



THE IMPACT OF EXOGENOUS PROCESSES ON LANDSCAPE STABILITY IN THE FOOTHILL AREAS OF THE FERGHANA VALLEY

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ABSTRACT	KEYWORDS
This article analyzes the impact of exogenous processes (erosion, mudslides, landslides) on the natural stability of the foothill landscapes in the Fergana Valley. The study examines the relief and hydrographic conditions of the region, as well as the degradation processes caused by human activity. Based on the research, geographically grounded solutions for rational management of foothill areas, identification of high-risk zones, and maintaining landscape stability are proposed.	Foothill landscapes, exogenous processes, erosion, mudslide, landscape stability, Fergana Valley, natural hazards, phytomelioration.

INTRODUCTION

The foothill areas hold a special place in the natural-geographical potential of the Ferghana Valley. Over the last decade, global climate change—specifically changes in the volume and intensity of precipitation—along with a sharp increase in anthropogenic pressure on foothill zones, has posed a serious threat to the natural stability of landscapes. The region’s complex geomorphological structure, the presence of slopes, and the susceptibility of loess deposits to erosion create conditions conducive to the rapid development of natural processes. As a result, exogenous processes such as erosion, mudflows, landslides, and slope failures are altering the morphostructure of foothill landscapes, leading to a decline in soil fertility and the degradation of regional ecosystems. These processes directly affect not only the aesthetic and ecological state of the natural landscape but also the efficiency of agricultural land use and the safety of human settlements.

The relevance of this study lies in the fact that examining the regional-geographical patterns of exogenous processes in foothill areas, assessing their impact on landscape stability, and analyzing high-risk zones constitute an important strategic task for regional sustainable development. This article examines the nature of exogenous processes occurring in the foothill landscapes of the Ferghana Valley and highlights scientifically grounded geographical approaches to mitigating them and ensuring landscape stability.

Main part

The foothill areas of the Ferghana Valley are highly sensitive and dynamic landscape systems that play a critical functional role in maintaining the region’s climatic, hydrological, and ecological balance. Recently, extreme meteorological events—driven by global climate change, particularly the uneven distribution of precipitation—coupled with intensifying anthropogenic factors, have created a

basis for the rapid development of exogenous processes in these areas. Processes such as erosion, mudflows, landslides, and slope failures occurring in the foothill zones disrupt the natural stability of landscapes and accelerate regional degradation processes. The development intensity of these processes and their impact on landscapes can be understood based on the data presented in Table 1.

Table 1 The impact of exogenous processes on landscape stability in the foothill areas of the Ferghana Valley

Process Type	Main Distribution Zone	Impact on Landscape	Ecological Consequence
Sheet erosion	Adyrs (foothills) and low-mountain zones	Erosion of the fertile soil layer	Decline in crop yield and bioproductivity
Gully erosion	Slopes with high gradients	Fragmentation of the land surface (erosional networks)	Reduction of agricultural land area
Mudflow processes	Dry creek beds and river channels	Destabilization of the hydrographic network	Damage to infrastructure and hydraulic structures
Landslides and slumps	Loess layers and steep slopes	Sharp alteration of the relief	Threat to the safety of settlements and economic facilities

Analysis and discussion

The processes presented in the table demonstrate a complex nature in disrupting landscape structure and causing a loss of stability. Specifically, while sheet erosion reduces the agrolandscape potential of the region, gully erosion leads to increased relief complexity and territorial fragmentation. Mudflow processes negatively affect the regime of the hydrographic network and channel formation, emerging as a hazardous factor for human activity. Landscape stability is intrinsically linked to anthropogenic pressure, following a specific mechanism: excessive grazing in foothill pastures and deforestation lead to sparse vegetation cover, which causes the soil to lose its natural protective function. Strong spring precipitation and the degree of relief slope then activate exogenous processes—erosion and mudflows—in these unprotected soil layers, ultimately resulting in landscape degradation and a complete loss of stability.

Regional-geographical analyses show that in the southern foothill areas, the high susceptibility of loess deposits to erosion and the steepness of the slopes keep the intensity of gully erosion at a higher level compared to the northern regions. The convergence of anthropogenic activity with these natural processes acts as a catalyst, intensifying degradation. As a result, the "self-healing" capacity of landscapes decreases sharply, and the balance between regional water balance and soil fertility is disrupted. Therefore, to prevent exogenous processes and ensure landscape stability in foothill areas, it is a requirement of the time to implement not only hydraulic structures but also wide-scale phytomelioration methods—protecting the area through vegetation—and to form a differentiated management system that takes into account the ecological capacity and landscape-geographical characteristics of the regions. These complex measures will be of decisive importance in minimizing natural hazards and maintaining the economic efficiency of the region in the future.

Conclusion

The manifestation of exogenous processes in the foothill landscapes of the Ferghana Valley is a factor posing a serious threat to the natural-geographical stability of the region. Research results indicate that the intensity of processes such as erosion, mudflows, and landslides depends not only on the relief and lithological characteristics of the area but also on the anthropogenic load arising from human economic activity. Accurately assessing the ecological capacity of the area and zoning land use systems based on geographical foundations are of great importance in ensuring landscape stability. To minimize the negative consequences of these processes and restore regional stability, the following scientific and practical proposals have been developed:

- 1. Phytomeliorative measures:** Establishing "green barriers" consisting of erosion-resistant plant species and shrubs in foothill areas to halt soil erosion, and maintaining constant monitoring of these areas.
 - 2. Landscape-geographical zoning:** Categorizing agricultural lands based on types of use according to the relief slope and the distribution characteristics of loess deposits, and restricting intensive farming in high-gradient areas.
 - 3. Digitalization of the monitoring system:** Creating a "hazard map" and conducting real-time monitoring in areas where exogenous processes are actively observed, using modern remote sensing technologies and GIS software.
 - 4. Hydraulic protection:** Designing modern hydraulic structures to manage the direction of mudflows and prevent flood damage to infrastructure, while increasing their operational efficiency.
- In conclusion, it should be noted that addressing problems related to exogenous processes in the foothill landscapes of the Ferghana Valley requires a complex approach. By taking natural-geographical patterns into account and applying phytomelioration, territorial planning, and innovative monitoring systems in harmony, we can not only ensure the ecological safety of the region but also create a solid foundation for future economic development.

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