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MAPPING OF MOUTAIN AND FOOTHILL LANDSCAPES

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ABSTRACT

This article analyzes the theoretical and practical aspects of mapping mountain and foothill landscapes. It examines the structure of landscapes, the natural and anthropogenic factors affecting them, as well as the significance of modern cartographic technologies.

KEYWORDS

Landscape, cartography, mountain regions, foothill zones, GIS (Geographic Information System) technologies.

Introduction

The study and mapping of mountain and foothill landscapes play a crucial role in natural resource management, environmental monitoring, and regional planning. These regions possess a complex geomorphological structure, and their landscapes are formed based on factors such as topography, climate, soil, and vegetation cover. Various cartographic methods are employed in the study and mapping of landscape complexes, among which analytical and synthetic methods are the most essential. Using scientific and technological advancements, as well as modern technologies in landscape mapping, is of great importance. Aerial and satellite imagery play a key role in large-scale mapping of landscape complexes, often interpreted through visual decoding. The similarity method may also be used in compiling landscape maps. In mapping foothill regions, aspects such as relief and erosion processes, geological composition, seismic activity, soil fertility, vegetation cover, water resources, precipitation, and resistance to anthropogenic impacts are considered. Mapping mountain and foothill landscapes is important for various purposes. For example monitoring the risks of natural disasters (landslides, floods, earthquakes), managing agriculture and water resources, planning urbanization and infrastructure, protecting ecosystems, and developing sustainable development strategies. Both traditional methods and modern technologies are used in the mapping process. These include GIS software, Digital Elevation Models (DEM), remote sensing, satellite imagery, and drone-based aerial photography. Several environmental issues exist in Uzbekistan's mountainous areas. A decline in biodiversity has been observed. Desertification and soil erosion affect 30–40% of mountain regions. According to research conducted across the country in 2022, forest areas in the mountains have decreased by 15%. The main causes include illegal logging and overgrazing. These problems are linked to local climate changes and mismanagement of natural resources. The climate characteristics

of mountain and foothill landscapes vary widely, primarily depending on global location and altitude. Mountain regions are vast areas with folded and fault-block structures of the Earth's crust, where elevation differences can span thousands of meters. These areas feature mountain ranges, isolated peaks, valleys, and wide plains. Mountain ranges are large, elongated landforms with steep slopes on both sides. Their elevation can range from 200 meters to several kilometers above sea level.

Mapping is based on the following principles:

1. In **mapping** landscapes, it is necessary to select the object, identify the type of geocomplex to be represented, determine the map scale and intended purpose, and consider the degree to which the landscape has been studied.
2. Geocomplexes depicted on maps must be identified and delineated through research. It is advisable to use indicators such as soil types, landforms, and the lithological composition of parent rocks.
3. Landscapes on the map should be classified and grouped according to their similarities, forming a classification scheme. This serves as the basis for creating the map's legend, reflecting the content and essence of landscape maps, and enhancing their scientific and practical value.
4. Typological landscape maps should be accompanied by legends that clearly express the essence and content of the geocomplexes depicted. This principle is considered the most complex, as the legend must reflect the names, characteristics, structural composition, typological divisions, relief elements, soil types, and zonal or azonal vegetation.

Mapping mountain and foothill landscapes at various scales and depicting geographical objects, phenomena, and events on the resulting maps involve the use of special cartographic techniques—such as linear symbols, contour lines, and qualitative color areas.

