Characterization of Condition of the Sewage Water and the Level of the Soil Pollution by Polygons of Waste Matter of Republic of North Ossetia - Alania

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Abstract. The sewage water, the soil at the polygons of burial of waste and some limited approved rubbish dumps were tested in four areas of Republic of North Ossetia-Alania. With a view to reveal the effect of the polygons of waste for the condition of subterranean water were taken exposure potential lot quality of natural water, given seriate the classes of pollutions. The soil at the polygons of burial of waste and some limited approved rubbish dumps were tasted. The results of environmental-geochemical approbation of the land revealed: in different technological areas becomes useful increase of areas of technological source of pollution under the useful increasing factors of concentration of majority of toxic elements. Water migration of some chemical agents, including heavy metal ions resulting in the landfill, promotes the pollution of the sewage water. According to the level of increasing the pollution of the soils were made the chain of exceeding the maximum permissible concentration: Cu > Pb > Zn > Cd. The soil increased concentration of heavy metal ions, which of exceeding the MPC in several times.

1. Introduction
Two most social and ecological problems of nowadays are efficient of nature management and liquidation of adverse effect of polygons of waste matters and municipal solid waste landfill in the regions. The number of polygons of burial of waste is nearly 1500 in Russian Federation today that is significantly less than the waste landfills [1,2]. But the number of unauthorized dump is more than the number of authorized ones in many times, what leads to the environment solution and is a threat for human health. The location of polygons of burial of waste without maintenance of sanitary and hygienic and ecological requirements leads to the dumps and polygons become large-scale technogenic object and the source of long-duration of environment pollution. According to climatic conditions and the condition of using polygons of burial of waste the environment is exposed to different physical-mechanical, physico-chemical and biochemical changes with the formation transformation of a lot of dangerous elements.

There are two formal polygons of burial of waste and 11 conditionally authorized dumps, which do not equip with necessary facilities, have no water supply and sewage system [3]. The reason of the absence is the absence of financing for making them according to the aspirations to environmental
legislation. Monitoring of influence of the waste water and the heavy metal ions in the system of “land-plant” does not make on the territories of authorized dumps.

We need to assessment the kind of rick wastes [4] and the condition of the sewage water, the soils by polygons of waste matter and authorized dumps, as there is a risk of natural water substitution by the water of anthropogenic origin water. Because of high food waste humidity, there is always water in domestic waste, which replenishes by precipitation [4-6]. That’s why filtrate is forming translucent from brown to dark brown color liquid with expressed objectionable smell. The main source of the influence on the polygon for the sewage water goes from released from the waste the filtrate. Amphimorphic sewage water is characterized by high content of organic and inorganic toxic chemicals [7], pathogenic microflora and acid reaction. The sewage water is absorbed by the ground that is the reason of its chemical compositions changes [8-11].

The sewage water and the soil by the polygons of burial waste, using by municipal budget institution “Special Ecological Service” and Ltd. “Chisty Gorod”, and authorized dumps were researched in four areas of the republic: Prigorornay area (a1), Ardonksy area (a2), Kirovsky area (a3) and Mozdoksky area (a4).

The sampling of the surface and the savage water was made with the conformance of sanitary regulations 2.1.5. 1059-01 “Hygienic requirements for the protection of subterranean water from pollution” [12]. Chemical indicators of the subterranean water: pH, chemical absorption of the oxygen, presence of dry setting, the presencency of heavy metals were indicated to find out the influence of the location of the polygons of waste matters to the conditions of subterranean water. It was found the sewage water of polygons of burial waste has as high level of inorganic pollutants, as the pollution of the filtrate by organic substances according to the chemical meaning and the concentration of polluting substances [13].

As for the Ministry of Nature Resources and Environment and Ecology of Republic of North Ossetia – Alania, hydrochemical condition of water in area 3 (Kirovsky area) indicated the higher concentration of organic substances (Biological oxygen consumption)-8,4 (Permissible concentration). The quality of the water moved from 3 “b” to 4 ‘a’ grade of fineness that is keeping “Dirty” level.

