



Conditions of concentration and composition of suspended load in the Vistula River between Wyszogród and Chełmno

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The main objective of the study is to explain causes of variations of concentration, particle size distribution and composition of suspended load in the riverbed of the lower Vistula between Wyszogród and Chełmno. The study was conducted in seven bridge cross-sections (three above and four below the Włocławek reservoir). In each cross-section, three water samples were collected in the characteristic parts of the riverbed. Since July 2012 fifteen measurement series were carried out. During each measurement series 22 samples of water were collected. In each sample the overall concentration of suspended load, the proportion of the organic matter and particle size distribution of the mineral fraction were measured.

Variation of concentration and characteristics of suspended load were studied both in the cross-sections of the Vistula riverbed and along its longitudinal profile. The study focus primarily on determining the qualitative and quantitative variation in the properties of suspended load in the cross-sections located in different morphological riverbed type, various level of its hydrotechnical management, including the operation on the Włocławek reservoir, and the diversity of the water flow conditions. The author tested the correlation occurring between the size of suspended load concentration as well as the flow rate and flow velocity at the water sampling sites. Moreover, the author determined the effect of morphological variation of the Vistula riverbed (the riverbed depth and the location of points of collecting water samples relative to the riverbed mesoforms) on the concentration size, composition structure and the particle size distribution of suspended load.

Measurement sessions were chosen in such a way as to cover the widest possible spectrum of the water flow conditions in the riverbed of the Vistula. In addition to the low and medium flow the variability in concentration during flood flows of various types (ice jam, snowmelt and rainfall) were determined.

The results showed that the variation of the concentration of suspended load in the longitudinal profile is primarily associated with the operation of the barrage in Włocławek. During the study period the reduction of concentration of suspension in the Włocławek reservoir averaged to 70%. As the results indicate, the average concentration of suspended load in the bridge cross-section in Chełmno did not reach even once the turbidity level of the section above the Włocławek reservoir. The problem of the variation of concentration of suspended load in the cross-sections of the Vistula was not previously the subject of a more detailed study. The observations performed by the author revealed that the variation of concentration, composition and grain size distribution of suspended load in the cross-sections were often higher than on the entire analysed section of the Vistula. During the study period the following turbidity variations in the cross-sections were recorded: 83% in Wyszogród, 74% in Płock, 40% in Włocławek, 53% in Toruń, 35% in Bydgoszcz, and 34% in Chełmno.