

**Multi-scale assessment of effectiveness and efficiency
of protection works against natural hazards :
from structural and functional aspects to economic approaches**

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Rapid mountain gravity natural phenomena are dangerous by their intensity and their suddenness. They cause direct and indirect damage to human and material issues, with serious economic consequences.

To reduce the damage, the State, with the technical support of the ONF-RTM, is financially responsible for the management of 20,000 works. They protect more than 15,000 homes, 500 roads, etc.

The associated risk level depends on the technical assessment of structural and functional effectiveness. On this basis, the actions to be taken (maintenance, new construction) must be decided from the national to the local level, in a limited budget environment.

To help with this decision, practical applications to assess the economic efficiency of several actions. Type Cost-Benefit-Analysis, Swiss and Austrian methods are comparable to those existing in France for floods. Sample applications Cost-Effectiveness-Analysis also exist.

These methods are functional but limited to a monetary evaluation of costs and damages, mainly direct. How to take into account other components of risk (indirect and intangible damages)?

They require expert advice to assess the hazard, the effectiveness of structures and damage. They are based on many information. Their imperfection affects the quality of the results and the associated decision. How to address these shortcomings in the decision process?