



## **Regional and local risk assessments of alluvial fans by combination of historical and geomorphological data on debris flows, the most damaging natural hazard in the Aosta Valley Region (NW-Italy)**

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The Aosta Valley (NW-Italy) is a small alpine Region (area = 3262 km<sup>2</sup>) where alluvial fans occupy large sectors of the main valley bottom and also of the tributary valleys; most towns and villages lie in these sectors which are frequently affected by different geomorphological processes, including debris flows. For a best environmental hazard assessment and management of alluvial fans, a research project has been carried out with a particular attention to debris flows, responsible for causing major damages to human activities and infrastructures.

A debris flows inventory on a regional scale has been created, combining historical data (1900 to present), technical maps and geomorphological analysis on the alluvial fans areas.

A complex methodology for data collection and analysis has been organized in two different stages. As a first step, aerial photointerpretation and Digital Elevation Models (DEMs) analysis were conducted over the Aosta Valley Region to obtain a complete fans inventory and to identify the most affected sectors by debris flows.

As a second step, data on debris flow events occurred in the Region has been collected from different sources, such as bibliographic and historical data, municipality hazard maps for land planning restriction and drainage basin technical studies. For each inventoried debris flow, aerial photointerpretations have been performed to validate geomorphological and historical data, mostly collected during major regional flood events. Finally, the selected debris flow events has been formally organized in a GIS to perform spatial and statistical analysis.

Application of the methodology to the complete Aosta Valley Region dataset involved the overcoming of some difficulties, such as: 1) correct identification of repeated events from different sources, 2) exact recognition of small phenomena by photointerpretation and 3) problems related to the rapid landforms obliteration.

The preliminary results of the research activity are outlined below. Analysis of the selected debris flow events led to the identification of about 200 single phenomena: a regional database for management of natural instabilities ("Catasto Dissesti") was successfully updated. Knowledge on natural hazards related to debris flow has been improved at a regional scale: a 1:100.000 geotematic map has been produced. Collected data also allowed important improvements to local knowledge on alluvial fan hazards, through the recognition in same alluvial fans of multiple occurrences of debris flows events: estimation of their magnitude and temporal occurrence led to more precise hazard assessment, useful for proper land planning and to evaluate interaction with human activities. Finally, geological, geomorphological and climate factors have been recognized, responsible for controlling typical activation thresholds and debris flow characteristics in different sectors of the Aosta Valley Region.