

SHARING THE COSTS FOR PROTECTIVE MEASURES BASED ON A RISK ANALYSIS

AN EXAMPLE

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INTRODUCTION

In Switzerland, the costs of measures for the protection of settlements are shared between the Federation, the cantons and the municipalities. In many cantons, the municipalities are responsible for the protection of their population and finance primarily the protective measures. They are subsidised by the cantons and the Federation.

If constructive measures do not only protect settlements but also infrastructure as motorways, railway lines or industries of national importance, these assets benefit from protection on the cost of the municipalities. A method is sought to determine an adequate contribution of the owner of the infrastructure to the investment in protection measures. Such a cost-sharing method based on a risk analysis was developed to finance flood protection measures in a village of Central Switzerland.

SITUATION

The village A. is situated on the alluvial fan of two torrents. A motorway crosses the torrents in the upper part of the fan on an earth dam. It is expected that flood events with an annual probability of 1 % or less will flood major parts of the alluvial fan and cover it with debris. The settlement of the village A. and the motorway would be affected. Furthermore, the motorway influences the hazard situation: On one hand, water and debris are retained behind the dam; the dam has therefore a protective effect. On the other hand the dam may be overtopped and may divert water and debris to areas of the fan that otherwise would not be at risk.

A flood protection plan foresees measures to retain debris in the catchment area and measures to improve the conveyance on the alluvial fan. The estimated investment costs sum up 31.3 Mio. CHF, whereof 8.5 Mio. CHF are costs for new measures and 22.8 Mio. CHF are foreseen to renew older structures whose lifespan has expired. In the upper reach of the torrent a series of check dams stabilises the bed of the torrent in landslide prone areas. Some of them are 80 years old and risk failing in case of a flood event. They will be renewed step by step within the next 15 years.

COST-SHARING MODEL

The cost-sharing model elaborated for the protective measures in the village A. is based on the following principles:

- The costs are shared according to the benefit the measures bring to different users/owners.
- The reduction of flood risks for the settlement and for the motorway is regarded as benefit.
- The reduction of flood risks generated by the motorway is regarded as benefit for the owner of the motorway.
- All measures are considered as a whole and their effect is evaluated globally (principle of solidarity).

The conceptual basis of the cost sharing method has been established earlier by the Swiss Federal Department of the Environment, Transport, Energy and Communications (DETEC) to finance large

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infrastructure projects (Fig. 1). In a first step, the total costs (1) are divided in direct originator costs (2) and chargeable costs (3). The originator costs are costs that would arise from measures taken to eliminate the risks generated by the presence of the motorway and are completely taken by the owner of the motorway. However, that portion of flood risk can hardly be quantified and a substitute was chosen. It comprises the costs that would arise to eliminate the influence of the motorway on the hazard. In that specific case the substitute is the costs of a hypothetical culvert that would allow conducting water and debris below the motorway without deposition.

The chargeable costs (3) are shared between the municipality and the owner of the motorway according to the effect of the protective measures in terms of risk reduction. (Fig. 2). The flood risks of the settlements pre and post measures have been assessed with the tool EconoMe, provided by the Federal Office for the Environment. The tool considers potential direct losses of housing, industry and public infrastructure. The potential damage of protective measures is not considered in the risk analysis because there is no protection objective for these goods. The flood risks of the motorway have been calculated according to the method described in Utelli et al. (submitted). This risk assessment includes potential direct and indirect losses.

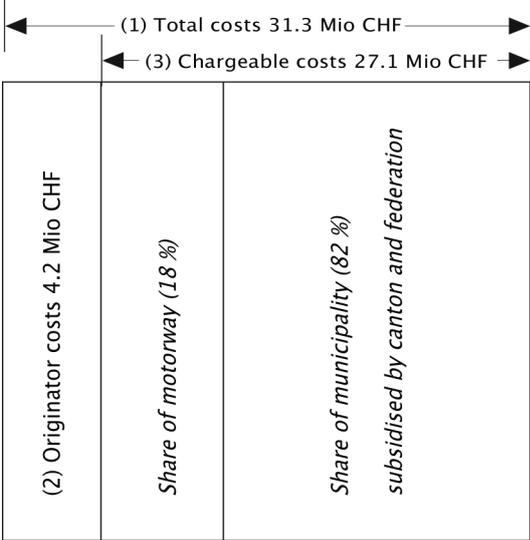


Fig. 1 Cost-sharing model of the DETEC.

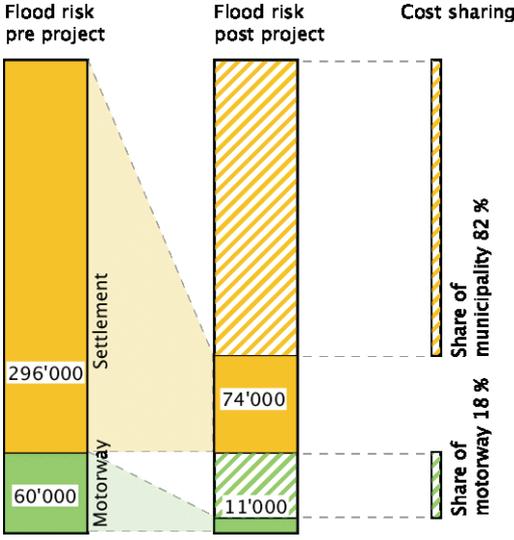


Fig. 2 The reduction of flood risk for settlements and motorway determines the portion of benefit taken from protective measures and the cost-sharing ratio of chargeable costs.

CONCLUSION

The method presented in this paper provides a possibility to share investment costs for flood protection measures between different cost holders in a way that each one, who benefits from protective measures, contributes to the investment in an adequate manner. The recently elaborated tools to assess natural disaster risks are proved valuable to quantify the benefit.

REFERENCES

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