



Ecogeochemical mapping of urban soils as a tool for indication of risk factors

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Today, most global and local environmental issues are connected with the disturbance of natural equilibrium of chemical elements, which is manifested by two contrary but synchronous and interconnected geochemical processes: dispersion and concentration of chemical elements. The ecological consequence of those intensively running processes is pollution of environmental compartments.

High intensity and multi-component character of pollution is common to urban ecosystems. In this respect emphasized should be mining centers representing biogeochemical provinces where the whole range of geochemical processes connected with socio-economic activities of the man reaches its maximum and high natural background of chemical elements is coupled with their man-made load.

Ecogeochemical mapping of soils of mining regions and cities is one of major tools while assessing ecological state of the territory and indicating risk factors.

When systemizing indices of geochemical pollution, the produced case specific maps coupled with ecogeochemical mapping techniques are territorial generalization of levels of pollution and levels of its danger. This allows indicating its spatial differentiation and finally ranging the city's territory by features of the defined level of ecological risk. Moreover, ecogeochemical mapping of soils allows indicating dominating pollutants, peculiarities of their distribution and major risk factors as well and thus revealing risk groups in the population.

An alternative method of ecogeochemical mapping of urban soils which allows to notably reduce the process of pollution level assessment and identification of risk factor is that of remote sensing. Collation between spatially conjugated data of soil analyses and multi-zonal satellite images allows developing spectral characteristics (signatures) of pollution of the territory with heavy metals (HM) and development of appropriate assessment criteria which may be reflected as diverse case specific maps.

This work considers the outcomes of application of ecogeochemical mapping of urban soils while revealing risk factors on a case of one of Armenia's mining centers – the city of Kajaran. It lies within the bounds of sulfide copper-molybdenum deposit, on which base a mining and dressing set of plants – a city-forming enterprise – operates.

As established, the city's territory is polluted predominantly with major ore elements: Mo, Cu. At the same time locally indicated are anomalies of a series of elements found in the ore in insignificant concentrations: As, Hg, Cd. Proceeding from fact that soils are indicators of atmospheric pollution, investigated were HM contents in dust. As established, the dust of the quarry and tailing repositories contains high contents of Cu, Mo, Zn and also Hg, As, Cd.

The assessment of farm crops cultivated on polluted soils indicated Mo, Cu, Pb, Ni, Cr, Zn, Hg excesses vs. MPC in potatoes, beans, beetroot and dill. Thus, the dust of the quarry and tailing repositories and farm crops has been defined as the major risk factors.

Data on detailed above-surface investigations with clear spatial and temporal coordination were collated with multi-zonal satellite images (Landsat ETM +28m) of the territory. As a result spectral signatures have been obtained which allows differentiation of the territory by the value of summary pollution with HM.