

Modeling morphological changes in the river bed using 1D and 2D models – Case study: Željeznica River (Sarajevo, B&H)

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Introduction: The alluvial watercourse is in the process of constant adjustment to spatial and temporal changes in the flow of water and sediment in the basin and the catchment area. The causes of change can be natural and anthropogenic. When in any way the equilibrium of the hydraulic-psychiatric regime of the waterway is disturbed, its reaction towards the establishment of a new equilibrium state is manifested by the morphological changes in the river bed - erosion or filling of the bottom, as well as the change in the position of the river bed in the horizontal projection.

By modeling the morphological changes of the riverbed, it is possible to predict the reaction of the watercourse to possible changes. A numerical model describing morphological changes in the river bed consists of a hydrodynamic (HD) module and a sediment transport module (ST). In the numerical simulation, the basic problem is the choice of an appropriate method for calculating the transport of bedload and suspended sediment, bearing in mind the conditionality of this division.

Methods / Case study: The paper presents the modeling of the morphological changes of the Željeznica River. Željeznica River springs on the mountain Treskavica (2088 m above sea level) and the length of the stream is 26.9 km. Željeznica River is one of the waterways extremely torrential character, which results in instability of the riverbed, and the deepening and demolition coast.

For the establishment of the numerical model, its calibration and verification were used:

- a) data on the morphological form of the river bed - geodetic recordings of cross sections and DMT for different periods of time,
- b) hydrological data - measured flows and water level from the automatic water meter station,
- c) data on the amount of sediment and granulometric composition of the sediment.

During the modeling, the HEC-RAS software for one-dimensional (1D) and two-dimensional (2D) flows was used.

Results / Discussion: 1. Numerical simulations of physical processes allow a detailed analysis of changes in hydrodynamic sizes and morphology of the riverbed, which is of great importance for

hydraulic practice. For the establishment of a numerical model and its reliable use, field research and measurements (geodetic, hydrological, geological, field deposition measurements, etc.) are of great importance.

2. On the considered section of the Željeznica River in the period between 1999 and 2009, significant morphological changes are evident. On the basis of the analysis of the recorded cross sections, which is shown by the results of the model, the deepening of the riverbed at the largest part of the stream was noted.

3. There is a large number of theoretical and empirical methods for calculating the transport of bed load and total sediment, and the selection of an adequate method represents a significant problem in the calculation of morphological changes in the river bed..

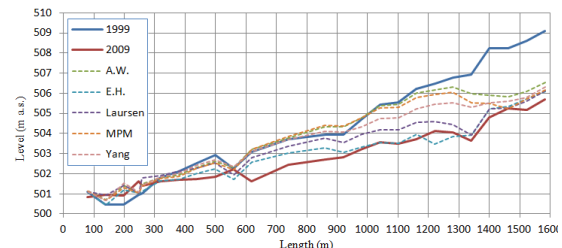


Fig. 1: Results of modeling of morphological changes in the river bed of the Željeznica river for the period 1999-2009 using different methods for calculating the transport of sediments