FLOOD PROTECTION IN SAMEDAN, ENGADINE, SWITZERLAND – A SUSTAINABLE SOLUTION IN RECORD TIME

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The two receiving channels of Upper Engadine, the Inn and the Flaz River, were leveed in the 19th century. Like in many other alpine valleys, this laid the foundation for settling and exploiting the floodplains. The corrective measures were designed on the basis of maximum discharge estimates according to the 19th century state of knowledge and experience. In reaction to flood events resulting in overtopped levees, the conveying cross sections were enlarged and stabilized. However, devastating floods in 1951, 1954 and 1956 caused numerous levee failures. Consequently, the Inn and Flaz river courses were newly constructed and fully canalized in the entire length from Celerina and Pontresina to La Punt. For these works, the guiding principle of flood protection was still based on a river control system that sustained the estimated maximum discharge without any loss or damage. Because settlement areas were now supposed to be flood save, they were rapidly developed, which increased their vulnerability as well as their demand for protection. The next major flood event occurred in July 1987. It was the last devastating flood for Upper Engadine in the 20th century. Even though the peak discharge was not at record value, the village of Samedan only narrowly escaped severe inundation, the water surface being only 20-30 cm below the top of the levee.
Subsequent to the major flood events in 1987 and 1993, Switzerland has adapted a new approach to flood protection. It is based on the understanding that flood control is a complex problem. Watercourses need to be observed in a greater context. Protective structures are not sufficient to ban flood danger.
In this spirit, the Samedan flood control project was conceived with state-of-the-art methods of planning and calculation. Numerical simulations of scenarios of flooding provided evidence for the hazard situation and the vulnerability of the village. The local authorities' information policy was exemplary in the way it considered all interest groups involved. As a result, the electorate endorsed a forward-looking and sustainable project in spite of its higher cost (EUR 18.6 million) rather than a cheaper but merely technically oriented minimal solution (cost: EUR 8.7 million). The new protective concept included the diversion of the entire Flaz channel to a non-settlement area, which is less vulnerable to inundations. This made the river system safe in case of overstress during extreme events. In the event of a flood exceeding the design value, no uncontrollable processes take place and damage is limited. The sustainable and multifunctional structure was subsidised by the Swiss Federal Government and the Canton of Graubünden. The channel diversion has produced several improvements: it provides distinctively better flood protection, enhances the overall appearance of the locality and the landscape, restores the river's natural function as a habitat, and preserves an intact living and working environment for future generations. The ambitious aim of the project was to build a new river course of 4 km of length, including 6 bridges, in 4 years' time and thus reduce the flood danger for Samedan to a minimum. Consequently, the construction project and the environmental compatibility report were accomplished within a very tight time schedule, which did not allow for planning things down to the last detail. The project therefore was continuously optimised during construction phase.

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This proceeding is sure efficient, but it requires flexibility of all parties involved. A transparent information policy is indispensable to inspire confidence among awarding authorities, cantonal offices, project authors and executers. Several times, implementation decisions had to be reconsidered in favour of ecological or technical improvements. Moreover, the implementing contractors faced a demanding task since the project was still subject to modification during implementation phase. With a total cost of EUR 18.3 million, the ambitious aims of the project were achieved within the approved budget thanks to the extraordinary commitment of all people involved but also due to favourable weather. Pre- and post-project monitoring of selected ecosystem indicators has been applied to control this new ecosystem approach to river management. During the next years, the monitoring is going to give documentation of the development of the river's morphology and the newly established habitats.

Fig. 1 The canalized Inn River next to the airport Samedan before the start of construction works in 2002

Fig. 2 New mouth of the diverted Flaz River into the Inn River, 2005

Keywords: Flood protection, channel diversion, restoration, monitoring