

Assesment of contamination of water and sediments in the Wilga River, Poland

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The Wilga River, one of the dextral tributaries of the Wisła, is one of the most polluted rivers in Kraków region. In the middle section it drains the Swoszowice region which is known for the natural mineral spring waters that are rich in sulphides, bicarbonates, calcium and magnesium. In the lower section of the Wilga valley an extensive, old dumps of soda factory are located. The waste consists in 70% of CaCO_3 and remaining 30% are CaCl_2 , SiO_2 , Ca-phosphates, Ca, Mg and Ba-sulphates and NaCl (Wójcik & Morawski 2009).

The aim of this study is the geochemical contribution to the assessment of the state of the environment of the Wilga River based on characteristics of water and bottom sediments. In contrast to the previous studies which concentrated on the polluted parts of the Wilga, this project aims at a systematic analysis of natural background in the upper parts as well as anthropogenic effects in the lower parts of the river.

Sediments and water samples were collected from six locations from springs to the mouth of the river. Temperature, pH and specific conductivity were measured on site. Chemical composition of water (major and selected trace elements) was determined by atomic absorption spectroscopy AAS (Na, K, Cu, Zn, Pb, Cd, Mn, Fe), by titration (Ca^{2+} , Mg^{2+} , HCO_3^- , Cl^-) and by spectrophotometry UV-VIS (SO_4^{2-} , PO_4^{3-}). X-ray fluorescence spectrometry (XRF) was applied for determination of major and trace elements in the sediments.

This was accompanied with qualitative mineralogical characteristics using powder X-ray diffraction (XRD).

The results were compared with the previous studies (Wójcik & Morawski 2009). From springs to just below Swoszowice the chemical composition of water and sediments as well as concentrations of trace elements are at the level of regional geochemical background. No influence of natural (sulphide) mineral springs was detected in Swoszowice. This is probably a result of small volumes of spring water compared to the volume of the Wilga River there. Elevated ion concentrations are apparent, however, in the river waters near the Kraków Soda waste dumps. This was also determined before by Wójcik & Morawski (2009). With respect to geochemical background in the upper parts of the river, chloride concentration increases from 80 mg/L to 466 mg/L, sodium increases from 40 mg/L to 230 mg/L, and calcium from 84 mg/L to 146 mg/L. This is associated with increase in Zn content in sediments. The water type changes from HCO_3 -Ca-Cl-Na above to Cl- HCO_3 -Na-Ca type below the dumps area.

Discharges and leakage of industrial waste dumps and agricultural waste (possibly resulting from extensive reclamation of post-industrial area) appear as major reasons of water quality deterioration in this area. All the parameters indicating pollution, however, are lower than measured 5 years ago indicating improvement and

positive effects of remediation procedures applied in contaminated area.

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REFERENCES

- Wójcik R. & Morawski Ł., 2009. Zawartość anionów w wodzie rzeki Wilgi na obszarze składowisk odpadów krakowskich zakładów sodowych. *Ochrona Środowiska i Zasobów Naturalnych*, 4, 497–504.