Natural Resource Management, GIS & Remote Sensing
Volume 2, Number 1, 25-31
April 2020
DOI: 10.22121/ngis.2020.201482.1012

Influence of the Torbeevo polygon of the MSW on the environmental condition of the Lyubertsy district of the Moscow region

Kashirskaya, Julia✉

MSc student of State University of Land Use Planning, Moscow, Russia

✉ 28_juliya@mail.ru

(Received: September 13, 2019/ Accepted: February 5, 2020)

Abstract In the modern world, there is the problem of ecosystem pollution by household waste. Glass, plastic, rubber, chemicals in the soil or in the air can decompose for hundreds or even thousands of years. The problem of municipal solid waste is ripe in cities. A person daily throws household garbage - packaging, paper, food waste and much more, and most of this waste is disposed of together.

The article presents the results of a study of the environmental impact of the Torbeevo solid waste landfill (hereinafter referred to as MSW) of the Torbeevo district of the Moscow Region in 2018. The current geoecological state of the landfill territory is determined. Measures are proposed to prevent, minimize the negative impact of the landfill on the environment of the district.

Keywords: nature management, environment, municipal solid waste, waste utilization.

1.Introduction

The MSW landfill is a complex integrated environmental protection facility. The purpose of the functioning of the solid waste landfill is to collect, dispose and bury human waste, mainly household waste. However, imperfections in the processing of waste in our country, in fact, allow the placement of all types of waste at the landfill, including industrial.

The Lyubertsy region is negatively affected by the Torbeevo MSW landfill, mainly due to its congestion. Residents of several settlements (Torbeevo, Kraskovo, Tomilino, Nekrasovka, etc.) note the frequent appearance of a sharp unpleasant odor that appears

as a result of the operation of treatment facilities, waste incinerators, landfills. This smell causes vomiting, dizziness, coughing, and suffocation in many adults and children.
Living near the landfill, the population experiences the effects of environmental pollution, because, first of all, sanitary and hygiene standards are violated.
Conducted field surveys (reconnaissance survey, engineering and geological work and topographic survey) showed the following:
- the area of the landfill occupied directly by waste is 11.4 ha, which is 90 % of the total area of the landfill;
- during operation, as a result of repeated occurrence of unauthorized fires, there was a difference in the height of waste storage at the landfill;
- the main mass of waste is located in the South-Eastern part of the landfill, where the height of the mass of waste reaches 15 meters, in the North-Western part this height ranges from 2 to 4 m.
Calculations based on field survey data allowed us to determine the volume and mass of waste placed in may 2015 within the area currently in use.
According to the inventory conducted by Rosprirodnadzor in 2018, the volume of waste was equal to 785 thousand m^3.
Thus, the size of the landfill at the landfill is increasing and occupies more and more areas, which leads to a deterioration of the environmental situation near the landfill «Torbeevo».

2.Research methodology

The research materials were used in the article - the components of the natural and technogenic environment of the territory adjacent to the Torbeevo solid waste landfill - surface water, atmospheric air, soil cover.
As part of the work, maps of environmental pollution in ArcGIS program were constructed using the Natural Neighbor algorithm based on the background distribution of pollution indicators.
The Torbeevo MSW landfill has been operating since 1975. The Torbeevo MSW landfill receives mainly solid household waste and only a small part of construction waste (reinforcing iron, wire, hardened cement mortar, etc.).
According to the inventory conducted by Rosprirodnadzor in 2018, the waste volume was equal to 785 thousand m^3 (fig. 1).

Figure 1 - Location of the landfill “Torbeevo”

The sanitary protection zone around the landfill is not respected; the nearest settlement is located 300 m from the upper border of the landfill. The anti-filtration facilities in the landfill are located on a site with an area of not more than 5.8 ha and are significantly depleted (with a landfill area of 12.8 ha.)

3.Results and Evaluation

Based on these studies, an excess of iron in drinking water is observed near the landfill. The only point not exceeding the MPC is located in the north-west of the site, where there are artificial protected water sources (fig. 2).

