# Analysis of Landscape Pattern Changes in Dali City Based on Gis

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**Abstract:** This paper analyzes the changes in the landscape type distribution, landscape change index, landscape transfer matrix, and landscape pattern index of Dali city to complete the study of the landscape pattern evolution of Dali city. Compare the differences in the evolution process of landscape patterns at different levels; qualitatively analyze the impact of the landscape composition evolution of Dali on the ecological environment and use the ecological risk index to quantitatively analyze the ecological risk situation of Dali; the results give suggestions for ecological optimization of the landscape pattern of Dali city.

# **1. Introduction**

At present, in the process of studying land use change, the commonly used research methods include comprehensive index of land use degree, land use transfer matrix, land use dynamic degree, center of gravity shift of land use type, landscape pattern index, etc. The landscape pattern index method in landscape ecology has become an important method for evaluating land use changes due to its unique advantages in the analysis of spatial pattern changes. Its purpose is to find potentially meaningful sequences from seemingly disorderly landscape or regularity, and associate space with time characteristics. And believe that the change of landscape pattern is the result of the combined effect of natural factors and human factors, and its driving force has always occupied a dominant position. Domestic research is mainly focused on the analysis of dynamic changes and driving factors of urban landscapes. For example, Ding Xiaohui and others use RS and social statistics to analyze the driving forces of urban expansion in Guangzhou. Ma et al. Used RS and social statistics to analyze the driving forces of Guangzhou's urban expansion. Zhang Xueru and others used canonical correlation analysis, principal component analysis, and partial minimum regression analysis to analyze the changes and driving forces of urban construction land in Anhui Province. Sun Xiaoyu and other ArcGIS software obtained land use area changes, and used model calculations to analyze the landscape index mechanism at different periods and analyze the driving forces in terms of population, economy, policy, and coastal location advantages that caused the changes. Qin Fucang and others analyzed land use change and driving force development, analyzed the influence of natural factors and human factors, and considered that the dominant role of natural factors is still the result of policies and human intervention. policy. In recent years, with the expansion of cities, soil erosion, land destruction, and groundwater levels, etc., the regional ecological environment has caused serious disruption, and landscape-based surface coverage has changed significantly. Based on the remote sensing and statistical data of Dali City from 1999 to 2014, this paper uses landscape ecology principles, factor analysis, and GIS spatial analysis methods to analyze and study the changes in the spatial pattern of the city's landscape and the factors and mechanisms that influence the landscape pattern over the same period. The scientific basis for assisting decision-making for the city's landscape planning and management at the landscape scale has played a very important role in the sustainable implementation of Dali's eco-economic system.

### 2. Analysis of Landscape Pattern Change Index Characteristics

The Shannon Diversity Index and Shannon's Uniformity Index are used as indicators at the landscape level, which reflects the heterogeneity of the landscape. From the diversity index of the

above chart, the SHDI of the entire region shows a gradual increase in value with increasing years. For the entire region, the SHDI index increased from 1.66 in 1999 to 1.88, an increase of 0.22. With the increase of time and years, the covering patches on the ground become scattered, changing the landscape pattern of the original land type. The various land types are scattered staggered and the diversity increases. The uniformity index SHEI index value is getting larger and larger, indicating that the plaque is becoming more and more uniform. The road's landscape shape index value is the largest, and the smallest landscape shape index belongs to the waters. Because the shape of the road is a linear extension feature, the shape is the most irregular; the area of the sea water area in the monitoring area is large and the shape is regular, which reduces the overall landscape shape index. For deserted and bare land and artificially dug land, the number of patches is small, and both land types are artificially generated. Human interference factors are large, and the general shape is more regular, making the landscape shape index smaller. The grassland is distributed along the Cangshan Mountain at the periphery of the monitoring area. The surrounding forest land is interrupted by intermittent grasslands, which causes the grassland to be fragmented and irregular, making the grassland landscape shape index in the region larger than the forest land. For the housing construction area, the west area of Dali is relatively large, the terrain is flat, and it has always been a rich place. The residential areas are scattered and the area is large, resulting in a large LSI in the housing construction area and relatively concentrated houses on a relatively small slope. The local area of LSI is relatively small; while for the structure and garden category, it is an artificial land type due to nature. Compared with artificial piles and deserted and bare surface and water areas, there are relatively many natural factors. Therefore, LSI is relatively larger than artificially dug land and deserted and bare surface and water areas.

It can be seen that the landscape separation FI index of the entire region shows that the landscape separation of cultivated land, housing construction areas, structures, and gardens all approaches 1. The grassland, woodland, artificial digging land, desert, and bare surface are divided into four categories. The resolution is also between 0.8 and 0.99, which indicates that the above eight categories of plaques are scattered, which is close to the actual situation, because in the Dali area, cultivated land, housing construction areas, structures, gardens, etc. are all artificial interventions. There are many types of land, the patches are scattered sporadically, and the area is generally small. For the two types of land, roads and waters, they are distributed in a piece and connected type, and the roads are linearly connected. The entire road forms a huge road traffic network, while the waters are mainly distributed in the Erhai Lake area. The water area is mainly an Erhai Lake patch, so the landscape separation of the water area is the smallest in the entire monitoring area, which is close to zero. The landscape fragmentation of the structure is relatively large in the entire monitoring area. This is mainly because the structure belongs to the artificial land category, which is greatly disturbed by humans, showing scattered and scattered areas, and the area is small; and the water areas, roads, Forest land is generally large in area and distributed in a continuous pattern; for housing construction areas, artificial piles, gardens, and other land types, the distribution of these types of land is adapted to local conditions, and then manual intervention is performed, so the landscape fragmentation is relatively large.

