



The impact of mining activities on agriculture

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The present study was designed to assess environmental status of the territory of the city of Kapan and neighboring agricultural farms with an emphasis on the impact of the tailing repository and operation of the Kapan copper plant on soil, water and plant pollution.

The region has long been known for its abundant copper and polymetallic deposits with vein- and stockwork-type mineralization. Moreover, historically Kapan was the miners' city and a powerful copper mining and dressing plant has been operating there since 1846.

The performed geochemical survey and a sanitary-hygienic assessment of pollution of the Kapan's soils have indicated high contents of Cu, Pb, Ni, Mo and As vs. the background and Maximum Acceptable Concentrations (MAC).

The assessment of pollution levels of surface water, including natural and industrial streams, has indicated that unlike natural stream waters, mining waters from the adit and industrial stream waters were high in a number of toxic (Cd, As, Hg) and ore (Cu, Zn) elements. Activation of most chemical elements and particularly of heavy metals in water environment rapidly brings to pollution of environmental components (soils, plants, etc.), and as a result heavy metals enter the human organism via trophic chains.

So, in the frame of the research eco-toxicological studies were performed on accumulation of heavy metals (Cu, Ni, Cr, Zn, Sn, Mo), including high toxic elements (As, Hg, Pb, Cd) in agricultural soils and in the basic assortment of agricultural crops. The research covered agricultural lands within the bounds of the city and private plots in neighboring villages. Wholly, 24 vegetable, melon field, cereal (corn), oil-bearing (sunflower) species adding spicy herbs and fruits were studied.

It should be stressed that agricultural crops growing on the study sites are used provide food products not only by the population of this particular city and neighboring villages, but of other cities, too. It means that the average number of people exposed to a probable risk of eating contaminated food is some 55-60 thousand.

The performed pilot eco-toxicological studies enabled us to conclude that

1. Mining waters from adits and industrial waters contained high concentrations of toxic (Cd, As, Hg) and ore elements (Cu, Zn). Mixing of these waters with surface streams (used for irrigation) brings to the increase in concentration of a number of compounds and heavy metals. Chemical element concentrations in the waters did not reach MAC, nevertheless there exists a real ecological risk factor stepping from high coefficients of their cumulation in bio-environments.
2. The soils of the city and neighboring villages are polluted by a number of heavy metals (Ni, Mo, Cu, Cr, As).
3. Agricultural crop pollution is dominated by Cr, Ni, Pb, Cu. In some species Mo, Zn and Hg were determined, too.

The obtained data evidenced the hazard of crops use for dietary purposes. With regard for such pollution level and extension that threatens sustainable development of the territory, we consider it reasonable to execute some additional prior organizational, research and diagnostic, technological actions.