

Contamination by Heavy Metals of Some Environmental Objects in Adjacent Territories of Solid Waste Landfill

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Abstract : Statement of Problem: The problem of solid wastes -dangerous sources of environmental pollution, is the urgent issue for Georgia as there are no waste-treatment and waste- incineration plants. Urban peripheral and rural areas, frequently along small rivers, are occupied by landfills without any permission. The study of the pollution of some environmental objects in the adjacent territories of solid waste landfill in Tbilisi carried out in 2020-2021, within the framework of project: "Ecological monitoring of the landfills surrounding areas and population health risk assessment". Research objects: This research had goal to assess the ecological state of environmental objects (soil cover and surface water) in the territories, adjacent of solid waste landfill, on the base of changes heavy metals' (HM) concentration with distance from landfill. An open sanitary landfill for solid domestic waste in Tbilisi locates at suburb Lilo surrounded with densely populated villages. Content of following HM was determined in soil and river water samples: Pb, Cd, Cu, Zn, Ni, Co, Mn. Methodology: The HM content in samples was measured, using flame atomic absorption spectrophotometry (spectrophotometer of firm Perkin-Elmer AAnalyst 200) in accordance with ISO 11466 and GOST P 53218-2008. Results and discussion: Data obtained confirmed migration of HM mainly in terms of the distance from the polygon that can be explained by their areal emissions and storage in open state, they could also get into the soil cover under the influence of wind and precipitation. Concentration of Pb, Cd, Cu, Zn always increases with approaching to landfill. High concentrations of Pb, Cd are characteristic of the soil covers of the adjacent territories around the landfill at a distance of 250, 500 meters. They create a dangerous zone, since they can later migrate into plants, enter in rivers and lakes. The higher concentrations, compared to the maximum permissible concentrations (MPC) for surface waters of Georgia, are observed for Pb, Cd. One of the reasons for the low concentration of HM in river water may be high turbidity - as is known, suspended particles are good natural sorbents that causes low concentration of dissolved forms. Concentration of Cu, Ni, Mn increases in winter, since in this season the rivers are switched to groundwater feeding. Conclusion: Soil covers of the areas adjacent to the landfill in Lilo are contaminated with HM. High concentrations in soils are characteristic of lead and cadmium. Elevated concentrations in comparison with the MPC for surface waters adopted in Georgia are also observed for Pb, Cd at checkpoints along and below (1000 m) of the landfill downstream. Data obtained confirm migration of HM to the adjacent territories of the landfill and to the Lochini River. Since the migration and toxicity of metals depends also on the presence of their mobile forms in water bodies, samples of bottom sediments should be taken too. Bottom sediments reflect a long-term picture of pollution, they accumulate HM and represent a constant source of secondary pollution of water bodies. The study of the physicochemical forms of metals is one of the priority areas for further research.

Keywords : landfill, pollution, heavy metals, migration

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