Treatment of Acid Drainage in a Uranium Deposit by Means of a Passive System.

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A pilot-scale passive system consisting of a permeable reactive multibarrier and a constructed wetland was used to treat a portion of the acid drainage waters generated in the uranium deposit Curilo, Bulgaria. The multibarrier consisted of an alkalizing limestone drain and an anoxic section filled with a mixture of solid biodegradable organic substrates (cow manure, plant compost, straw) and crushed limestone. This section was inhabited by a microbial community consisting of sulphate-reducing bacteria and other metabolically interdependent microorganisms and was intended for processes such as microbial dissimilatory sulphate reduction, biosorption by the dead plant biomass and additional chemical neutralization. The constructed wetland was characterized by an abundant water and emergent vegetation and a diverse microflora. *Typha latifolia* and *Phragmites australis* were the main plant species in the wetland but representatives of the genera *Scirpus, Juncus, Eleocharis, Carex* and *Poa* as well as different algae were also present.

The waters had a pH in the range of about 2.0 – 4.5 and contained radionuclides (uranium, radium), heavy metals (copper, zinc, cadmium, lead, nickel, cobalt, iron, manganese), arsenic and sulphates in concentrations usually much higher than the relevant permissible levels for waters used in agriculture and/or industry. The water flow rate through the passive system varied in the range of about 1 – 17 m^3/24 h, reflecting water residence times from about 300 – 18 hours. Efficient removal of pollutants was achieved by this system during the different climatic seasons, even during the cold winter months at water and ambient temperatures close to 0 ^oC.