Research on Land Use Change in Hanzhong City Based on RS

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Abstract. This paper studies the land use change status and development direction in Hanzhong City in recent years. The four remote sensing image data of Hanzhong City in 90 years, 00 years, 05 years and 10 years are selected, and the maximum likelihood ratio classification method is selected in ERDAS software. The land use types are divided into six categories, namely, forest land, grassland, water area, cultivated land, construction land, and unused land. The land use area changes, speed changes, and degree changes are analyzed. The results show that Hanzhong City has been used for 20 years. The area of forest land and construction land is increasing. The area occupied by water, grassland, cultivated land and unused land is decreasing. The annual rate of change in land use is low, and there is a tendency to rise first and then fall. From the comprehensive index of land use, Hanzhong The land use degree of the city is relatively high. Generally speaking, the land use of Hanzhong City is in an adjustment period and has a large development space.

1. Introduction

Landform classification is the foundation of land use dynamic change research. Many researchers continuously explore and study the classification of image land use types: Jiang Yan uses object-oriented decision tree classification method to classify under ecognition software, the focus is from Separation scale and decision tree nodes, indicators, threshold research, and then compare the change vector analysis method and vector similarity analysis method (Jiang, 2013); Guo Chunmei applied NDVI, SRWI index, adopted decision tree classification method, and obtained the third phase of Shehong County Classification of land use (Guo et al, 2012); Hu Jiehua performs supervised classification of each pixel in the two-stage image, and selects the optimal classifier according to the accuracy of the land use classification result (Hu et al, 2012).
Foreign scholars have also made many achievements in the classification of land use change. Chilar et al. carried out multi-band combination selection of NOAA-AVHRR data to carry out land use classification in northern Canada; Chen et al. proved that ASTER based data was analyzed by object-oriented image analysis. The accuracy of urban land cover mapping is higher than that based on pixel high (Chen et al., 2007); Zhang and other object-oriented classification techniques realize the automatic extraction of land use information in China's Three Gorges region (Zhang et al., 2005). Yan et al., through the mapping of land cover thematic maps of the Inner Mongolia coal fire area, found that the accuracy of using object-oriented image classification is much higher than that based on pixel classification (Yan et al., 2006); Platt and Rapoza are aimed at an urban-suburb around Penzburg, Pennsylvania. The mixed landscape of agriculture compares the results of maximum likelihood and object-oriented classification (Platt et al., 2008).

Hanzhong is a medium-sized city that is backward in the west. At present, through the development of the western region and land adjustment, the state studies the land use change situation in Hanzhong City, clarifies the land use, and correctly develops land resources, laying a foundation for building a green and modern landscape city. Studying the change of land cover in Hanzhong City from 1990 to 2010 not only provides decision-making for the efficient use of land resources but also restores the ecological functions of the land. The sustainable development of land resources has a great room to rise, further protecting Hanzhong City. Beautiful mountains and rivers.

2. Study area

Hanzhong City is located at 105°30'50" east longitude and 32°08'54" north latitude. The northern part of Hanzhong City is bounded by the Qinling Mountains, the southern part is bounded by Sichuan Province, and the west is the Hanzhong Mayor of Gansu Province, 258.6 kilometers wide and 192.9 thousand wide. Rice, with an area of 27,246 square kilometers, Hanzhong City has a minimum elevation of 0.45 kilometers and a maximum elevation of 0.60 kilometers. It is oval in shape and long in width from east to west.

