the most abundant landslides triggered by earthquakes. Rock falls are one of the primary causes of fatalities and of damage caused by landslides. Despite being widespread and highly destructive, only a few attempts have been made to establish rock fall hazard and the associate risk along transportation corridors in mountain areas. We present a preliminary assessment of rock fall hazard and risk for the central part of the Nera River Valley, in the Umbria Region of Central Italy. The Nera River, a tributary of the Tiber River, flows across the Apennines in a deep and narrow valley. Two national roads, the SS 305 and the SS 209, and several mountain villages are located along the valley bottom. The villages and the roads are frequently affected by rock falls. On October 1997, aftershocks of the Umbria-Marche earthquake triggered hundreds of rock falls, ranging in size from few cubic decimeters, to some tens of cubic meter. Damage was severe and the two national roads were closed for several weeks. Following the earthquake defensive measures (including scaling, rock fences, elastic fences, and artificial tunnels) were installed along the valley. These costly defensive measures were installed without any specific assessment of rock fall hazard and the associated risk. Using a 3-dimensional, spatially distributed rock falls simulation program, we have quantitatively evaluated rock fall hazard along a 20 kilometres section of the central part of the valley. The source areas of rock falls (i.e., the detachment zones) were identified from vertical aerial photographs and in the field. Parameters controlling the loss of energy at impact points and during rolling were obtained from a surface geology map prepared updating a geological map through the analysis of aerial photographs and field surveys. Maps of the expected rock fall count, a proxy for the probability of being hit by rock falls, and of the expected maximum velocity and flying height, proxies for rock fall intensity, were used to evaluate rock fall hazard. A map of the main structures (i.e., villages and single houses) and of the infrastructure (state roads and other secondary roads) was combined into a GIS with the rock fall hazard map to obtain a preliminary map of rock fall risk. The location and characteristics of the new defensive measures were compared to the rock fall hazard

and risk maps to evaluate their usefulness and efficacy