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Control works in debris-flow channels: influence on morphology and sediment transfer

L. Marchi
CNR IRPI, Padova, Italy (lorenzo.marchi@irpi.cnr.it)

Extensive torrent control works, such as grade-control dams, debris basins, deflecting walls, etc. have been implemented in the European Alps since the last decades of 19^{th} century. These structural measures, aimed at stabilizing channels and to control sediment transport, are also widespread in Japan and are increasingly present in other mountain regions. As debris flows are one of the most destructive processes in steep mountain channels, hydraulic works are often intended to attenuate debris-flow hazard. Multi-temporal aerial photos and historic records permit evaluating the long term effects of torrent control works on the morphological settings of the channels and the delivery of sediment.

The experience arising from over one century of torrent control works in debris-flow channels of the Alps permits also to improve the management of steep headwater catchments.

A basic issue in the management of debris-flow channels is the recognition of success versus failure of engineering control works. Successful debris-flow control works provide benchmarks for further implementations, whereas the failure in reducing debris-flow hazard may lead to refinements in planning and design of control works or to the choice of preferring non-structural measures for coping with debris flows. Data from historical archives on debris-flow occurrence and on the performance of control works are the basic sources of information for these analyses.

Moreover, when dealing with hydraulic structures for debris-flow control, it should be reminded that the artificial morphology resulting from the construction of check dams provides only a temporary stability to the channel and adjacent banks. This stresses the importance of evaluating the state of conservation and the effectiveness of control works and implies the need for their careful and continuous maintenance. Inventories of hydraulic structures, coupled with detailed data on catchment and channel topography, sediment sources and supply processes, are required for taking decisions about maintenance and possible upgrade of debris-flow control works.