3. Research methods

3.1. Data source

The data used in the study area is a remote sensing image of 90-10 years. The data of 90 years and 05 years are from the geospatial data cloud (http://www.gscloud.cn/) and obtained from the Statistical Yearbook of Hanzhong City. Data from 00 years and 10 years, from Hanzhong City, the administrative boundary map of Hanzhong City, the distribution map of land use status.
3.2 Research methods

Single land use dynamics: The change in the quantity of a type of land use within a certain time horizon in the region, the formula is (Zhang et al, 2012):

\[
K = \frac{U_b - U_a}{U_a} \times \frac{1}{T} \times 100\% \tag{1}
\]

Comprehensive land use dynamics: The change in the amount of land use within a certain time frame of a study area, the formula is(Zhang et al, 2012):

\[
LC = \left[ \frac{\sum_{j=1}^{n} \Delta LU_{i,j}}{2\sum_{j=1}^{n} LU_{i,j}} \right] \times \frac{1}{T} \times 100\% \tag{2}
\]

Land Use Level Composite Index: The index indicates the comprehensive level of land use in the study area, and its formula is(Zhang et al, 2012):

\[
L_j = 100 \times \sum_{i=1}^{n} (A_i \times C_i) \tag{3}
\]

4. Results and analysis

4.1 Analysis of land use speed change

| Name         | 1990       | 2000       | 2005       | 2010       | 1990-2010       |
|--------------|------------|------------|------------|------------|-----------------|
|              | area (km²) | proportion | area (km²) | proportion | area (km²) | proportion | area (km²) | proportion | area (km²) | proportion | Rate of chang |
| woodland     | 19799.8    | 8          | 20050.5    | 6          | 20308.7    | 5          | 20314.2    | 5          | 514.37     | 0.13         |
| Grassland    | 116.69     | 0.43       | 99.93      | 0.37       | 101.43     | 0.38       | 100.58     | 0.37       | -16.11     | -0.69        |
| Waters       | 228.31     | 0.84       | 173.44     | 0.64       | 178.86     | 0.66       | 186.81     | 0.69       | -41.50     | -0.91        |
| arable land  | 6508.86    | 24.13      | 6310.54    | 23.39      | 6030.63    | 22.35      | 6000.44    | 22.24      | -508.42    | -0.39        |
| Constructio n land | 231.38 | 0.86 | 250.25 | 0.93 | 269.86 | 1.00 | 292.31 | 1.08 | 60.93 | 1.32 |
| Unutilized land | 93.25 | 0.35 | 93.69 | 0.35 | 89.56 | 0.33 | 83.37 | 0.31 | -9.88 | -0.53 |

According to the comparative analysis of Table 1, the forest area accounted for 514.37km² in 20 years, with an annual increase of 0.13%. However, the number of forest foundations is large, so the growth rate is relatively low. The grassland area accounts for 16.11km², which is reduced by 0.69%
per year. The water area accounts for 41.50 km², which is reduced by 0.91 per year. %, the cultivated land area accounts for 504.42 km², which is reduced by 0.39% every year. The construction land area accounts for 60.93%, and the annual growth rate is 1.32%. The unused land area accounts for 9.88, which is reduced by 0.53% every year. Among them, the waters and cultivated land are falling faster. This is because the annual precipitation in Hanzhong City is affected by various aspects and is destroyed, which leads to the reduction of surface water and groundwater. It is affected by the level of urbanization, returning forests, grassland implementation and various development of local characteristic agriculture in the county, etc., the cultivated land is decreasing. The area of forest land and construction land has increased, and the fastest annual change rate is construction land. In recent years, Hanzhong City's diverse tourism culture and beautiful ecological environment provide the basis for project construction and development of modern cities; although the forest area The proportion is large, but the annual rate of change is small.

Land use rate changes play an important role in comparing the differences in land use and predicting future land use trends (Ma et al, 2010).

