

Technogenic Disturbance of Soils under the Influence of Industrial Enterprises

Ro`ziyeva Inobat Jo`rayevna

Associate Professor, Doctor of Philosophy in Biological Sciences, Denov Institute of Entrepreneurship and Pedagogy

Raupova Nodira Bahramovna

Professor, Doctor of Biological Sciences, Tashkent State Agrarian University
inobatjurayevna1985@gmail.com

Received: 2024, 15, Jan

Accepted: 2025, 21, Feb

Published: 2025, 18, mar

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Annotation: Due to the population growth and high demand for products in the Tashkent region, the spread of various chemical elements from industry, manufacturing, mining and factories currently leads to soil pollution in the regions. The role of industrial sectors in technogenic pollution in changing the ecological state of the regional ecosystem under the influence of individual industrial sectors located in three districts of the Tashkent region, namely Akhangaron district, Bekabad city and Almalyk city, is analyzed. Dark gray and typical sierozems, brown, gray-meadow, typical and light sierozems, meadow-gray, meadow and marsh-meadow soils are widespread in the region.

Keywords: Industrial enterprises, waste emissions, chemical compounds, environmental status.

The object of research is the soils developed in the desert-oasis regions of the Tashkent region.

Research methods. During the study, soil samples were taken from 7 industrial sectors of the

Tashkent region based on established standards. Also, during the study, work was carried out to determine the ecological state of soils and study their properties. Laboratory experiments were conducted using modern methods in soil science, biochemistry, microbiology, chemistry and other related areas, based on internationally approved standards.

Discussion of results. In recent years, the ecological state of soils has changed, and its technogenic pollution has been increasing every year. This is directly caused by the release of various chemical elements into nature as a result of industry, production, development of mines, and the activities of factories and factories. As a result, changes in the physicochemical and agrochemical properties of lands intended for agricultural production lead to a decrease in soil fertility. Therefore, today, with the increase in the world population, satisfying people's needs for environmentally friendly food products is one of the important issues.

Data on the year of commencement of operations of industrial sectors located in the study areas were analyzed using their official websites (1-table).

1-table. Industries that cause soil pollution in Tashkent region

Province	District/city	Sanoat tarmoqlari nomi	Year of construction
Tashkent	Ahangaron	Angren IES	1957
		New Angren IES	1976
		Angren Oil Base	1992
	Bekabad city	Uzbekistan Metallurgical Combine JSC	1944
		Bekobodcement AJ	1926
	Almalyk city	Almaliq KMK AJ	1949
Ammophos-Maxam AJ		1969	

In addition, as examples of the main industries in the Tashkent region, we can cite ferrous metallurgy, electric power, fuel, mechanical engineering and metal processing, non-ferrous metallurgy, chemistry and petrochemicals, forestry, building materials, wood processing and cellulose and paper, food processing, etc.

Since Tashkent region is an industrialized region in the republic, various harmful substances have a negative impact on all living organisms. In particular, many chemical compounds harmful to humans are released into the atmosphere from industrial enterprises in the region. In addition, technogenic pollution of soils is observed under the influence of waste from industrial enterprises. As a result, the ecological state of soils changes, leading to a decrease in their fertility. In many countries of the world, there are no practical recommendations and skills for the effective use of soils in industrialized areas.

The negative impact of some industrial sectors in this region on irrigated soils was studied. During the study, the role of industrial sectors in technogenic pollution in changing the ecological state of the regional ecosystem under the influence of the activities of some industrial sectors located in three regions of the Tashkent region, namely, the Akhangaron district, the city of Bekabad and the city of Almalyk, was analyzed.

According to the official website of the Angren Thermal Power Plant, the construction of the Angren TPP began in 1957, and the New Angren TPP in 1976. These TPPs operate to provide electricity to the population. The Angren TPP is located on the right bank of the Ahangaron River, operates on low-quality brown coal, and annually emits 42,610 tons of heavy substances into the atmosphere, including 16,929 tons of ash and 25,581 tons of coal dust [5]. The areas near the TPPs are polluted with coal slag, heavy metals, dust, and ash elements.

