

SEDEX – A PRACTICAL TOOL TO ESTIMATE SEDIMENT DELIVERIES IN MOUNTAIN TORRENTS

CONSIDERATION AND COMMUNICATION OF UNCERTAINTIES IN EVERYDAY PRACTICE OF TORRENT ASSESSMENT

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Practical tools are indispensable in the everyday practice of hazard assessment of mountain torrents. SEDEX, an acronym standing for SEDiments and EXperts, is a project with the aim of designing a practical method to estimate the sediment deliveries for events with certain recurrence periods. This tool needs to be linked with other assessment methods, such as the description of the general characteristics of the torrent, runoff conditions and records of historic events.

The requirement of being a method for practice implies that SEDEX is applicable to a catchment within a short time. This means it has to be a handy and very efficient tool. Furthermore, the new proceeding ensures a good traceability and transparency, which are both essential characteristics in the quality management of a project.

For the quality of the results, exact data are just as important as information about the range of uncertainty. The awareness of uncertainties is crucial when the findings of an expertise are implemented e.g. in the design of countermeasures or land use planning.

ASSESSMENT SYSTEMATICS OF SEDEX

The procedure for assessing the sediment load according to SEDEX is based on the division of a mountain torrent into relatively homogeneous sections. In the field, the channel, embankments and slopes are then assigned to one of twelve defined unit types. These so-called modules are then evaluated step by step by assigning them a process type, a degree of activity and an estimated sediment delivery. The results of the analysis of every single module are merged and used for the assessment of the overall potential sediment delivery in the torrent. Furthermore, the distribution of the module types in a torrent reveals information about the general characteristics of a torrent as well as the possible courses of an event.

DEALING WITH UNCERTAINTIES IN SEDEX

Every step in the hazard evaluation of mountain torrents includes uncertainties. Regarding the quantification of sediment delivery, often a broad bandwidth is possible, which has to be

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represented by one specific value per scenario. The determination of error margins is as subjective as the definition of the relevant value. Hence a proper error analysis is not the appropriate tool to examine the uncertainties. Generally, it is one of the challenges in applied torrent assessment, that the estimated sediment deliveries for events with defined recurrence periods cannot be reviewed. Even for those past events where actual data were measured and exist, determination of recurrence periods remains difficult and is subjective.

SEDEX therefore offers an approach that enables experts to judge the influence of uncertainties on their result and to verify the consistency of their considerations. The main goal of SEDEX is to provide a standardized procedure for the assessment of uncertainties and to formalise implicit expert knowledge.

For this purpose, the SEDEX software interface (PDA- and Desktop Version), designed to record and interpret the field data, provides the following features:

During data acquisition, a range of uncertainty can be entered for the most relevant parameters. The information is referred to the estimated sediment delivery of a single module, that is to say for a channel, an embankment or slope process within a certain section. Based on these data, graphs and tables are automatically generated, which give a summary and overview of the results. Thereby, the deciding sections or processes and the uncertainties in their sediment delivery are clearly revealed in an illustrative way that allows an expert to reconsider his assessment. A further advantage of this tool is the simple, but rewarding sensitivity analysis, which is decisive for the quality of the result.

Besides the above described analysis of a single process or section, supplementary tools of SEDEX allow experts to verify the plausibility of the overall sediment load at the basin outlet. For this purpose, checklists have been established that guide an expert step-by-step through all the important factors with an influence on how much of the mobilized material in the catchment is transported to the basin outlet. These checklists include questions or considerations about the transport capacity, different possible courses of event (i.e. caused by channel sections with changing functions, clogging and thereby surges caused) and precipitation scenarios with different effects on flood waves and debris flow surges.

COMMUNICATION OF UNCERTAINTIES

During its development, SEDEX has constantly been reviewed by experts from practice, administration and science, to guarantee that the newly designed tool meets requirements from both scientific and practical points of view. All the participants agreed that the assessment uncertainties have to be disclosed and communicated to the client of an expertise, since for the implementation of a hazard assessment it is essential to reveal error ranges and thereby allow that these facts can be taken into account e.g. into the definition of the safety factor of a counter measure.

Legitimate concerns exist about the proper interpretation of an indicated bandwidth of sediment delivery. It is therefore recommended that the responsible expert with the best local knowledge of a specific mountain torrent takes the responsibility to determine a decisive value. At the same time it is his obligation to communicate the uncertainties in his assessment and to reveal how these were weighted in the determination of the relevant figure about the sediment delivery.

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