### Table 2. Dynamics of single land use in Hanzhong City from 1990 to 2010 (%)

| Time slot   | woodland | Grassland | Grassland | arable land | Construction land | Unutilized land |
|-------------|----------|-----------|-----------|-------------|------------------|-----------------|
| 1990-2000   | 0.13     | -1.44     | -2.40     | -0.30       | 0.82             | 0.05            |
| 2000-2005   | 0.26     | 0.30      | 0.63      | -0.89       | 1.57             | -0.44           |
| 2005-2010   | 0.13     | -0.69     | -0.91     | -0.39       | 1.32             | -0.53           |

Analysis of single land coverage: The dynamic index of single land use type in Hanzhong City in the past 20 years, the dynamic degree of forest land is 0.13%, 0.26%, 0.01%, respectively, all of which are positive values, indicating that the forest area in the area has been increasing trend, although the forest area increases, but the base is large, so the dynamic indicators are relatively small. Among them, the increase was most significant from 2000 to 2005. Because the country advocated returning forests and grasslands in 2003, it is particularly important to build a green ecology. Afforestation and development of agricultural production can promote green development of the land. The dynamic degree of grassland is -1.44%, 0.30%, -0.17%, and the dynamic degree is negative first and then negative, indicating the amplitude of the three time periods in 90-00, 00--05, and 05-10. There is fluctuation, the area of the first time period drops rapidly, the area of the second time period increases again, and the area of the third time period shows a downward trend first, but from the time period of 90-10 years, The dynamic degree is -0.69%, indicating that the grassland area is decreasing overall, and the second and third stages are increased due to regreening, grass restoration, and artificial grass planting. The overall reduction in grassland area is due to man-made damage, the expansion of urbanization, and the uncontrolled grazing of livestock beyond the carrying capacity of pastures. The annual change rates of land use types in waters are -2.40%, 0.63%, and 0.89%, respectively. The annual change rate is negative and positive, indicating that the water area is decreasing from 1990 to 2000, and the area is gradually increasing from 2000 to 2010. The annual change rate from year to year is -0.91%, indicating that the overall water area is declining. The main reason is that precipitation is damaged by man-made and vegetation, resulting in a decrease in surface runoff and underground
runoff, and in the 2000-2006 waters. The annual rate of change remained at 0.63%, indicating that the water area was rectified during this period, artificially created new water area, and water conservation was promoted. However, the overall water area is decreasing due to the annual precipitation in Hanzhong City, the stagnation of the water cycle, the siltation of soil erosion, and the decline of waters. The dynamic degree of cultivated land is -0.30%, -0.89%, -0.10%, -0.39%, all of which are negative values, indicating that the area of cultivated land has been decreasing, mainly due to urbanization, tourism development, returning farmland to forests, and grasslands. Impact. The dynamics of construction land are 0.82%, 1.57%, 1.66%, and 1.32%, respectively, all of which are positive values, indicating that the area of construction land has been increasing in the past 20 years from 1990 to 2010. With the increase of GDP, people's living standards Gradually increase, commercial, industrial land, entertainment venues, etc. continue to expand, and naturally the construction land is increasing. The dynamic degree of unused land is 0.05%, -0.44%, -1.38%, respectively. The dynamic degree is positive and negative, indicating that the area increases first and then decreases. The dynamic degree of 1990-2010 is -0.53%, indicating that the overall degree is not The use of land area shows a downward trend. However, in the first period (90-2000), the area (forest land) showed an upward trend, indicating that the urbanization development level was relatively backward at this time, the land utilization rate was relatively low, and the land adjustment was not very reasonable, and the second The area of three periods (00-10 years) (forest land) continued to decrease, which indicates that the full use of various land types has alleviated the problem of uncoordinated development of land types.

### Table 3. Dynamic land use dynamics of Hanzhong City from 1990 to 2010 (%)

| period          | 1990 to 2000 | 2000 to 2005 | 2005 to 2010 | 1990 to 2010 |
|-----------------|--------------|--------------|--------------|--------------|
| Comprehensive land use dynamics | 0.1          | 0.21         | 0.03         | 0.11         |

Analysis of the comprehensive land cover shows that: in general, Hanzhong City has experienced a slow change in land cover in the past 20 years, and its dynamic degree is 0.11%. During this period, the data fluctuated, and the trend showed a rise and then decrease. The dynamics of the three periods of 90-00, 00--05, and 05--10 were 0.1%, 0.21%, and 0.03%, respectively, and the dynamic degree was the largest in 2000-2005. In the past few years, with the opening of the expressway, tourism and economy have developed rapidly, but the speed is not very fast. This may be the planned land cover plan. It is not very reasonable. The expanded land space is small and there is no continuous use of land.

