

BUILDING IN THE MOUNTAIN ENVIRONMENT

TAKING TORRENTIAL RISK INTO ACCOUNT

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Traditionally, risk management in France is based on four broad principles: knowledge, warning, protection, and safeguarding. The first objective of this approach is to assess a particular risk and map it so that human activity is not set up in areas where this risk would be unacceptable. It then aims to propose a certain number of solutions to limit the impact of flooding, whether or not it is combined with construction measures to ensure the protection of humans and property potentially exposed to the risk. Last, it requires that safeguard measures be proposed to ensure the operational management of a crisis situation.

Approaching the different aspects through the lens of construction, the objective of this article is to present a summary of the data and recommendations of the guide titled Building in the Mountain Environment: Taking Torrential Risk into Account. Soon to be published by the Ministry of Ecology, Sustainable Development, Transportation, and Housing, this book is aimed at builders. It provides indications and reference information so that both private individuals and construction professionals can standardize their practices and take torrential risks into account as early as possible in their projects. It also raises necessary questions, with particular attention paid to design and construction issues in mountainous zones exposed to flooding.

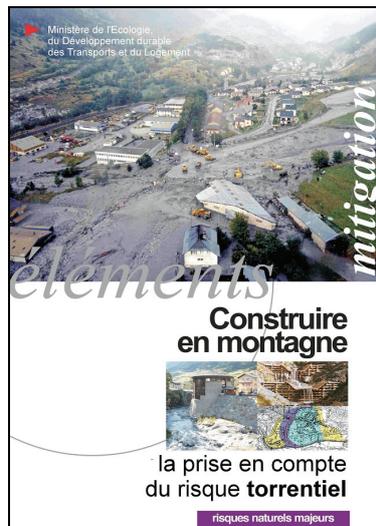


Fig. 1 Front cover of the guide Building in the Mountain Environment: Taking Torrential Risk into Account

This complete review and the ideas developed therein take root in the accumulated experience and the knowledge that has progressively been gained in this domain. Through back analysis of past catastrophes and direct accounts of these events archived by the National Forest Office's Restoration of Mountain Territories departments, the impact of mountain torrents on constructions can now be appropriately assessed in qualitative terms.

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This experience shows that the main impacts observed on buildings are the following:

- sediment deposits on land areas
- scour of foundations
- damage to building angles
- damage to walls
- destruction of openings
- invasion of the construction by sediments of all sizes

However, no precise methods to quantify the hydraulic stress that need to be taken into account has been defined to date; no norms or authoritative rules for calculation are available on this question. The guidelines of the Swiss local insurance organizations have put forward the most advanced approach. These guidelines, to which the reader can refer, distinguish several typical danger situations:

- static flooding
- dynamic flooding
- dynamic flooding with erosion and sedimentation
- channel migration
- embankment sliding
- debris flow

As for the possible construction responses, a broad palette of solutions using common building techniques is available. To guide the planner with limited experience in this domain or to support those who may hesitate between several solutions, the guide develops the following points:

- possible defense strategies
- protection of foundations from scouring
- resistance of walls in masonry
- choice and use of materials
- problem of openings
- finishing components

It should also be mentioned that although the problem of wall resistance is relatively easy to solve, the problem of openings is more complex. Furthermore, the problem of foundations should be carefully studied: scour of foundations is nearly always the cause of the damage observed. Experience also shows that this phenomenon is more often neglected than submersion and sediment deposits phenomena. Finally, although well-adapted construction responses are available for new constructions, retrofitting existing buildings remains a real problem.

The guide also covers the question of torrential risks from a collective point of view and develops several notions from urbanism suggesting that planners learn to work with torrents in place, to ensure that sufficient space is available for flood runoff, to carefully design the type of construction and its implantation, to study the most advantageous shape to adopt for constructions, and finally to limit the impact of bridges.

In all cases, beyond the regulatory and normative aspects, the response to torrential risks does not involve complicated design approaches. For a skilled constructor, a good understanding of the phenomenon and a little common sense can suffice as long as questions are raised on the phenomenon's mode of action and the weak areas of constructions are reduced.

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