

Monitoring of Land Use Type Transfer Direction in Yuyang District

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Abstract

Based on the land use data of Yuyang District in 2000, 2010 and 2020, using the land use transition matrix, the temporal and spatial change characteristics of land use in Yuyang District were analyzed. The results showed that the land use type in Yuyang District from 2000 to 2020 was mainly grassland, of which the grassland area in 2020 was 5290.1 km², accounting for 58.38% of the total area of the study area. In the past 20 years, the absolute change of land use types in Yuyang District is: grassland > construction land > cultivated land > wetland > forest land > shrub land > bare land > water body. The land and bare land first increased and then decreased, and the area of water and wetland decreased first and then increased. The reduction of grassland and wetland area is mainly affected by human factors.

Keywords

Yuyang District; Land use type; Transfer matrix; Human factor.

1. INTRODUCTION

Land is the foundation of human survival and development, and one of the most precious natural resources for human beings [1]. Land Use and Cover Change (LUCC) is an important carrier of human activities to transform the natural surface, and it is the basis for the study of global climate change and ecological environment issues such as surface carbon cycle and biodiversity [2, 3]. The International Geosphere and Biosphere Programme (IGBP) and the Human Factors Programme on Global Change (HDP) jointly developed and published the Land Use/Land Cover Change Scientific Research Programme in 1995, which promotes land use change the role of comprehensive research on global issues and also highlights the significance of land use change to global climate change and human development [4]. Therefore, strengthening the research on the temporal and spatial dynamic changes and driving mechanisms of land use is of great significance for maintaining the balance between the natural environment and the human social system and improving the regional ecological environment [5].

Yuyang District is located at the northern end of Shaanxi Province and is the junction of Shanxi, Shaanxi and Mongolian provinces. It is connected with Hefugu County in the northeast,

Yijinhuluo Banner in Inner Mongolia in the northwest, and Xingxian County in Shanxi Province across the Yellow River in the southeast. As shown in Figure 1. The land ecological environment of Yuyang District is fragile. The northwest is a sandy and grassy beach area, and the terrain is relatively flat; the southeast is a loess hilly and gully area, with broken terrain, vertical and horizontal ravines, and serious soil erosion. Rivers run through the territory; soil types are diverse and mineral resources are abundant, especially coal reserves are abundant and widely distributed.

2. RESEARCH METHODS

Land use transfer matrix is a description of the structural characteristics and direction of changes of different land use types in a region, and it is the most widely used method in land use research at present. Its mathematical calculation process is:

$$S_{ij} = \begin{bmatrix} S_{11} & S_{12} & \cdots & S_{1n} \\ S_{21} & S_{22} & \cdots & S_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ S_{n1} & S_{n2} & \cdots & S_{nn} \end{bmatrix}$$

In the formula: S_{ij} is the area of different land use types. n is the number of land use types, i and j are the serial numbers of land use types at the beginning and end of the study, respectively.

3. RESULTS AND ANALYSIS

3.1. Spatiotemporal Distribution of Land Use Types

Table 1. Three Scheme comparing

Year land use type(km ²)	2000	2010	2020	Trend
Cropland	1507.6	1516.7	1587.2	Continued to increase
Woodland	72.1	80.5	77.5	Increase and then decrease
Grassland	5613.2	5585.4	5290.1	Continue to decrease
Shrubland	72.5	74.9	68.8	Increase and then decrease
Wetland	25.7	11.8	13.2	Decrease then increase
Water	80.2	68.0	78.0	Decrease then increase
Built-up land	19.9	52.9	278.5	Continued to increase
Unused land	135.9	136.8	133.3	Increase and then decrease