### Table 4. Hanzhong City Land Use Level Change Index

| Land cover comprehensive index | Land use change | Rate of change in land use (%) |
|-------------------------------|----------------|--------------------------------|
| 90year 00 year 05 year 10 year | 90-00 00-05 05-10 90-10 | 90-00 00-05 05-10 90-10 |
| 225.50 221.90 224.02 224.07  | -360 212 5 143  | -0.26 0.01 0.001 -0.006 |

The comprehensive index of land cover in Hanzhong City in 1990, 00, 05, and 10 years was 225.50, 221.90, 224.02, and 224.07, respectively. According to the maximum range of land use index of 400, the land use degree in Hanzhong City was relatively high.
5. Conclusions and prospects

5.1 Conclusion

According to the research results, the study of land use change can adjust the land structure and coordinate the harmonious development between man and nature. This paper takes Hanzhong City as the research area, preprocesses the four-stage image map with 'RS' method, and then classifies the remote sensing image. Using the maximum likelihood ratio classification method, the land use classification map of Hanzhong City was extracted and the land law was obtained through the change of land use quantity, speed and degree.

The main conclusions of this paper are summarized as follows:

(1) According to the above statistics, it can be seen that the proportion of various types of land types in Hanzhong City from 1990 to 2010 is: forest land is in the forefront, followed by construction land, followed by cultivated land, water area, grassland, and unused land. Among them, the area of forest land and construction land is in the forefront of land use type, showing an increasing trend. On the contrary, the area of grassland, water area, cultivated land and unused land is decreasing. Overall, the annual change rate of construction land and forest land in this area has increased significantly. The increase in area is large, and the annual change rate of construction land is the largest, while the number of forest land is relatively large. Although the annual change rate is increasing, the increase rate is relatively small; the annual change rate of grassland, water area, cultivated land and unused land is decreasing.

(2) From the perspective of comprehensive land use dynamics, the annual change rate of land use in the study area is relatively low in the past 20 years, and the annual change rate is 0.11%, indicating that the urbanization level of Hanzhong City is relatively low, and the transportation infrastructure is relatively backward. Human activities have little impact.

(3) According to the comprehensive land use index, the comprehensive index of land use in 1990, 2000, 2005 and 2010 was 225.50, 221.90, 224.02 and 224.07, respectively, indicating that the development of land resources is relatively strong. The land use in Hanzhong City is in the adjustment period from 1990 to 00, and the land use is in the development period from 00 to -05, and from 2005 to 2010. The amount of land use change in the area from 1990 to 2010 is $\Delta B_{b-a} = -143, G = -0.006\%$, indicating that the overall land use is in a period of adjustment. In recent years, the state has adjusted the land structure through the development of the western region.

5.2 Discussion

Land use change is a very complicated process. Due to limited data, the image resolution is too low in the data processing process, which makes the later data repeatedly appear. Through data analysis, I summarize some conclusions, but in the geometric correction processing, There have been many problems in the subsequent classification process, and some of the steps have not been done rigorously. Therefore, the current land use change research is discussed as follows:

(1) Due to my limited ability, only the histogram equalization process was performed during image enhancement processing. No histogram specification was made, and no in-depth research supervision and classification was carried out. The rules of each feature were not further explored, resulting in results. Not precise enough.

(2) The ERDAS software is not proficient in mastering. When processing the geometric correction step, the error is not kept within the range of 0.5.

(3) Have a deeper understanding of various remote sensing image classification methods, but the
analysis of factors affecting land types is not perfect.

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