ECOLOGICAL AND GEOCHEMICAL CONDITIONS OF SURFACE AND NEAR-SURFACE WATERS OF KYIV, UKRAINE

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Contamination of surface water and shallow groundwater is an urgent problem in Ukraine. Comprehensive monitoring programs are needed for managers and administrators to make good decisions regarding environmental safety. In particular, tracking the concentrations and distributions of the most dangerous pollutants, such as pathogens and metals, is a foundation for identifying environmental hazards and launching effective reclamation scenarios. Of greatest concern are the urban centers of Kyiv and Kharkiv, both million-plus cities, where the lack of appropriate environmental protection can increase the risk of infectious disease outbreaks.

As part of an ongoing assessment of the ecological-hygienic and medico-biological state of Kyiv, a set of surface water and shallow groundwater samples was collected and analyzed (ICP-MS) for major and trace-element concentrations. Surface-water samples included two lakes that are popular recreation sites. Although all waters had near-neutral pH, concentrations of several trace elements were found to be above the maximum permissible concentrations (MPC) in Sunny Lake (Sb to 63 mg/L, Mn to 337 mg/L) and Lower Telbin Lake (Al to 4.0 mg/L, Fe to 1.4 mg/L, As to 50 mg/L). Shallow groundwater samples had highly elevated concentrations of Fe (to 16.3 mg/L) and Mn (to 2.6 mg/L), as well as dissolved organic acids (to 25 mg/L). Two primary controls were established to explain the observed patterns in water quality: 1) water residence time coupled with the underlying geology; and 2) proximity to industrial effluent, including incineration and wastewater treatment facilities.

In addition, lake-bed sediment is locally contaminated (e.g., lead up to 100 times the MPC). Preliminary data on the metal content of aquatic vegetation suggests a potential threat to human health and the environment. As a whole, our data show that the sampled water bodies fail to meet minimum requirements for category II (cultural, household, recreational) use. Although other water bodies in the area meet category II standards, continued loading of bio-organic and man-made inorganic pollutants may degrade water quality in the future. This situation can only be avoided by the introduction of scientifically sound and administratively supported reclamation measures which are at the moment are slowly being implemented in Ukraine.