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Ecological Environment Evaluation in Southern Anhui Based on Remote Sensing Data Processing

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Abstract: To study the value of ecological environment and promote regional sustainable development, the remote sensing data is used for data processing, and the related evaluation indexes of ecosystem service function in Southern Anhui are analyzed in detail. It is found that the development of tourism in Southern Anhui can make certain changes in the ecological environment, which plays a very important role in tourists and the development of tourism. Based on the refinement of ecosystem services and the improvement of the accuracy of basic data, the evaluation accuracy can be optimized to provide a scientific basis for the decision-making of ecological environment construction in Southern Anhui.

Keywords: ecosystem; tourism development; remote sensing technology.

1. Introduction

Southern Anhui refers to the south area of the Yangtze River in Anhui Province, including Huangshan City, Xuancheng City, Anqing City, Chizhou City, Tongling City and Xianhu City. It is also an important economic, cultural and tourism area in Anhui Province with abundant human landscapes. