

Overview of Natural Risk Management and Torrent Control Maintenance in French Mountainous Areas

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INTRODUCTION

The French National Forestry Office's (ONF) department of Mountain Terrain Restoration (RTM) is a long-standing player in the management of natural hazards in France. It operates in mountainous areas (the Alps, the Pyrenees). As a specialist in related natural phenomena (torrential floods, landslide, snow avalanches), it takes part in the French policy for major natural risk prevention. This presentation has three goals: to show how torrential risk prevention policies in France have evolved over time since the implementation of the RTM policy; ii) to take stock of the current state of this policy and involved players; iii) to present actions taken to improve the management of decision-making strategies concerning areas of torrent control structures.

HISTORICAL BACKGROUND OF THE FRENCH RTM POLICY

After two first laws in 1860 and 1864 on mountain reforestation and regrassing, the policy of mountain terrain restoration was born with the law of April 4th 1882, amended by a law in 1913. Overall goals have changed from extensive reforestation into a so-called "active" treatment of emerging and present hazard zone: snow avalanche starting zone, torrents, sediment sources (landslide, erosion, etc.).

This policy was implemented by the Water and Forests Administration (AEF). It was supported by the State's acquisition of land, "state-owned RTM forests" today, and the installation of civil and biological engineering structures. Four periods describe the implementation of this policy: trial and error (1860-1882); the golden age (1882-1914) during which most of the structures were constructed; iii) the age of maintenance (1914-1940) dedicated to maintenance of existing structures; iv) decadence (1940-1970) when this maintenance was progressively abandoned. In 1964, 380,000 ha of state-owned RTM forest were acquired with, amongst others, 100,000 torrent control structures of which 15,000 are still monitored and maintained by the RTM department.

The 1960s and 1970s were crucial years. Management policies for natural hazards changed from the mere aspect of protection to integrated policies of prevention, of which the flagship tool is the Natural Risks Prevention Plan (PPRn). Local authorities are also getting increasingly involved, with the execution of so-called "passive" torrent control structures such as deposit areas. Grounded on the AEF, the ONF was created in 1964, and was given the responsibility of the RTM department in 1970. RTM agents manage protective structures in state-owned RTM forests and provide technical support to State services and local authorities to ensure better consideration for natural hazards in public policies.

PRESENT RISK MANAGEMENT IN FRENCH MOUNTAINOUS AREAS

In France, there are seven pillars of natural risk prevention: knowledge of phenomena and hazards, monitoring, citizen information, controlled urbanisation, reduced vulnerability, preparing for emergencies and feedback. The first four have resulted in the implementation of PPRn. These latter are carried out at municipality level by State services and based on three stages: i) hazard analysis, which defines zones of intensity (weak, medium or strong) for a centennial frequency scenario or, in rarer cases, for the known historical event; ii) vulnerability analysis; iii) definition of regulated zones for urban planning.

These are the five time phases of risk management: prevention, preparation, alert, crisis management and repairs. The same torrent or torrential river involves many players. Specialists, such as ONF-RTM services or private experts, supply technical elements. The French State is on the one hand the owner of “active” RTM structures and, on the other hand, responsible of crisis management at a supra-municipal scale. Control services make sure that conducted actions comply with regulations. Local authorities at different scales (region, department, multiple municipalities, and municipality) finance, carry out and manage preventive measures. The mayor of each municipality is responsible for crisis preparation, alert and coordination in his area. Thanks to regulations, the civil society is getting increasingly involved.

Confronted with this fact, the State looks into several approaches in order to establish integrated risk management (with aquatic environmental management, several phenomena) in areas of major watersheds involving supra-municipality structures.

DEVELOPMENT OF A TORRENT CONTROL MAINTENANCE STRATEGY

Maintenance of existing torrent control structures and the construction of new structures are amongst potential actions in integrated risk management. Given restricted budgets, priority actions must be determined. The State, local authorities, network operating bodies private players must define actions to be carried out on the structures for which they are responsible.

For the structures they are in charge of, RTM services have elaborated an approach of management assistance grounded on several stages: 1) a database including inventory and description of control systems at different scales (structures, devices and torrential watersheds); 2) grading of watersheds according to the level of socio-economic risk; 3) for high-risk watersheds, definition of the function given to each device to reduce the risk and graded according to their expected capacity; 4) for devices with high expected risk-reduction capacity, grading of structures according to their level of importance; 5) for each system selected at each scale, evaluation of effectiveness at structural and functional level, but also socio-economically 6) and proposition of solutions; 7) for each solution, analysis of the efficiency comparing total cost and the planned effectiveness improvement; 8) establishing priority actions.

CONCLUSION

This multidisciplinary approach (civil engineering, torrential hydraulics, risk analysis, multi-criteria decision aiding) has been scientifically tested and approved. Its operational deployment is underway. The final goal is to make it sufficiently robust in order to be used within the framework of integrated approaches presently supported by the French State.

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