

New element for optimizing the functioning of sediment traps

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Sediment traps protect urban areas against excessive sediment transport during hazardous floods and consist typically of a retention basin with an open sediment check dam at the downstream end. The design, as well as the morphological processes within the retention basin, were analyzed by several authors. With regard to open sediment check dams two types of triggering mechanisms for the initiation of sediment retention can be distinguished: (1) mechanical and (2) hydraulic clogging of the structure. Recent studies have shown that outlet structures combining both clogging principles may be considered to avoid undesired self-flushing. Further elements of check dams are conceivable, e.g. for retaining or conveying driftwood. This study analyses experimentally working principles and design criteria of standard elements of sediment traps. Furthermore, it introduces a new structural element to the sediment trap design with a guiding channel in the retention reservoir. Taking into account the natural shape of mountain rivers, the guiding channel has a trapezoidal cross-section shape and a rough but fixed bed. The effect of the guiding channel on sediment deposition pattern and re-mobilization are studied by means of physical model experiments with a standardized hydrograph and variable sediment supply. The results are evaluated by means of zenithal pictures and bedload transport rate, measured at the downstream end of the model. Major advantages of the combined use of both clogging principles include an improved control of the initiation of sediment deposition in order to allow for sediment transfer for small floods and a reduction of hazards related to self-flushing.