

# Design of a Remediation Approach to Heavy Metals Contaminated Sediments in the Great Backa Canal (Serbia)

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**Introduction:** The Great Bačka Canal (GBC) is an integrated part of the large Danube-Tisa-Danube Hydro-system (DTD system). It is built at turn of the 19th century primarily for drainage of flooding areas and to expand inland navigable routes in this part of Europe. The GBC is 118 km long canal which links the Danube at Bezdán with Tisa at Becej (Fig. 1). Nowadays, GBC is practically non-navigable and without runoff due to accumulation of around 400,000 m<sup>3</sup> of sediment in the 6 km section of canal that runs through urban area of the Vrbas city (Fig. 1). The pollution in the GBC came in the second half of the 20th century as a result of the rapid development of industry and non-existent or inadequate treatment of communal and industrial wastewaters of the cities of Vrbas, Kula and Crvenka. This has resulted in poor water quality and impossibility of river transport because accumulation of sediments has resulted in a water depth of less than 0.5 m. It also represents a huge ecological problem and risk to the local and wider area, as part of the pollution from the GBC flows into the Danube and Tisa rivers. According to the Official report on the environmental conditions in the region, the GBC is a European environmental hot spot and one of the most polluted water bodies in Europe [1].



Fig. 1: GBC canal

**Methods:** The site characterization investigations and risk assessments performed in 2007 and 2014 provided the information on the nature and extent of contamination and the potential risks to human health and environment [2]. This work presents analysis of different options for sediment dredging, treatment of

dewatered sediment and final use/disposal of stabilized dredged material.

**Results:** According to detailed site investigation, around 75% of accumulated sediments are contaminated with heavy metals primarily copper, chromium, zinc and nickel (Class 3 and 4 according to national legislation [3]). General design considered five remedial options which included: two options for sediment removal, two methods for dewatering, stabilization/solidification (S/S) treatment of sediment with different S/S agents and final disposal of dredged material after dewatering but without any stabilization of pollutants. Material recovery and beneficial use of stabilized dredged material is also considered.

**Discussion:** The optimum solution is proposed, considering technical, financial, investment, operation and maintenance costs. It includes hydraulic dredging, dewatering on drying beds, S/S treatment with clay, final deposition and/or beneficial use. The proposed solution is chosen as the preferred solution in the Pre-feasibility study and General Design of dredging, depositing and remediation of sediment in Vrbas – Bezdán canal in Vrbas (PFS) which is approved by the Revision committee of the Provincial Secretariat for Urbanism, Construction and Environmental Protection of the Autonomous Province of Vojvodina.

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**References:** [1] SEPA (2009) The official report about environmental state, pp. 20; [2] Krčmar et al. (2017) *Sci Total Environ* **601–602**:833–844; [3] Official Gazette RS, no. 50/2012.