Multidisciplinary approach to assess landslide hazards in alpine environment: the geomorphological map of the upper Maira Valley (Western Alps, Italy).

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The landscape evolution of the U-shaped Maira Valley was mainly led by glacial dynamics during Pleistocene. The Holocene linear fluvial erosion creates higher steepness slopes in a narrow valley in which gravitational phenomena involves buildings and facilities of Acceglio municipality (Piedmont, Italy). A geomorphological survey in an unmapped area of about 12 km² has been carried out and a new map at scale 1:10000 has been realised. In order to improve the accuracy of fieldwork data, several multidisciplinary techniques have been investigated. The landforms and slope evolution were analysed by using a 5-meters resolution ARPA Digital Elevation Model (DEM) in GIS environment. Discontinuities and geomorphological features were recognized and mapped observing aerial-photos provided by Regione Piemonte. Multi-temporal dataset of orthophotos were useful to examine the river pattern behaviour coupled with interdigitating polygenic fan deposition. The stratigraphic sequence knowledge was achieved using boreholes, inclinometers and piezometers evaluating eventual detrital cover thickness. Detailed field investigations allowed to understand the relationship between structural geology and landslide evolution, in particular concerning several detachment zones characterising the slope overlooking Acceglio town. In the uppermost range of that slope, the fracturation is intense and influences the rock-falls and rock avalanches trigger, whilst debris flows were identified throughout the detected area associated with a homogeneous presence of weathered cover. Widespread accumulation bodies suggest how avalanche and debris flow occurrences have affected Acceglio human activities, testified by historical archives documents as well. In the past, several trial to mitigate these risks were performed through engineering activities which could be refined and implemented with further local analysis on landslide susceptibility. Research on this issue, in addition to having a great scientific interest, can provide essential tools for upper Maira Valley Administrations, being the main available support for an appropriate urban planning.
