HUMAN IMPACT ON SANDY DAHA SOILS

Akbarov Golibjon Alisherovich
Kokand State University

Abstract
This article scientifically analyzes the impact of anthropogenic factors on soil and sand layers. In recent decades, soil resources have been degraded as a result of global climate change, urbanization, industrial waste, agricultural activities, and the expansion of the transport system. The aim of the study is to determine the impact of human activities on the physicochemical and biological properties of soil, as well as on the structure of sand . The results show that anthropogenic impact leads to a decrease in soil fertility, reduces microbiological activity, and disrupts the ecological balance.

Keywords : anthropogenic factors, soil degradation, sand erosion, salinity, ecological stability, deflation.

Introduction

Sandy soils contain more than 70% sand , are characterized by rapid water infiltration, poor nutrient retention, and high susceptibility to wind erosion. Therefore, such environments are not suitable for traditional agricultural activities, and ensuring sustainable production is a serious agroecological problem [1].

Sand dunes play an important role in stabilizing shifting sand and have a significant impact on wind speed and sediment dynamics. However, the relationship between nutrient accumulation and environmental factors is still poorly understood [2].

arid regions and the assessment of ecological limits of their use are important factors in the sustainable development of land resources. For this purpose, the "limiting factors exclusion method" developed has been proposed as an effective approach to determine the arable potential of sandy soils [3].

When soft rocks are mixed into sandy soil, its physicochemical properties improve, the number of aggregates increases, and the content of organic matter, phosphorus, and potassium increases . This approach serves as an effective technological basis for the reclamation of sandy lands [4].

However, anthropogenic pressures, tourism, mining, and transportation activities are causing severe erosion of sandy beaches. As human factors disrupt natural sand transport, the stability of coastal systems is disrupted [5].

In sandy soils, rapid water loss and high nutrient loss limit productivity. Therefore, reclamation technologies have been developed, but their effectiveness has not yet been fully evaluated [6].

Studies conducted in the Central Fergana region have revealed the genesis, formation patterns, and changes in the influence of anthropogenic factors on sandy and irrigated sandy soils. These studies provide a scientific basis for assessing the physical-mechanical dynamics and ecological state of the soil [7].
In general, according to FAO (2022), 33% of agricultural land worldwide is degraded, and in Uzbekistan and Central Fergana, these processes are mainly taking place in the form of salinization, deflation, and erosion. As a result of anthropogenic impact, soil fertility and the stability of sand structures are being undermined.

Research methods: The research methodology was formed based on an integrated approach, and the methods of Agrochemical Analysis, Physical-Geographic Analysis, Biological Monitoring, and Comparative Analysis were considered and studied.

Results and discussion: It represents the impact of human activities on land resources, including soil and sand . These factors can change the quality of soil and sand, which affects agriculture , ecology , and the reclamation and management of land resources in general. The main aspects of anthropogenic impact include changes in the chemical, physical, and biological state of the land, including soil structure, water absorption properties, nutrient availability, quality, and others .
Anthropogenic factors affect soil and sand in various ways. These impacts can lead to: **Soil erosion** is the washing away of topsoil by human activities. This phenomenon occurs on agricultural lands, during construction and other infrastructure works. Erosion reduces soil fertility. **As a result of salinization,** soil can be stressed by water and wind. Improper irrigation practices in agriculture can lead to soil salinization.
This degrades the quality of the soil, reduces the availability of nutrients, and lowers the soil's fertility. **Chemical pollution** Industrial activities, the use of pesticides and fertilizers , and organic waste lead to chemical pollution of soil and sand. This reduces soil fertility. **Mechanical structure of the soil** Construction, transportation, and industrial activities change the mechanical structure of the soil , which affects the water absorption and air permeability of the soil.
Criteria for assessing the impact of anthropogenic impact on the quality of soils and sands is calculated as follows. **Physicochemical criteria include soil density, mechanical composition** , humus salts, gypsum content, as well as their water absorption and air permeability properties, etc. **Water absorption properties** Measuring soil infiltration rate and depth distribution is important in assessing the efficiency of soil use in agriculture . **Soil erosion resistance** is an assessment of the degree of erosion, i.e., the resistance of the soil to being washed away by wind or water. **Chemical criteria pH is** an assessment of whether the

soil is acidic or basic. Anthropogenic influences, such as chemical fertilizers and industrial wastes, can change the pH **level** . **Nutrient availability is** the amount of essential nutrients needed by plants in the soil, such as nitrogen, phosphorus, potassium, and trace elements. Anthropogenic activities can reduce or increase these nutrients . Salinity is a **measurement** of the level of salinity in the soil, especially as a result of agricultural and irrigation activities. Salinity reduces soil fertility.

Biological criteria The activity of microorganisms in the soil, which is important in determining the ecological state of the soil in areas where plants grow. Humus **content** Soil organic matter, in particular humus, determines the fertility and water-holding properties of the soil. When the humus content decreases, the biological activity of the soil changes.

General impact of anthropogenic impact on soil quality Proper land reclamation, fertilization and proper irrigation practices help improve soil quality. For example, the application of organic fertilizers or improving the mechanical structure of the soil increases the score. Negative consequences of anthropogenic impacts, such as a decrease in soil fertility due to salinization or chemical pollution. Anthropogenic factors have a significant impact on the quality of soil and sand. These impacts, especially agricultural and industrial activities, directly affect the structural state, chemical composition and biological activity of the soil. Analyzes based on physical, chemical and biological criteria when assessing the quality of soil and sand help determine the negative or positive impact of anthropogenic impacts on soil quality . This plays an important role in ensuring effective soil use and environmental sustainability .

Conclusion

Human factors are causing physical, chemical and biological changes in the soil layers of sandy soils . As a result, the ecological balance is disrupted, and fertility and biodiversity are decreasing. In the conditions of the Fergana Valley, the main causes of such changes are the intensity of agricultural activity, industrial waste, transport pollution and improper management of water resources.

The following measures are important for maintaining ecological stability in sandy areas: soil reclamation and restoration of organic matter balance; creation of green zones and protective trees against wind erosion; ecological recycling of industrial waste; introduction of water-saving irrigation technologies; development of an ecological monitoring system based on GIS. Measures such as these serve to reduce the impact of human activities on sandy soils and ensure ecological stability.

References

[1] de Holanda, S. F., Vargas, L. K., & Granada, C. E. (2025). Challenges for sustainable production in sandy soils: A review. Environment, Development and Sustainability, 27(1), 53–66.

[2] Cai, L., et al. (2025). Sand barriers promote the accumulation of soil nutrients in sandy areas under different ecological conditions: A meta-analysis. Journal of Environmental Management, 381, 125235.

[3] Xu, Y., et al. (2022). Evaluation for appropriate tillage of sandy land in arid sandy area based on limitation factor exclusion method. Land, 11(6), 807.

4] Guo, Z., et al. (2023). The soft rock can promote the improvement of aeolian sandy soil in Mu Us Sandy Land, China. Scientific Reports, 13(1), 11813.

[5] Brown, A. C., & McLachlan, A. (2002). Sandy shore ecosystems and the threats facing them: Some predictions for the year 2025. Environmental Conservation, 29(1), 62–77.

[6] Musei, S. K., et al. (2024). Sandy soil reclamation technologies to improve crop productivity and soil health: A review. Frontiers in Soil Science, 4, 1345895.

[7] Yusupova, M. A., et al. (2023). Changes in the morphological structure and mechanical properties of sandy soils. IOP Conference Series: Earth and Environmental Science, 1138(1).