

IMPROVED BED LOAD MANAGEMENT FOR THE ALPINE UPPER DRAU RIVER/AUSTRIA

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The Drau River, which drains the southern areas of the main mountain range of the Alps in Tyrol/Austria, can be regarded as an example for insufficient flood control and bed load management since many years. Fortified changes of the riverbed in the 35 km long part between the Italian border and the town of Lienz which are characterized by considerable accumulations as well as local erosions, created raised rehabilitation efforts and repeated mechanical removal of deposits. As a basis for an improved flood control of the valley floor, the authority of Tyrolean Provincial Government initiated a study for bed load management aiming at the analysis of the past negative morphological reactions as well as the investigation of options to improve the control of the sediment regime. The catchment area of the Upper Drau river, from its spring down to the confluence with the Isel river at the town of Lienz totals 670 km², whereby the head area of 163.1 km² lies on Italian territory.

Recent training interventions did not succeed to mitigate the existing sources of hazards. Furthermore a striking modification of the run off and bed load balance was introduced by the hydro power plant "Strassen – Amlach" which is operated since 1988 and diverts a major part of the natural run off over a stretch of 20 km.

Comprehensive survey of the bed development and the geometry of the watercourse formed the basis for the investigation. By numerical computation the whole reach of the Upper Drau was modeled and the run off conditions as well as the bed behavior of the last 20 years simulated and analyzed. The results show, that the accumulation tendencies on the one hand have been amplified by the water diversion of the power plant in the medium part of the Upper Drau but on the other hand would have increased without the power plant in the lower reaches. As a main factor for the recent problems an extraordinary rise of torrential activity of some bed load delivering tributaries in the last decade has been detected.

Beside the analysis of the status quo, the future conditions have been assessed and a catalog of measures prepared and investigated. Particular for artificially widened reaches a new layout concept for an improved bed load transport regarding also ecological aspects have been developed. For a mountain river as the Upper Drau, the natural impulse for free and continuous reshaping of the riverbed must be limited to some extends to be compatible with the inhabitants' use of the valley. In order to avoid severe threats to

inhabitants, a river course beyond its natural optimum has to be accepted and controlled. The suggested interventions comprehended i.e. the reduction and balancing of the bed load input from tributaries by way of either extending or constructing bed load retention dams, the preparation of depositing areas in the vicinity of powerful torrents, local reduction of bed resistance, restructuring of 4 widened reaches, locally lowering of the river bed level and maintaining regular sediment removal at specific sites.

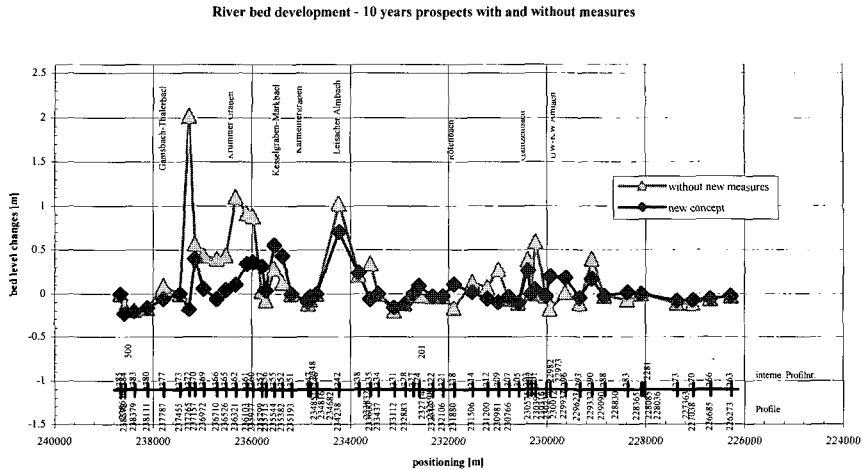


Fig. 1 Predicted riverbed development with and without balancing measures in the lower part of the Upper Drau

The examined measures could all, on the whole, be classified as effective. The average changes of the riverbed, which are shown in Fig. 1 are an illustration of the improvements achieved by the selected measures. Particularly the restructuring of widened areas would allow a comparative moderation of the bed load transport. At the same time, the danger of floods would be effectively reduced.