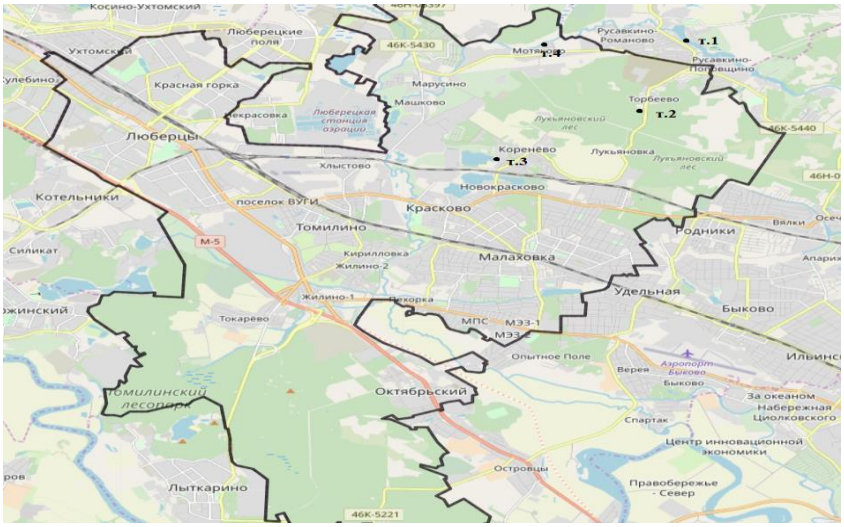

Figure 2 - Water sampling points in the Lyubertsy district

The obtained water samples do not meet the requirements of SanPiN 2.1.4.1074-01. Exceeded standards for turbidity, color, and iron, manganese and sulfide content near the solid waste landfill. Water has a foreign taste (fig. 3).
Based on the data obtained, a map in the ESRI ArcGIS program was compiled in drinking water.

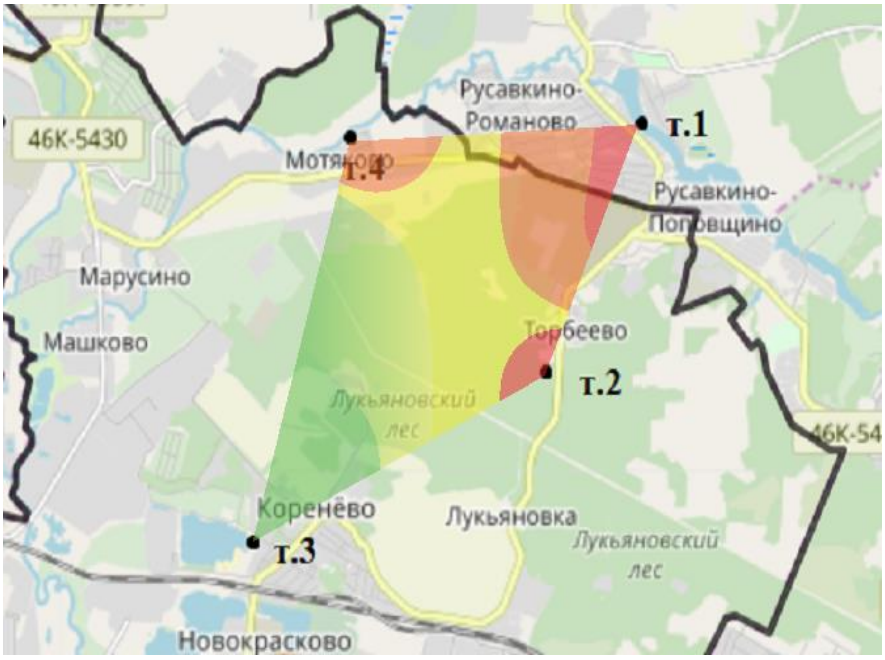

Figure 3 - Total iron content (mg / l) in water sources in the study area

Analysis of the soil cover showed that 80% of all values of the concentration of heavy metals in soils of the Lyubertsy region are below the regional background. Only in 4% of cases are excesses in the Pb content up to 3 times.
According to the obtained maps, one can see significant pollution of soils with heavy metals in the eastern part of the city, where there is an excess of cobalt, copper, lead and zinc. Given the toxicity of lead and its danger to humans, it can be concluded that these soils are hazardous (fig. 4).

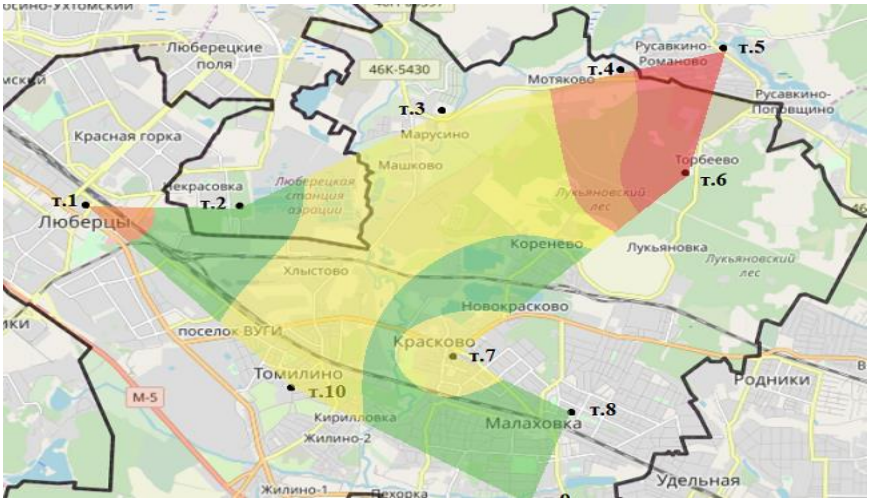

Figure 4 - The content of heavy metals in the soil of the territory of the Lyubertsy district

Based on the research results, the following conclusions can be drawn:
1) The general ecological state of the study area can be assessed as unsatisfactory, due to the high degree of pollution of water and soil.
2) The most polluted are the western (the city of Lyubertsy) and the eastern territories of the region.
3) Landfill "Torbeevo" is one of the largest sources of toxic pollutants in the area, negatively affects the livelihoods of local residents. The soils around the landfill are heavily contaminated with heavy metals. Water resources - underground and surface waters contain elevated concentrations of heavy metals, especially iron, drinking water does not meet quality indicators.

