

Analysis of the suspended sediment contamination sources on the Dobczyce Reservoir tributaries example with use of the geochemical markers (sediment fingerprinting method)

Intensive three years research on the qualitative role of suspended sediment based on the example of two tributaries of the Dobczyce Reservoir allowed answering the questions regarding the relationship between geochemical marker set of suspended sediment and soil samples in the Wolnica Stream and the Raba River catchments. They also allowed clarifying doubts related to the sources of contamination of suspended sediment.

A low level of contamination of suspended sediment, bottom sediments and soils was found using heavy metals (Pb, Zn, Cd, Cu, Mn, Ni, Fe, Hg), biogens (total N and P), PAH (NAPH, ACYN, ACEN, FLU, PHE, ANT, FLT, PYR, BaA, CHR, BbF, BkF, BaP, IndP, DahA, BghiP) (also in street dust) and radioisotopes (Cs-137 and K-40). The environmental risk assessment of the aquatic environment and biocenosis of heavy metals using commonly known pollution assessment methods have also shown low contamination. Furthermore, it was noticed that the Wolnica Stream catchment was less contaminated than the Raba River catchment.

Based on the research, geochemical marker set of suspended sediment in the Wolnica Stream and the Raba River catchments was determined. Lead, zinc, cadmium, copper, nickel and mercury were selected as a typical geochemical marker set for suspended sediment and soil samples of the Wolnica Stream catchment and lead, zinc, copper, iron and total phosphorus were selected of the Raba River catchment. However, differential contamination level of individual types of Carpathian soils contributed to the determination of the origin of the material transported from the catchment to the aquatic environment. On this basis, the statistical model showed that suspended sediment samples of the Wolnica Stream catchment originated from residential soils. On the other hand, suspended sediment samples of the Raba River catchment originated from meadows and pastures.

As proven, the sediment fingerprinting method deployed in these studies can be successfully used in other small catchments with diversified land use management. In the future, it may also support quantitative analyzes of suspended sediment in other catchments and forecasts among others water quality and sedimentation.

Zemełka Gabriela