In 2020, the land use type in Yuyang District is mainly grassland, with an area of 5290.1 km², accounting for 58.38% of the total area of the study area, which is spread throughout the study area. Cultivated land and construction land are the next, with an area of 1587.2 km² and 278.5 km², respectively. The cultivated land is mainly distributed in the southern hilly and gully area and scattered in the northern part of the study area, and the construction land is distributed in the middle and northern part of the study area. Bare land is mainly distributed in the west, woodland and shrub land are scattered in the north and south, the water bodies are mainly

lakes and rivers, and the wetland area is small, mainly around the river in the south of the study area. In the past 20 years, the absolute change of land use types in Yuyang District was: grassland > construction land > cultivated land > wetland > forest land > shrub land > bare land > water body. Among them, the area of construction land and cultivated land continued to increase, and the area of grassland continued to decrease. The reasons are that the increase of construction land area is related to the urbanization process and mineral development; the increase of cultivated land area is related to the balance of land occupation; the decrease of grassland area is related to land development; In 2020, there will be a decreasing trend again. This phenomenon is worthy of our warning. The protection of existing forest land is an important measure for ecological protection. The changes in the area of water bodies and wetlands further prove that large-scale afforestation will increase water consumption, but at the same time, it will increase water consumption. Improve the microclimate, thereby increasing the humidity in the study area.

3.2. Land Use Type Transfer Matrix

In order to further explore the temporal and spatial change process of land use types in Yuyang District, this study uses ENVI density segmentation and the confusion matrix module based on ground truth to create a land use transition matrix in Yuyang District from 2000 to 2020, to clarify the difference between different land use types in the study area. transfer direction. From 2000 to 2020, the areas of cultivated land, forest land and construction land increased by 80.15 km², 5.40 km² and 258.49 km² respectively, of which the increase in cultivated land and construction land was mainly due to the conversion of grassland. The grassland and wetland areas decreased significantly, by 323.22 km² and 12.40 km² respectively, among which grasslands were mainly converted into cultivated land and construction land, and wetlands were converted into water bodies and cultivated land. The area of shrub land, water body and bare land changed little. The reason is that the reduction of grassland area is greatly affected by human factors. Human activities such as urbanization construction, mineral development, and balance of cultivated land occupation and compensation occupy a large amount of grassland area, which also affects the quality of the local ecological environment. How to balance ecological and economic development is the government's responsibility. Urgent consideration. The reduction of wetland area by more than 50% is a problem worth considering. Reducing the development and utilization of natural wetlands is of great significance to the ecological protection of northern Shaanxi.

Table 2. The transition matrix of land use types in Yuyang District from 2000 to 2020(km²)

2000 2020	Cropland	Woodland	Grassland	Shrubland	Wetland	Water	Built-up land	Unused land
Cropland	1222.47	7.22	336.91	8.63	6.35	3.38	0.70	1.61
Woodland	9.16	26.33	37.95	3.16	0.33	0.47	0.08	0.00
Grassland	222.55	35.24	4913.80	49.61	3.54	13.45	1.71	48.83
Shrubland	6.29	2.38	49.03	9.69	0.13	1.08	0.05	0.10
Wetland	0.75	0.03	0.52	0.00	4.17	7.76	0.00	0.00
Water	9.39	0.25	6.60	0.23	9.29	51.75	0.43	0.03
Built-up land	35.03	0.61	214.64	1.03	0.21	1.41	16.92	8.54
Unused land	1.47	0.03	52.50	0.10	1.60	0.80	0.00	76.75

4. SUMMARY

The land use type in Yuyang District is mainly grassland, followed by cultivated land and construction land. In 20 years, the absolute change of land use type in Yuyang District is: grassland>construction land>arable land>wetland>woodland>shrubland>bare land>water body. Among them, the increase of construction land is related to the urbanization process and mineral development; the increase of cultivated land is related to the balance of land occupation; the decrease of grassland area is related to land development; the increase of forest land and shrub land is affected by afforestation policies. The increase in the area of cultivated land and construction land mainly comes from the conversion of grassland, and the wetland is mainly converted into water body and cultivated land. The reduction of grassland area is greatly affected by human factors. Human activities such as urbanization construction, mineral development, and balance of cultivated land occupation and compensation occupy a large amount of grassland area, which also affects the quality of the local ecological environment. How to balance ecological and economic development is an urgent issue for the government to consider.

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