

Integral flood protection project for the medieval town of Sursee

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INTRODUCTION AND AIM OF THE PROJECT

The stream Sure forms the lake outlet of Lake Sempach and flows through the settlement area of Oberkirch and the medieval town of Sursee. The most important tributary is the stream Hofbach, which is mainly responsible for flooding in the city of Sursee. The current discharge capacity of the Sure is too low, so that high discharges coming from the Hofbach have led to repeated flooding in the settlement areas in recent years.

The flood hazard in Oberkirch is comparably low, but in Sursee several vulnerabilities in the core area of the town exist. The old town of Sursee, which is affected by flooding, is listed in the Federal Inventory of Swiss Heritage Sites (ISOS). It gets throughout highest ratings in almost all categories in the inventory. The two runs of the canalised Sure (Neue and Alte Sure) are important elements of this townscape (Figure 2, right). In addition Sursee

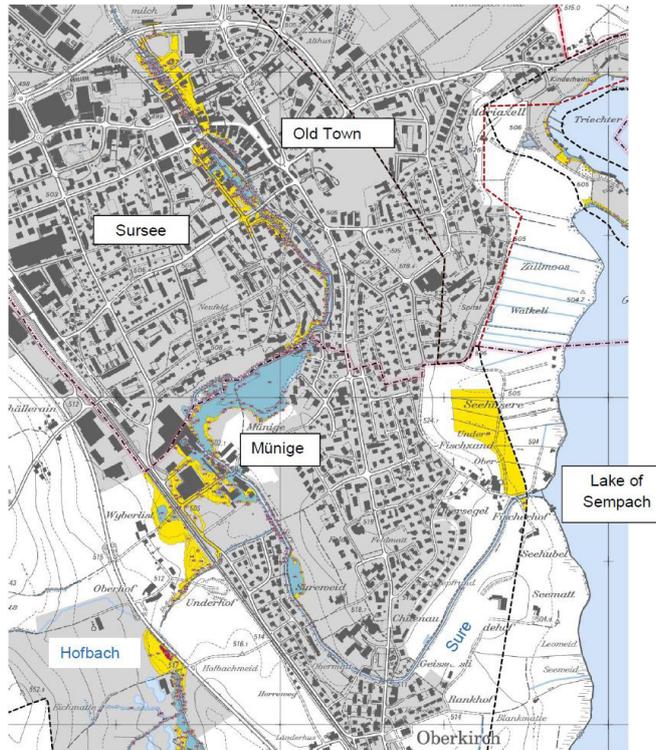


Figure 1. Flood hazard Map for the streams Sure and Hofbach within the town of Sursee and the village of Oberkirch; yellow: light flood hazard, blue: medium flood hazard, red: high flood hazard



Figure 2. Left: Flood protection and revitalisation measures ahead of schedule in direct proximity of the old town in Sursee as an example of synergy of flood protection, revitalization and recreational use; right: canalised runs of the Sure are important elements of the protected townscape of Sursee.

received the Wakker Award in recognition of the conscious approach of the existing facilities and new buildings in the city. In this extremely sensitive area relating to townscape and design structural interventions are only feasible with high particular requirements. Therefore, an integral flood protection concept is needed, which on the one side ensures best possible flood protection and on the other side meets the high demands of the protected townscape. Accompanying ecological measures will improve the habitats of the Sure.

STUDIES OF VARIANTS

As part of a detailed variant study different protection concepts were investigated according to the principles „retention where possible“ and „expansion where necessary“.

The increased design requirements of the measures in the old town of Sursee were included in the cost estimate. Along with the basic variants for ensuring flood protection were measures provided to increase the ecological value of the stream, such as revitalisation and the longitudinal connectivity. The variants were compared in a comparison matrix taking into account various evaluation criteria (Table 1). There, the criteria flood protection, nature and landscape (incl. protected townscape) as well as socio-economics were evaluated using a numerical scoring system and the economic efficiency of the variants was verified. The overall

rating of the variants is determined by the score for the criteria mentioned above and their percentage weighting. The study of variants was also discussed with representatives of the federal government, the Canton of Lucerne and the municipalities.

The resultant best option out of the study of variants contains particularly retention measures. Thus, the retention of Lake Sempach is to be optimized by adjusting its regulation in case of flood events. A flood control reservoir situated in the immediate proximity of the settlement area in Sursee restricts the discharge of the Sure when required. These retentions are that much efficient, that flanking protection measures in the protected old town of Sursee can mostly be dispensed. Also in case of overload the chosen best variant represents a robust system.

PARTICIPATION

Due to the complex requirements (including flood protection, historic preservation, ecology, recreational use) it was very important to develop the project with the involvement of various stakeholders. In particular, the offices for flood protection and protection of historical sites of the federal government, the Canton of Lucerne and the municipalities as well as the residents around Lake Sempach were integrated. By discussing with stakeholders the acceptance can be encouraged and it can be worked out individual solutions. This participatory approach has proven in the past, particularly for complex projects, and is one of the fundamental issues in hazard management practised in Switzerland.

CONCLUSION

This presented flood protection project includes an integral and robust package of measures to ensure sustainable flood protection in the settlement areas of Sursee and Oberkirch, and meets the high demands in the medieval town of Sursee.

KEYWORDS

flood protection; Integral Riskmanagement; protected townscape

Important synergies could be used by this integral planning of measures. Flood protection measures in the inner city area could be combined with a revitalisation of the stream and the improvement of recreational use (Figure 2, left).

Currently, the construction project is being developed. After the completing of the approval procedure, the realisation can be started from today's perspective earliest in 2017. In the course of urban renewal and enhancement separate measures have already been realised in recent years.

Table 1. Comparison matrix with the evaluation criteria A - D. Each evaluation criterion is described and rated using the subgoals (e.g. A1).

main-goals:	sub-goals = rating criteria:
A Flood protection: The variant shows best protective effect. Risk of flooding in inhabited area is minimized 30%	A1 With this variant there is the best possibility to eliminate the protection deficit areas which are reported on the hazard map A2 This variant reduces the residual risk and reacts robust about an overload event. A3 This variant ist technically easy to implement. The technical risks are low. A4 The measure of this variant have a long life term. Average Flood protection
B Nature and landscape: The variant shows least impact on nature and environment. 20%	B1 This variant will create new natural habitats, improve the existing ecosystem and improves the connectivity of the natural habitats. B2 This variant will improve the ecomorphological condition of the waters. B3 This variant will impair the landscape as less as necessary. B4 This variant will impair the townscape as less as necessary. B5 In this variant there won't be a high affect at the nature reserves and landscape protection areas. B6 This variant will retain/improve the quality of the ground- and surface water. Average Nature and landscape
C Socio-economic aspect: The variant shows least impact on socio-economic development. 20%	C1 Agriculture: The project claims as little as possible crop rotation areas and highly productive areas. C2 This variant claims as little as possible forrest C3 This variant encounter on an wide acceptance (municipal, population, associations, landowner etc.). Assessment of project risks in implementation. C4 This variant allows a sustainable developmnt of suitable settlement area and ensures the transport infrastructure. C5 This variant increases the recreation benefits. Average socio-economics
D Cost/benefit ratio: Assessment of economic aspects. 30%	Construction costs [CHF] Land acquisition [CHF] Total costs [CHF] prevented damage (benefit) [CHF] Rating 1: NIK<0.5; 2: 0.5≤NIK<0.8; 3: 0.8≤NIK<1.2; 4: 1.2≤NIK<2; 5: NIK>2 Rating

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