

Screening of metal content in Begej (Serbia) river basin

Dejan Krčmar¹, Milena Dalmacija¹, Srđan Rončević¹, Božo Dalmacija¹, Ljiljana Rajić¹, Jelena Tričković¹, Snežana Maletić¹, Miljana Prica², Malcolm A. Watson¹

¹ University of Novi Sad Faculty of Sciences, Department of Chemistry, Biochemistry and Environmental protection, Trg D. Obradovica 3, Novi Sad, Serbia Phone: +381 (21) 4852724

E-mail: dejan.krčmar@dh.uns.ac.rs

² University of Novi Sad Faculty of Technical Sciences, Trg D. Obradovica 6, Novi Sad, Serbia

Introduction: Polluted sediments are a very significant problem in Vojvodina, the northern province of Serbia – an estimated 2×10^6 m³ of sediment requires removal annually. Begej is artificial waterway, which is in terms of water regime and environmental protection is completely connected with the Old Begej and Tamiš, and a network of canals of Danube-Tisa-Danube system. As a result of rapid development of industry and agriculture in Timisoara and the Romanian part of Banat and due to lack of construction of adequate facilities for waste water treatment quantity of contaminated sediment increased. As such, it represents a serious impact on the environment in Romania and Serbia. In earlier studies [3], it was found that the high metal content is the main problem in the sediment of Begej river basin. Begej was sampled on five profiles: Itebej upstream of sluice (1), sluice Itebej downstream (2), near the village of Zitište (3), upstream from the sluice of Klek (4) and upstream from the sluice of Stajičevci (5)



Fig. 1: Sampling locations

Methods: Monitoring of Begej sediment covered period 2006-2009. Sampling sites were chosen before the dam or sluice where is the highest accumulation and retention of sediments that are transported along watercourse. In this way, it was enabled that the quality of sediment that was accumulating over a longer period of time in these areas, can be determined and assess its impact (risk) of the water ecosystem. An Eckman grab was used for sampling surface sediments. (Beeker, Eijkelkamp, The Netherlands). Metal analysis was carried out by FAAS, Perkin Elmer AAnalyst700 (according to method EPA 7000B), with sediment samples undergoing microwave digestion according to method EPA 3051A.

Results: Due to a lack of national legislation, the determined sediment metal contents were compared with Dutch and Canadian guidelines, as they have a long tradition of investigation in this area, and antecedence in developing criteria and regulations for sediment quality [1,2].

According to the Dutch system of classification it was concluded that for a period of 2006-2009 Begej sediment (Itebej upstream of sluice 2009-depth, 2008 -surface, and all samples downstream of the sluice, surface, Žitište 2009 and Klek 2009-surface) belongs to Class 4, which is defined as highly polluted. According to the Canadian guidelines, the metals contents exceeded the PEL levels for Cd at all locations, for Pb at 53% of locations, for Cu and Zn at 60% of locations, and for Cr at 27% of locations.

Discussion: The high content of toxic metals are due to release of untreated or partially treated industrial and municipal waste water, and corrosion of metal structures and construction, the impact of waste water from the farm (Cu, Zn), the impact of diffuse sources, primarily agriculture (Cd), and traffic (Pb).

Further investigation is necessary, in order to obtain full understanding of the processes which define bioavailability, to develop quantitative models for these processes, and to develop chemical and biological tests for the quick and easy determination of bioavailability and hence sediment quality and the assessment of environmental risk

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References: [1] Anon. Circular on target values and intervention values for soil remediation. Netherlands Government Gazette, p.39, Ministry of Housing, Spatial Planning and Environment Directorate-General for Environmental Protection, 2000.; [2] Anon. Canadian sediment quality guidelines for the protection of aquatic life, updated, In: Canadian Environmental quality guidelines, Canadian Councils of Ministers of Environment, 2001. [3] Anon. Results of physical-chemical analysis of sediment Begej in the project "Feasibility study for the reconstruction and rehabilitation of the channel Begej", Serbia, Vojvodina, Provincial Secretariat for the Environment and Sustainable Development, 2003.