Measures to improve

As a measure to improve the environmental situation in the area, it is proposed to introduce the technology of high-loading landfill. Such polygons are already used in developed countries on the site of preserved polygons.
Recycling remains the most effective, since sorting garbage by physical properties (division into metals, plastic, glass, wood, etc.) makes it possible to recycle waste several times. Therefore, it is necessary to strengthen the work on sorting garbage in the upper layers of the landfill, which will reduce the volume of existing garbage. In the upper layers of the polygon, there is still no strong re-sealing and sorting of garbage is quite possible.
Another measure to reduce the anthropogenic impact on the environment of the study area is the reclamation of the landfill in the future. Remediation measures consist in the systematic restoration of environmental components, in this case, soil and water quality. The soil on the site of the landfill will probably not be able to maintain its original properties, but it is possible to improve its condition by gradually planting soil-improving

crops-siderates (legumes, mustard). Also, small-leaved shrubs can be planted on the landfill.

For landfills, ecomonitoring is developed to monitor the quality and quantity of waste entering the landfill; the technical condition of engineering structures; changes in the quality of surface, underground water and atmospheric air; soil and vegetation cover; noise pollution.

The monitoring program includes the following observations for:

- chemical composition and amount of filtrate formed in the landfill body;
- changes in the quality of ground water outside the landfill;
- air pollution, both in the working area on the territory of the landfill and outside it;
- compliance of waste entering the landfill with the declared hazard level.

Thus, a systematic reduction in the concentrations of toxic substances in soils, water horizons and water sources, and in the atmospheric air will help to improve the environmental situation in the Lyubertsy district.

4.Conclusion

To reduce environmental stress in the area of the Torbeevo solid waste landfill in soil and ground and surface water, I propose the following action plan:

First of all, it is necessary to close the waste flow into the landfill, recycle and dispose of the garbage on its territory. This measure is the first step to the conservation and subsequent reclamation of the landfill.

As a protection of soil surfaces from wind and water erosion, landscaping is necessary. A part of the forest stands has been cut down around the landfill; therefore, on the slopes and terraces of the landfill, it is necessary to plant protective trees and shrubs, and sow perennial grasses on the slopes. As part of a six-row protective strip - drooping birch, acutifoliate maple, common ash, soft hawthorn.

In addition to protecting soils from erosion, the forest protection strip will partially limit emissions of hydrogen sulfide into the air, thereby improving air quality in the nearest settlements.

As an additional measure to improve the environmental situation in the area, I propose the introduction of technology for the construction of a high-load landfill. Such landfills are already used in developed countries in place of canned landfills.

Thus, the systematic decrease in the concentration of toxic substances in soils, water horizons and water sources will contribute to improving the environmental situation in the Lyubertsy region.

Reference

1. The Russian Federation. Laws. Land Code of the Russian Federation. - M.: Prospect, 2018. -224 s.
2. Russian Federation. Laws. On Environmental Protection: Federal Law of the Russian Federation No. 7-FZ of January 10, 2002. // Russian newspaper / [Electronic resource]. - Access mode: www.rg.ru
3. Bryzgalina E.V. Ecology of Moscow Region / E.V. Bryzgalina - M .: Modern Teradi, 2016 .-- 606 p.
4. Landfills for the deposit of municipal solid waste [Text] / Ya.I. Weisman, V.N. Korotaev, Yu.V. Petrov. Perm state tech. un-t - Perm, 2018 .-- 150 s.
5. Hygienic requirements for the placement and disposal of production and consumption waste. SanPiN 2.1.7.1322-03; DEAN - M., 2014 .-- 803 p.
6. Ecology of the city: textbook. allowance / under. ed. V.V. Denisova. - Ed. Phoenix, 2015 .-- 568 p.
7. Sheludyakov L. N., Kosyanov E. A., Markonrenkov Yu. A. Complex processing of silicate waste; Science - M., 2014 .-- 172 p.
8. Marinenko E.E., Belyaeva Yu.L., Komina G.P. Development trends of drainage water and methane-containing gas collection and treatment systems at solid domestic waste landfills: Domestic and foreign experience / E.E. Marinenko, Yu.L. Belyaev, G.P. Komina - St. Petersburg: Nedra, 2017.160 s.
9. Imalitdinov, V. A. Improvement of the waste management system / V. A. Imalitdinov // Solid household waste. - 2011. - n 3. - p. 42-46.
10. Report of the Ecoanalysis group “Natural and Environmental Situation of the Lyubertsy District of the Moscow Region”. M .: Promizdat, 2017 .-- 219 p.