The quality of water in area 2 (Ardonsky area) is 3 ‘a’ (the specific combinatorial index of water pollution 2,62) and 3 ‘b’ is keeping “Dirty” and “Very Dirty” levels. The containing of organic substances in water is 2.4 of permissible concentration. Deficiency of biology oxygen consumption doesn’t observe. Petrochemical and biogenic substances are within normal limits of the specific combinatorial index of the water pollution. As for the metals there are manganese, cuprum and zinc in water are within limits 2,0 of the specific combinatorial index of the water pollution.

The quality of water in area 1 (Prigorodny area) is between 2 and 3 grades of fineness that is “Slightly” and “Very” polluted the specific combinatorial index of water pollution is 1,06 and 3,32 [3].

Beside the illegal dumping, we should take into account the problem of oil pollution [14] of area 4 (Mozdoksky area). The researching of the solution for liquidation of the Mozdoksky man-made hearth have been started in 1990 and the solution is not completely found yet. The epicenter of the pollution is lenses of aviation kerosene on the subterranean water table, which are the result of the fuel communications of the military airfield.

According to the laboratory researching of the water sample the level of the subterranean water pollution by dissolved jet fuel on the Mozdok area is still high, changing from 1 to 8 MPC.

The research complex on the geological polluted area by heavy metals [15-18] was made within the study of the 15-ecological and geological environment on the areas with dangerous level of technogenic pollution on the territory of Republic of North Ossetia-Alania. The result of the research are in table 1.
Table 1. The researching result of content of heavy metal ions inside the ground of ecological areas of Republic of North Ossetia-Alania, mg/kl.

| Content       | Area 1          | Area 2          | Area 3          | Area 4          | mpc (mg/kl) according to Clarke [19] |
|---------------|-----------------|-----------------|-----------------|-----------------|--------------------------------------|
| Plumbum, (Pb)| 18,96±2,2       | 3,27±0,2        | 3,85±0,1        | 23,4±2,1        | 6,0                                  |
| Cadmium, (Cd)| 0,37±0,1        | 0,04±0,1        | 0,02±0          | 0,34±0,2        | -                                    |
| Copper, (Cu) | 12,8±0,9        | 10,3±0,7        | 4,8±0,1         | 14,8±0,9        | 3,0                                  |
| Zinc, (Zn)   | 24,3±1,9        | 4,43±0,9        | 4,57±0,8        | 23,7±1,4        | 23,0                                 |

The result of ecology-geochemical of the soil sample showed that in different technogenic areas the polluted areas increase with the essential expansion of concentration of majority toxic elements (especially in the extreme polluted area). [20,21]

The rising of concentration of the chemical elements for 2-5 levels of MPC was admitted beyond the bounds of Vladikavkaz industrial areas but by the main highways and metallurgical company. Higher content of Pb is found in the soils of Prigorodny and Mozdoksky areas: excess of MPC in 3,2 and 3,9 times properly. The raising concentration of copper in local polluted areas in 4,3; 4,9 times are the same as in Prigorodny and Mozdoksky areas. (figure 1)

![Figure 1. The content of ions of heavy metals in soils of ecological zones of North Ossetia-Alania.](image)

2. Conclusion

The following regularities were established for the studied territories. Wastewater contains chemicals in high concentrations. Water migration of chemicals, including heavy metal ions, formed in the body of the landfill, contributes to pollution of wastewater. The landfill soil can be characterized as a mixture of the end products of decomposition of organic components of natural soil, small particles of wood, glass, building materials, etc. Values for pH of this material (average of 9.8 to 10.1) are characteristic for the methanogenic phase. According to the degree of contamination of soil with...
heavy metal ions near unauthorized landfills, the following series can be built for exceeding the MPC: Cu<Pb>Zn>Cd. The soil contains elevated concentrations of heavy metal ions, which is several times greater than the MPC.

3. References

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