

# Successful management of protective structures in long-term conservation projects

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## INITIAL SITUATION AND CHALLENGES

In recent decades, many protective structures have been erected to help fight against gravitational natural hazards. These constructions help safety officials carry out their duties to protect human living space and infrastructures, in addition to their spatial planning or organisational measures. The long-term conservation management of this protection infrastructure is a key task as the safety requirements continue to rise and the building materials and the foundations are constantly deteriorating over time. In the last few years, conservation concepts for protective structures have been developed in many regions (AWN 2012, Suda 2012). The conservation of the constructions can be ensured if the safety officials raise awareness for the type, location and condition of their protective structures. In the Canton of Bern, the safety officials are often the communities themselves. Thus they usually lack specific expertise and a constant change in responsibility is the norm, especially with political leaders. The Department of Natural Hazards in the Canton of Bern recognises the challenges of these shortcomings and has therefore introduced the integral long-term conservation projects (in brief: conservation projects).

## Objectives of a conservation project

The safety officials should

- know the type and location of protective structures and periodically check their condition. There should no longer be any abandoned protective structures.
- decide on the qualified individuals to conduct the monitoring.
- have instruments that permit the evaluation of the results from the monitoring and the necessary maintenance measures at the optimal time.
- know what maintenance measures they can carry out independently and which ones they need to turn to the cantonal department for

or a specialist expert office.

- be able to budget the expenses for monitoring the structures and the maintenance measures for the next five years.

## CONCEPT OF A CONSERVATION PROJECT

In the sense of the SIA standard 469, the conservation work includes both the monitoring (ongoing surveillance, periodic inspection) and the maintenance of the constructions (repair, renovation). The figure below describes the stages of a conservation project, the respective competences as well as the intended impact (see Fig. 1).

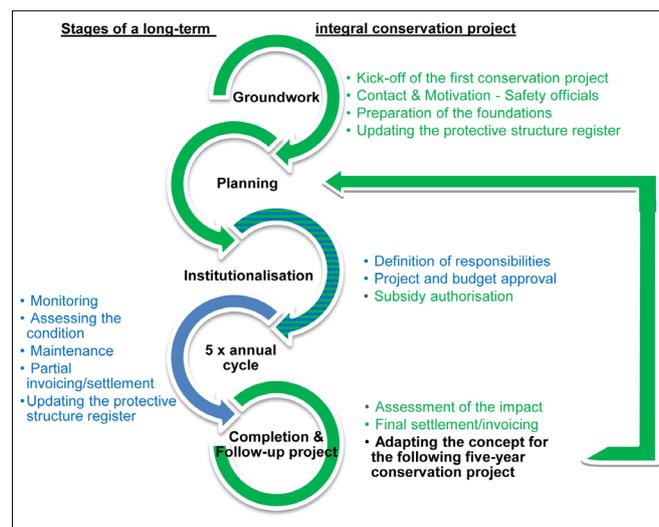


Figure 1. Groundwork and cycle of the maintenance planning for five-year conservation projects; green shows the work steps for the responsibilities of the cantonal office; blue shows the work steps that are the responsibility of the safety officials.

As a basis for developing a conservation project, all the protective structures against natural hazards are recorded within a demarcated area of responsibility and listed in the protective structures register. The protective structures register is updated and maintained by the cantonal office, giving it an overview of the existing constructions and their condition. The office can use it to deduce whether there is a possible need for action. However, the safety

officials are primarily responsible for maintaining the protective structures and they can call on support from the cantonal office in carrying out their tasks as needed. The drafting of a conservation project is often done in close collaboration between the safety official and the cantonal office. A conservation project consists of an overview of the existing protective structures, details on the monitoring cycle for each damming construction, as well as information on the foreseeable maintenance measures for the next five years including cost estimates. The regular monitoring of the protective structures ensures that the protective structures register is updated. This requires standardised methods and instruments for monitoring the constructions and assessing their condition; in the Canton of Bern this is done according to the KUFU methodology (control and maintenance of forestry infrastructure; AWN 2012).

Thanks to the conservation projects, the safety officials know the estimated financial requirements as well as the subsidy contributions expected from the federal and cantonal authorities. The designated costs are not strictly reserved for individual measures; instead they can be flexibly used according to the urgency of damage and the conservation priority of various protective structures.

When a conservation project elapses after five years, its success is assessed through a review of the protective structures it maintained and the cooperation of all those involved. These findings are then incorporated in the subsequent conservation project. The advantage of a five-year term is that the safety officials can gain a clear understanding of the work to be done and the estimated financial resources over a longer period. At the same time, the cycle and process of a conservation project also provides the opportunity to adjust and adapt to new insights or changes in circumstances, in order to ensure the long-term existence of protective structures in the subsequent conservation project. As the credit for the maintenance of the protective

structures is decided by the political institutions of a community, the political leaders have a greater awareness of the existence of protective structures and the tasks involved in their planning and upkeep.

## CONCLUSION

With the institutionalisation of long-term integral conservation projects, the safety officials and the cantonal offices have a suitable instrument with which to ensure the long-term presence and reliability of protective structures in an area. The initial experiences from ongoing projects and the positive feedback from the municipalities strengthen the efficacy of this approach. At the same time, it provides an opportunity for the public to reliably determine the need for financial resources to ensure the long-term conservation of protective structures.

## REFERENCES

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## KEYWORDS

management of protective structures; maintenance planning; monitoring; inspections; maintenance

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