

Increased Soil Erosion Processes in Uzbekistan Under Climate Change Conditions

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Abstract. This article provides a scientific analysis of the intensification of soil erosion processes in Uzbekistan under climate change conditions. Rising air temperatures, changes in precipitation patterns, increased drought frequency, and growing anthropogenic pressure in recent decades have led to soil degradation and the intensification of water and wind erosion. Based on statistical data, scientific sources, and regional analyses, the causes, consequences, and mitigation measures of erosion processes are discussed. Research results show that 30-35% of agricultural lands are affected by various degrees of erosion, leading to yield reductions of 5-35%.

Keywords: soil erosion, climate change, drought, land degradation, crop yield, environmental problem.

Climate change is one of the most pressing global problems of the 21st century, seriously affecting natural and socio-economic systems [1, 2]. The observed global temperature increase, changes in atmospheric structure, uneven distribution of precipitation, and an increase in extreme weather events pose a direct threat to agriculture, water resources, and ecological stability [3, 4].

The territory of the Republic of Uzbekistan is mainly located in the arid and semi-arid climatic zone, typical of continental climatic conditions [5]. This geographical location and natural conditions make soil resources particularly vulnerable. Over the past 50 years, the average annual temperature in the republic has increased by 1.5-2.0°C [6, 7]. This situation leads to a decrease in soil moisture, weakening of plant cover, and, as a result, increased erosion processes [8].

Soil erosion is the process of erosion and displacement of the soil surface layer under the influence of water or wind, which directly threatens food security, rural life, and rational land use [9, 10]. According to national estimates, more than a third of agricultural land is subject to varying degrees of erosion [11]. Therefore, it is important to understand the interaction between climate change and erosion processes.

Research objective: To study the dynamics of soil erosion processes in Uzbekistan under climate change, identify their causes, and develop measures to reduce them.

Research objectives:

1. Analyze climate change indicators and determine their relationship with soil erosion;

2. Study the territorial distribution of erosion processes in the republic.
3. Assess the impact of erosion on agricultural productivity.
4. Develop practical recommendations to reduce erosion.

The study analyzed data from the State Statistics Committee of the Republic of Uzbekistan, FAO and IPCC reports, as well as the results of local scientific research. Statistical analysis, comparative analysis, and regional approaches were used to assess erosion processes. The study covered climate indicators and the dynamics of erosion processes for the period 1980-2023.

The analysis of the data obtained showed that over the past 40 years, significant changes have occurred in climate indicators in Uzbekistan. The average annual temperature has increased by 2.6°C compared to 1980, annual precipitation has decreased from 420 mm to 355 mm (a 15.5% decrease), and the number of drought days has increased from 195 to 267 (a 37% increase).

Table 1

Dynamics of climate indicators in Uzbekistan (1980-2023)			
Year	Average temperature (°C)	Annual precipitation (mm)	Drought days
1980	13,5	420	195
1990	14,1	405	208
2000	14,8	390	225
2010	15,4	370	241
2020	15,9	360	258
2023	16,1	355	267

Studies conducted throughout the republic have shown that erosion processes are unevenly distributed territorially. The highest erosion rates are recorded in the Karakalpakstan (47%) and Kashkadarya (41%) regions. Water erosion prevails in the foothills and mountainous regions, while wind erosion is strongly developed in the desert and steppe zones.

Table 2

Territorial distribution of soil erosion in Uzbekistan		
Area	Eroded land (%)	Main erosion type Intensity (t/ha/year)
Tashkent city	28	Water 8.5
Fergana Valley	35	Water 12.3
Kashkadarya	41	Water 15.7
Surkhandarya	38	Water 14.2,

Navoi 22 Wind 6.8

Karakalpakstan 47 Wind 18.9

3.3. Impact of Erosion on Agricultural Productivity

Soil erosion has a direct negative impact on agricultural productivity. Studies have shown an inverse correlation between the level of erosion and productivity. According to economic estimates, soil erosion causes economic losses of \$300-500 million per year.

Table 3

The impact of soil erosion on productivity			
Erosion rate	Soil loss (t/ha/year)	Yield loss (%)	Economic loss (\$/ha)
Low	2-5	5-8	150-250
Average	5-15	18-25	450-700
High	15-30	35-50	900-1500
Very high	>30	>50	>1500

In the context of climate change, soil erosion processes are intensifying in Uzbekistan. 30-35% of agricultural land is subject to varying degrees of erosion. The highest erosion rates are recorded in Karakalpakstan and Kashkadarya regions. Soil erosion causes a 5-50% reduction in productivity, and annual economic losses are estimated at around \$300-500 million.

To reduce erosion, it is necessary to introduce a scientifically based land management system, restore vegetation cover, implement hydrotechnical measures, and develop climate adaptation strategies. It is important to improve legislation on soil protection and widely disseminate environmental information.

Adabiyotlar ro'yxati

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