Geophysical Research Abstracts
Vol. 13, EGU2011-13266, 2011
EGU General Assembly 2011

Implementation of an Artificial Bed Load Retention Structure

Georg Schuster (1), Cedomil Josip Jugovic (2), Franz Steiner (), and Robert Koloseus ()

(1) Institute of Water Management, Hydrology and Hydraulic Engineering, University of Natural Resources and Life Sciences, Vienna, Austria (georg.schuster@boku.ac.at), (2) Institute of Water Management, Hydrology and Hydraulic Engineering, University of Natural Resources and Life Sciences, Vienna, Austria (jugovic@boku.ac.at)

In anthropogenically influenced regions, disequilibrium in the river and stream sediment budget often takes place. For this disequilibrium, variable explanations can be found. Finally, two basic principles can be distinguished:
- Changes in sediment input
- Changes in sediment transport
The aggradations having an anthropogenic or a native source origin are treated as a serious problem in the field of hydraulic engineering, and especially in the field of the flood risk management. The cause for these aggradations can be the excessive sediment, as well as a reduction of the sediment transport. Moreover, the hang slides and a reduction of vegetation may provoke an additional sediment input and thereby aggradations. Or the transport capacity reduction, (initiated e.g. through the widening of the flow cross section), as well as a reduction of the flow velocity through barriers, or reduction of the bed slope between the bed drops. So, the most sustainable and ecologically worthwhile answer is the rearrangement of the natural conditions. However, often just the symptoms of this imbalance, like the appearance of aggradations in rivers, are being removed by excavation. Thus, already during the next flood the aggradations reappear, reduce the discharge cross-sections, and provoke overflows. Hence a sustainable and environmentally compatible alternative to the existing common methods is needed. If there is no possibility to restore the natural situation, the application of a bed load retention sidearm option may serve as a sustainable compromise. This structure fulfils the requirements of an appropriate sediment modulation, while supporting both, the river continuum, as well as the biological continuity. Thereby, the bed load retention sidearm operates in a shunt circuit. This means, that the main discharge stays in the natural river bed, while the excessive contingent of the bed load is diverted into an artificial sidearm. The design of the bed load retention sidearm is composed of three main parts:
- Intake structure
- Accumulation reservoir
- Downstream water outlet
Distribution of the discharge and the bed load between the main channel (river) and the sidearm (accumulation reservoir) is controlled by a diversion structure (intake structure), positioned at the beginning of the sidearm. The diverted material is sedimenting in the accumulation reservoir. The clear water is led back into the river, through the downstream water outlet. The intake structure is build up of three main elements:
- Low weir
- Side weir
- Flushing channel
The low weir in the main channel stabilises the river bed in front of the diversion structure and initiates a bed load movement in direction of the flushing channel, and thus improves the bed load extraction even at lower discharges. The main function of the side weir is to cause a lateral drift, which provides an efficient bed load extraction by high discharges. The flushing channel begins with the side weir opening on its downstream end, at the intersection between the side weir and the low weir. The main function of the flushing channel is to provide a permanent water/sediment discharge into the sidearm, especially at the low discharges.
This concept has been successfully implemented in the Steyr River near the city of Steyr where this technique appeared as the only way to adapt the bed load transport rate to the existing situation. However, in general, such a measure should only be applied when all the other analyzed alternatives drop out.