GIS-Based Analysis of the Cultural Landscape of Settlement Toponyms on the Northern Slope of the Tianshan Mountains: Postprint

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Abstract

By employing geographical information methods to conduct visualization analysis of toponymic cultural landscapes on the northern slope of the Tianshan Mountains in Xinjiang, different types of place names were classified into nine categories: military corps, natural, industrial (palace) transport, ethnic, numerical, surname, directly-affiliated, immigrant, and other types. Building upon this foundation, GIS technology was utilized to perform hierarchical classification and kernel density analysis on point-represented place names, visualizing the agglomeration and distribution patterns of different place name types. Focusing on the historical, economic, natural, and ethnic-cultural contexts of Xinjiang' s northern Tianshan slope, the study analyzed the agglomeration and distribution patterns of various place name types. The findings reveal that place names in the region are predominantly concentrated near several oasis town clusters situated between the southern Tianshan Mountains and the northern desert basin. Among the nine categories, with the exception of the directly-affiliated type which shows a relatively dispersed distribution, the remaining types are primarily distributed along the central oasis belt line, exhibiting distribution characteristics that reflect their respective historical backgrounds, economic conditions, natural features, and patterns encompassing reclamation settlement, ethnicity, immigration, and the distinctive regional cultural traits of Xinjiang.

Full Text

GIS-based Analysis of Cultural Landscape Patterns in Settlement Names on the Northern Slope of the Tianshan Mountains, Xinjiang

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Abstract

This study employs GIS-based methods to visualize and analyze the cultural landscape patterns reflected in settlement names across the northern slope of the Tianshan Mountains in Xinjiang, China. Geographical names were systematically classified into nine categories, and kernel density estimation techniques were applied to examine their spatial agglomeration and distribution characteristics. The analysis emphasizes the historical, economic, and natural factors that have shaped these naming patterns in the region.

For ethnic cultural names specifically, the study reveals how their distribution correlates with geographical features as well as Xinjiang' s historical, political, natural, economic, and cultural attributes, thereby demonstrating the region' s rich cultural diversity. The cultural landscape patterns of various settlements exhibit distinctive characteristics. Names associated with the Xinjiang Production and Construction Corps are concentrated primarily in the western part of Urumqi, located in the lower reaches of oases and away from main transportation corridors—a distribution pattern consistent with historical constraints on troop deployments. Natural feature-based names predominantly occur in the upper alluvial fan areas and along major river basins, reflecting local variations in natural geography. Gong and Yun type names relate to historical oasis development conditions and are generally distributed along main transportation routes in the upper and middle alluvial fan regions.

The study area in northern Xinjiang is characterized by mountainous and piedmont nomadic ethnic minorities, and the spatial distribution of geographical names largely mirrors this ethnic settlement pattern. Digital place names, typically assigned during early development stages based on natural and human landscapes, are located in downstream oasis areas somewhat distant from main traffic lines. Earlier geographical names tend to be situated near towns with favorable water and soil conditions and convenient economic transportation. Immigration-derived place names, originating primarily from Gansu, Henan, Guangdong, and Shaanxi provinces, show clustering patterns similar to those of migrants from the same origin areas.

Due to extensive tracts of difficult-to-use land in Xinjiang that remain sparsely populated, artificial naming is limited, and such areas typically fall under local grassroots administrative jurisdictions. Other name types do not exhibit clear unifying characteristics. Geographical names are found across almost all regions, with higher densities in the economically developed Urumqi-Shihezi area. The study of geographical names represents a crucial scientific endeavor and a

specialized research direction in cultural geography, and future work should continue to deepen investigations into Xinjiang' s place names within multicultural ethnic contexts.

Keywords: Xinjiang; Tianshan north slope; place-naming cultural landscape; kernel density estimation

Note: Figure translations are in progress. See original paper for figures.