

ASSESSING SOIL FORMATION, DEGRADATION, AND RESTORATION IN THE JIZZAKH REGION USING GEOINFORMATION TECHNOLOGIES

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Abstract

This article examines the characteristics of the soil cover in the Jizzakh region, including its formation, major environmental issues, and modern methods of study and monitoring using geoinformation technologies (GIS). The processes of soil formation influenced by climate, relief, and anthropogenic factors, as well as the impact of irrigation systems on soil composition, are described. Special attention is paid to methods of soil mapping and spatial data analysis, which allow for a more accurate assessment of soil degradation and the development of effective soil restoration measures. The study is based on an analysis of scientific sources, remote sensing data, and GIS cartography.

Keywords

Jizzakh region, soil science, soil formation, soil degradation, erosion, salinization, geoinformation technologies, remote sensing, soil mapping, soil restoration.

Theses

1. Geographical and Climatic Influence on Soil Formation

- a. The Jizzakh region's soils are shaped by arid climatic conditions and diverse topography, leading to variations in soil composition and fertility.
- b. The balance of temperature and precipitation affects the processes of soil erosion, salinization, and organic matter decomposition.

2. Main Soil Types of the Jizzakh Region

- a. The region features several soil types, including sierozems (grey desert soils), meadow sierozems, solonchaks, solonetz soils, mountain brown soils, and alluvial soils.
- b. Each soil type has distinct properties that determine its agricultural potential and degradation risks.

3. Impact of Irrigation and Anthropogenic Factors

- a. Extensive irrigation has led to an increase in secondary salinization and groundwater level rise, affecting soil structure and crop productivity.
- b. Unsustainable agricultural practices and the excessive use of fertilizers and pesticides accelerate soil degradation.

4. Application of Geoinformation Technologies in Soil Analysis

- a. GIS and remote sensing technologies facilitate precise soil mapping, monitoring soil health, and identifying erosion and salinization trends.
- b. Satellite data from Sentinel-2 and Landsat provide insights into long-term changes in soil cover.

5. Findings from Soil Monitoring Using GIS and RS

- a. Multispectral analysis reveals a 12% increase in salinized lands over the past decade.
- b. The southeastern districts exhibit severe erosion due to improper land use.

c. GIS-based analysis helps in decision-making for land conservation and agricultural planning.

6. Proposed Solutions for Soil Conservation and Restoration

a. Development of **reclamation systems** to improve drainage and reduce groundwater levels.

b. Implementation of **drip irrigation** to optimize water consumption and prevent further salinization.

c. Use of **gypsum treatment** to mitigate soil salinization effects.

d. Adoption of **GIS-based planning** for precision agriculture and sustainable land management.

e. Enhancement of **crop rotation techniques** to improve soil resilience and fertility.

7. Conclusion and Future Prospects

a. A multi-disciplinary approach integrating GIS, remote sensing, and agronomic solutions is essential for sustainable soil management.

b. Digital soil maps generated through GIS enable more effective land-use planning and conservation strategies.

c. Continued monitoring and implementation of advanced soil restoration practices will ensure the long-term productivity of the region's soils.

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