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River monitoring at the Flaz-river

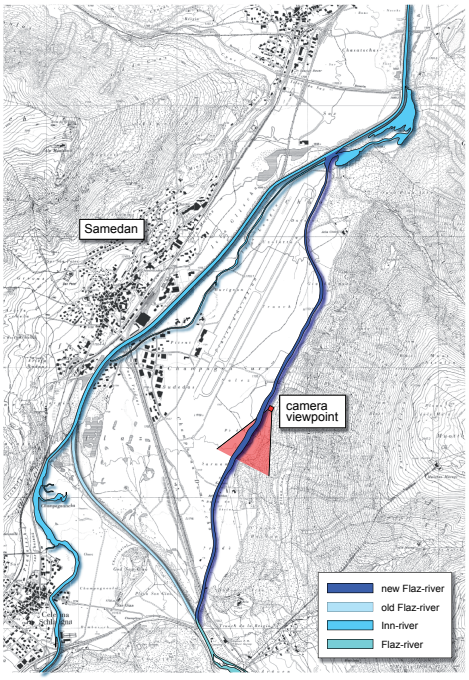

Fig. 1: Situation of the Flaz-river correction project.

Fig. 2: Flaz-river on june 6 2004 before and on july 15 2004 after a major flood event occurred. Both pictures were taken at a discharge of 10 m^3/s.

Samedan, a locality in the canton of Graubuenden, has been exposed to significant risk due to floods during the last years. Although located at the Inn-river, the main risk is the large discharge of the Flaz-river which joins the Inn-river just upstream of Samedan.

To ensure the flood protection of Samedan, a major correction of the Flaz river was realised in 2004 by building a new 4 km long channel for the Flaz river that now confluences with the Inn-river downstream of Samedan (Fig. 1). After 80 years this is the first major permanent diversion of a river in Switzerland. In addition to flood protection purposes, the realisation of a nature-orientated river-bed was a main goal of the project.

The objective of the present study is to monitor the development from a constructed channel towards a natural river space considering all important river engineering aspects. Due to regular and systematic measuring campaigns, theoretical approaches and numerical simulations can be compared with controlled field conditions. The main areas of investigation include the bed material composition, hydraulics, sediment transport and bed morphology. In addition to these engineering aspects a method developed by the EAWAG (Swiss Federal Institute of Aquatic Science and Technology) to control the ecological success of river revitalisations is applied and tested on the river Flaz.

Bed material
In order to analyse the bed composition, different sampling procedures e.g. bulk sieve, line-by-number, grid-by-number or photographical analyses are compared to evaluate their potential to reproduce the grain size distribution of the surface and subsurface material. The distribution of the bed material along the river is analysed before and after flood events.

The development from an unstressed bed to a course bed pavement is compared with approaches that have been derived under laboratory conditions.

Hydraulics
Permanent water level measurements at three positions in addition to regular surveys of the corresponding cross sections allow a continuous determination of water depth. In combination with simultaneous discharge measurements, the flow-resistance (Mannings n values) can be compared with data under controlled field conditions. Results determined with numerical 1d und 2d simulations are compared with measured water levels.

Sediment transport
Using regularly measured cross-sections a comparison between the actual development of the river bed during a flood and the sediment balance obtained by numerical simulation of the same event is aimed for.

Bed morphology
In some parts of the new Flaz-river, the channel width is large enough to allow morphological structures such as alternating bars or a braided flow pattern (Fig. 2). Comparisons between the expected bed pattern and observations can reveal interesting results regarding the development towards a near-natural river morphology. The river expansion is permanently surveyed by a digital camera that daily takes a picture.

The monitoring will continue till 2012, when final results will be published. First results are published in two different editions of the Journal:
Wasser Energie Luft, 2007, Heft 3 and 2005, Heft 3/4.

Keywords:	river monitoring, bed morphology, sediment transport, river correction, grain size distribution
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