

## Abstract for the poster exhibition

### Multiple floods damage risk assessment and management for engineering structures in river flow

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Water flow in rivers during floods strongly impact transport system infrastructure – roads, bridges, dams, and etc. To ensure the safety and stability of the engineering structures in river flow is important task, but today there are no methods for flood damage risk estimation from the aspect of river bed changes at the foundations.

The flood damage risk for transport system infrastructure (main national roads that have economical importance, emergency evacuation roads, as well as, critical bridges and bridges with unknown foundations) is necessary to compute for social, economic and environmental losses prevention.

The objective of this research is to work out the method that allow to estimate the safety and stability of the engineering structures in river floodplains during the multiple floods from the aspect of scouring at the foundation of the structures. The research focuses on the study of development of erosion processes at the engineering structures during the multiple floods and at the equilibrium stage.

Existing methods and formulas do not take into account multiple floods impact on scour process near structures, as well as, probability, duration, frequency and sequence of the floods. To estimate current stage of the scour process after or before multiple floods and compare it with designed equilibrium stage is necessary for prediction of construction stability and safety, and for early-warning system development from possible disaster.

A differential equation of equilibrium of the bed sediment movement for clear water was used and a method for computing the scour development at abutments in river floodplain during multiple floods was elaborated. The method was verified by experimental data.

A new method for computing equilibrium stage of local scour at abutments in river floodplain was also developed and verified by experimental data.

Using two mentioned methods we propose to estimate possible damage of abutments caused by multiple floods. The parameters of scour hole computed during multiple floods can be compared with its equilibrium parameters by equations suggested, and the flood damage risk factor for abutments can be determined as a ratio  $h_s/h_{equil}$ , where  $h_s$  is a scour depth developed during/after multiple floods, and  $h_{equil}$  is a equilibrium scour depth. The closer current depth value of the scour hole is to the equilibrium value of the scour hole, the more is the flood damage risk factor and less is the stability of the structure.

By using this approach the civil engineers could both to estimate the safety and stability of designed engineering structures for planned maintenance period, and to prove the preparedness of engineering structure for extreme flood events.