#### 3. Analysis of Driving Forces of Land Cover Change in Dali City

The increase of population in Dali requires a corresponding increase in food to protect people's demand for food, which forces people to convert some non-cultivated land into cultivated land in terms of land use types; further, the increase in demand for food promotes people More intensive use of land. The population of Dali City in 2001 was 510,100, and in 2012 the population increased to 609,900. From the analysis of the population structure, the proportion of agricultural population and non-agricultural population decreased from 1.69 to 1.38, reflecting the increasing proportion of non-agricultural population, further development of urbanization in Dali City, a large influx of agricultural population into cities, and the arable land in rural areas was left uncultivated Abandoned, on the contrary, the area of construction land in cities has gradually increased.

(1) Land use change is closely related to economic development. The financial and asset

investment in Dali has developed rapidly. According to the 2013 government work report of Dali City, in 2012, the total financial revenue of the Innovation Industrial Park was 1.053 billion yuan, the fixed asset investment is expected to be 5.92 billion yuan, the total industrial output value is expected to be 15 billion yuan, and the total tourist resort financial revenue is 3.22 RMB 100 million and investment in fixed assets is expected to be RMB 3.01 billion. The rapid growth of total fixed asset investment and loan balances of financial institutions has led to dramatic changes in the surface coverage of Dali City. (2) The per capita disposable income of rural residents in Dali, with a majority of the agricultural population, increased from 3011 yuan in 2001 to 7,709 yuan in 2012. It reflects that the rural economy and the living standard of the population in Dali have been greatly improved, which will inevitably lead to the growth of consumption, which will lead to the development of related industries. The development of the industry will also promote the change of people's land use methods, which will cause changes in land cover. (3) In the industrial structure of Dali, the secondary industry developed rapidly, and the output value of the secondary industry increased from 3.181 billion yuan in 2001 to 12.83 billion yuan in 2012. Some of these related industries belong to the infrastructure category. The development of infrastructure construction will inevitably lead to changes in land use methods and changes in land cover. From 2001 to 2012, the change in the comprehensive index of the driving force of Dali's surface coverage has generally shown an upward trend, especially since 2009, the comprehensive index of the driving force has increased sharply, and the surface coverage has changed dramatically. According to the changing characteristics of the driving force composite index, Dali city's surface coverage change can be divided into two phases: before 2009, the phase of accelerated change for surface coverage is gradually accelerated; after 2009, it is the phase of rapid change in surface coverage. In March 2009, the Yunnan Provincial Government convened a special working conference in Dali, and made a major strategic deployment focusing on "protecting Erhai Lake, protecting Haixi, developing Haidong, and developing Fengyi" to accelerate the construction of a central city in western Yunnan. Later, related policies and plans such as the "Uptown in the Town" policy, Erhai Haixi Protection Regulations, Regulations on Management of Village Planning and Construction, and Dali "Hollow Village" Remediation were issued, and projects around these policies and plans were successively implemented to make Dali's surface coverage It is changing rapidly. In recent years, Dali has boldly explored new ideas for urban and rural development of "protecting the good fields in the dam area, protecting the rural scenery, industrial projects, and the construction of cities and towns." It requires space for the mountains, ecology for the mountains, and development for the mountains. On the basis of vigorously protecting the good land in the dam area and strictly observing the red line for the protection of cultivated land, the development and utilization of mountainous areas to promote urban construction has effectively reversed the bad development model of occupying dams and occupying cultivated land for development and construction. The primary drivers of drastic changes in surface coverage often come from government policies. In recent years, the state has promulgated many related policies in order to protect land resources and solve some outstanding land use issues. such as the Land Management Law, the Forest Law, the Regulations on Soil and Water Conservation, and Regulations such as the "Several Opinions" gradually restrain the transformation of the existing land use structure and affect the changes in surface coverage. With the country's in-depth implementation of the western development and the "Twelfth Five-Year Plan", as well as development strategies such as the "Belt and Road" initiative, Dali has firmly grasped the major development strategies of the country and Yunnan Province, actively building a central city in western Yunnan, and formulated the "Dali Central City Master Plan of Western Yunnan (2009-2030) "and" Dali City Master Plan (2010-2025) ".

#### 4. Conclusion

By analyzing the changes in the landscape type distribution, landscape change index, landscape transfer matrix, and landscape pattern index of Dali City, the research on the landscape pattern evolution of Dali City is completed, and the Dali City is divided into three major circles with Erhai Lake as the center. The differences in the evolution process of landscape pattern, through the

qualitative analysis of the impact of the landscape composition evolution of Dali on the ecological environment and the quantitative analysis of the ecological risk situation of the landscape in Dali by using the ecological risk index. The results put forward suggestions for the ecological optimization of the landscape pattern in Dali. The construction landscape of Dali City has been increasing rapidly with the economic development and the expansion of towns. The occupation of agricultural landscapes and the use of bare land landscapes are the two main ways. The increase in woodland landscapes is mainly due to the landscape of bare land. The ecological restoration of Dali City has strengthened the protection of the water landscape, especially Erhai Lake. The grassland landscape is mainly large-scale pastures in Dali, which are greatly affected by seasonal climate. The area of each landscape, bare land landscape, water landscape, agricultural landscape, construction landscape, and grassland landscape. From the level of landscape type, the area showing an increasing trend is the type of construction. There are two types of landscapes and woodland landscapes, and water landscapes. Grassland landscapes have no obvious change trend.

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