The Angren oil base serves to meet the population's demand for transport fuels. As a result, the transportation and filling of petroleum products has a negative impact on the ecological state of

soils. This network releases aromatic hydrocarbons and heavy metals into the environment.

The Almalyk Mining and Metallurgical Combine, founded in 1949 in the city of Almalyk, is a JSC. Today, this combine is engaged in the extraction of silver, gold, lead, zinc, iron, amethyst, copper and other metal products. As a result of its operations, this combine releases heavy metals, dust and other harmful chemical compounds into the environment. This leads to environmental pollution of the area.

Ammophos-Maxam JSC began its activities in 1969, and the organization is one of the leading manufacturers of nitrogen and phosphorus fertilizers in the Republic of Uzbekistan. Ash elements, heavy metals, dust and other elements are released into the environment from Ammophos-Maxam JSC. In addition, a large amount of ash elements have accumulated in the form of mountains at the landfills of Ammophos-Maxam JSC. This has had a negative impact on the ecological situation of the region.

Uzbekistan Metallurgical Combine JSC is one of the largest enterprises in the production of ferrous metallurgy in our country. Uzbekistan Metallurgical Combine JSC began its activities in 1944, and the combine produces a wide range of metal products for the needs of the population. During the process of heating and melting metal at the combine, a number of harmful elements are released into the environment in the form of smoke from its chimney.

The last area selected as the object of the study is Bekobodcement JSC. This enterprise produces high-quality cement products for the population. Bekobodcement JSC began its activities in 1926, and it was considered the first cement production enterprise in our country. In addition, Bekobodcement JSC is still one of the enterprises with high capacity for cement production. This industrial enterprise emits ash, heavy metals, nitrogen oxides, sulfur oxides, carbon monoxide, dust and other elements into the environment. Today, not only in our country, but also around the world, as a result of the increasing population, the number of industrial sectors is also increasing. The emissions from industrial enterprises have a negative impact, first of all, on the atmospheric layer, secondly, on the biosphere layer, thirdly, on the lithosphere layer, and fourthly, on the hydrosphere layer.

Soils of the region. In the Tashkent region, dark and typical gray soils, brown, gray-meadow, typical and light gray soils, meadow-gray, meadow and swamp-meadow soils are found. Irrigated soils in the Tashkent region have developed in various lithological, hydrogeological and soil-climatic conditions, distributed in the subtropical foothill semi-desert region, the foothill sloping plains consisting of loess and alluvial deposits of the typical gray soils region, and the terraces of the Chirchik, Ahangaran and Syrdarya rivers. Automorphic, semi-hydromorphic and hydromorphic soils are distributed throughout the region, consisting of genetic groups such as irrigated typical gray soils, irrigated gray-meadow, meadow-gray soils, irrigated meadow soils, irrigated meadow-swamp soils. Since Tashkent region is a mountainous region, the distribution of soils also has its own characteristics. In some areas of the region, the water table is close to the surface layer of soils, so it is prone to water erosion and salinization processes. The relief of Tashkent region is low-elevation, wavy. In addition, the soils in the region are diverse depending on the level of groundwater and relief conditions, as well as different mechanical composition, clays, heavy, medium, light loams and sandy loams. On alluvial terraces I and II, meadow and meadow-marsh soils provide the opportunity for the formation of gley and hornblende layers under conditions of shallow water regime [2].

Salinization processes are accelerating in soils found in some foothill and sub-mountainous areas of the Tashkent region, including in the districts of Buka, Pskent, Bekabad, Lower Chirchik, Middle Chirchik, Upper Chirchik, and Chinaz. This is directly caused by flooding of lands and rising groundwater levels. All this has led to disruption of natural geochemical processes, changes in the salt balance in geochemical landscapes, activation of salinization processes, and the circulation of salt reserves [1]. The following soils are found around the industrial sectors of the Tashkent region where scientific research was conducted (2-table).

