Multiscale integrated decision-aiding approaches for checkdams' effectiveness assessment

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Natural mountain phenomena such as torrential floods put people and assets at risk. Risk reduction measures consist either in structural measures such as protection works or non-structural measures such as land-use planning and risk zoning maps. In torrential watersheds, many protective checkdams (about 14000) have been built in French mountainous areas since the 19th century. As any civil engineered structure, those dams are aging. In a context of decreasing public budgets, choices have to be done: assessment of their structural, functional and economic effectiveness both to assess residual risk and to choose the best maintenance strategies have therefore become crucial issues. However, global methodology and decision-aiding tools to help experts are still missing.

We present and discuss a global approach (resulting from a recent PhD) integrating several techniques such as safety and reliability analysis, multicriteria decision-making methods and information imperfection processing to analyze torrential protection works effectiveness. Several issues are addressed in this pluridisciplinary approach. Effectiveness concept, assessment criteria and system scales are first described. Required expertise is often based on imperfect information, provided by several sources with different reliability levels. To help decisions, the approach breaks down general assessment into several smaller decision-making problems. Dependability analysis tools and innovative Evidential Reasoning based-decision-aiding methods (ER-DAMs), using fuzzy sets, possibility and belief function theories, are chosen and implemented to help individual decisions. New developments consist in:

1)Describing multi-scale decision-making problems thanks to dependability analysis;

2)Adapting ER-DAMs to help effectiveness assessment at each system's scale, including indicators definition and evaluation methodologies.

3)Integrating individual problems and associated methods in a generic methodology to help torrential protective measures' effectiveness assessment at watershed scale.

Integrative aspects of proposed ER-DAMs' specific developments are discussed giving some elements to improve methods but also to help operational implementation of the generic methodology.