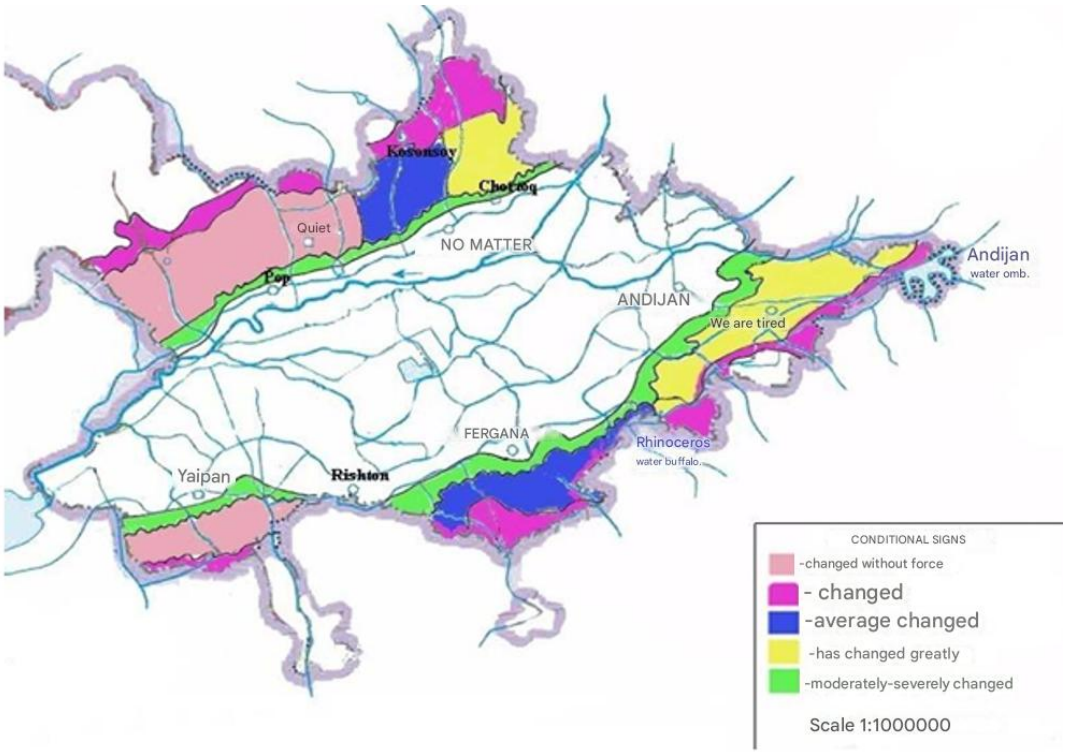


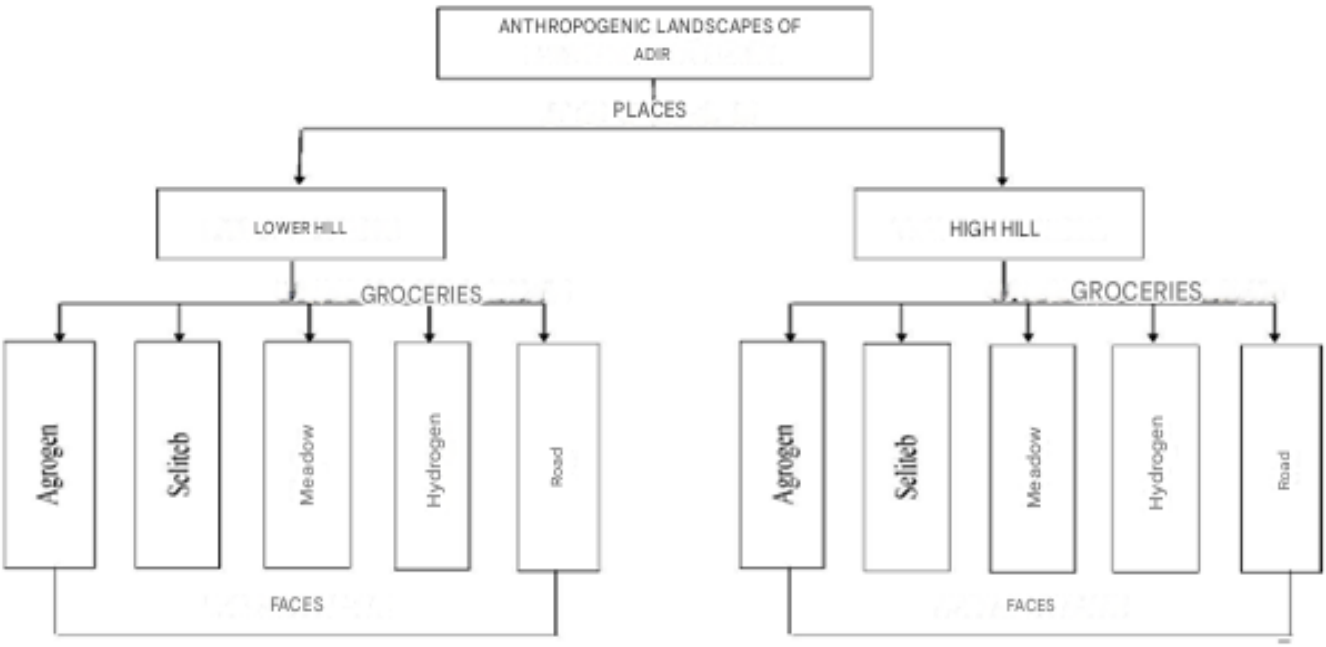
Figure 3. Assessment map of the hilly landscapes of the Fergana Valley

Mountain and foothill landscapes are natural complexes formed in high (mountain) and lower (foothill) relief zones. As distinct natural geographic complexes, these areas possess unique topography, climate, soil, flora, and fauna, which develop through complex interrelationships. The landscapes in these regions are based on the principle of vertical zonation, with significant changes in natural components and their interrelationships as elevation increases.

In mountain regions, the terrain is rugged with steep slopes and high elevations, leading to colder climates, increased precipitation, and zonal distribution of vegetation and soil cover. Typical mountain landscapes include forest zones, subalpine and alpine areas, and bare rocky terrains. These areas often have short growing seasons, relatively low soil fertility, and minimal anthropogenic impact. At the same time, mountain regions are notable for their tourism and recreational potential.

Foothill areas are located at the base of mountain ranges, usually at elevations between 500 and 1500 meters. These regions have a milder climate, fertile soils, diverse vegetation cover, and are favorable for agriculture. The main ecological issues in mountain and foothill landscapes include increased erosion, deforestation, soil degradation, and the negative effects of climate change. In such conditions, the scientific study, monitoring, and protection of these landscapes have become pressing issues.

Today, the study of mountain and foothill landscapes increasingly relies on modern Geographic Information Systems (GIS), remote sensing technologies, and digital mapping methods. These tools allow for the analysis of landscape composition, current conditions, and changes over time, enabling sustainable management and environmental planning. For example, this can be observed in the piedmont landscapes of the Fergana Valley. These landscapes can be classified into categories such as slightly altered, modified, moderately altered, strongly altered, and moderately strongly altered, based on the degree of anthropogenic transformation.



Lower piedmonts have been rapidly developed under anthropogenic influence. Due to irrigation difficulties in upper piedmonts, these areas are more often used for dry farming and pasture-based livestock.

Lower and upper piedmonts differ in their natural and economic characteristics. Lower piedmonts are favorable for economic activity, densely developed, and subject to heavy anthropogenic pressure. In contrast, upper piedmonts are relatively less developed, with well-preserved natural components but vulnerable landscapes from an ecological standpoint. Both zones require special attention in terms of sustainable development, rational use of water resources, and combating land degradation.

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