2-table. Soils found in the study area

Province	District/city	Main source of pollution	Soils
Tashkent	Bekabad	Uzbekistan Metallurgical Plant JSC	Irrigated gray-meadow soils
		Bekobodcement JSC	Irrigated gray-meadow soils
	Ahangaron	Angren TPP	Irrigated dark gray soils
		New Angren TPP	Irrigated dark gray soils
		Angren Oil Base	Irrigated dark gray soils
	Almaliq	Almalyk Mining and Metallurgical Combine JSC	Irrigated typical gray soils
Ammofos-Maxam JSC		Irrigated typical gray soils	

Irrigated gray-meadow soils are located on the III and II upper terraces and consist of loess and alluvial deposits. These soils are located on the lower part of the slopes of the III upper terrace at a slope of 1-20, 2-50, and consist of unwashed and slightly washed soils. At a slope of 2-50, 5-80, medium and strongly washed soils are separated in the middle and upper parts. Their area is relatively small. Due to the surface of the silt waters, salinization processes are observed. Irrigated meadow soils are typical and distributed in the region of light gray soils. Their largest areas are found on the I and II upper terraces of the Syrdarya, Chirchik and Angren rivers. They were formed in places where groundwater is close to the surface [6].

Irrigated dark gray soils: soils are distributed in the foothills and lowlands. According to the mechanical composition, they are heavy loamy, in some places slightly rocky, sometimes sand-gravel deposits are found at a depth of 50-100 cm. The humus content fluctuates around 1.7-2.6%, nitrogen 0.12-0.20%, total phosphorus 0.10%, and total potassium 1.5-2.8% [4].

Typical irrigated gray soils are located on the III and IV upper terraces of the region and consist of loess-like deposits. The relief of these soils develops under diverse conditions. The humus content in the upper arable layer of soils is 1.200% in unwashed soils, 0.913% in poorly washed soils, 0.860% and 0.550% in moderately and strongly washed soils. In addition, mobile phosphorus is 10.8 mg/kg in poorly washed soils, and 4.7-5.6 mg/kg in moderately and strongly washed soils. In some places, although poorly washed, mobile phosphorus is 36.0 mg/kg [5].

In conclusion, internationally approved standards and modern methods were used in the laboratory study of soil properties in industrialized areas, and in the implementation of technical and biological remediation technologies for cleaning man-made contaminated soils..

References

1. Axmedov A.U., Burxanova N.H., Turdaliyev J.M., Fahrutdinova M.F // Toshkent viloyati bo'z tuproqlar mintaqasi o'tloqi va botqoq-o'tloqi tuproqlaridagi tuzlar miqdori va zaxiralari // O'zbekiston zamini 2/2021 y. B. 62-67.
2. Mosaffaie J., Jam S.A., Tabatabaei R.M, Kousari.R.M. Trend assessment of the watershed health based on DPSIR framework // Land Use Policy 100 (2021) 104911. – P. 1-9.
3. Gorbacheva T. T. Lusia A. V., Ivanova L. A. Ximicheskaya melioratsiya nefelinovyx peskov s primeneniem osadka stochnyx vod regionalnogo predpriyatiya vodoprovodno-kanalizatsionnogo xozyaystva. Vestnik MGTU. – 2021. T. 24, № 1. S. 88-96.
4. Erofeevskaya L. A., Klychkin A. K., Klychkin A. A., Gabyshev A. A. Issledovanie vliyaniya faktorov okrujayushchey sredy na mexanizm biozarajeniya tekstolitov pri ekspozitsii v usloviyax otkrytoy ekosistemy // Polzunovskiy vestnik. 2021. № 3. – S. 189-200.

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5. Jidkov A.N., Kojenkov L.L. Osobennosti biologicheskogo etapa rekultivatsii poligonov skladirovaniya vtorichnykh materialov promyshlennosti // Lesnoy vestnik – 2019, tom 23, № 2. – С. 92-97.
 6. Kamanina I.Z., Kaplina S.P., Chigoeva D.N. Opredelenie toksichnosti pochv v zone vliyaniya gornodobyvayushchey promyshlennosti // Nauchnoe obozrenie. biologicheskie nauki № 3. – 2021. – S. 21-26.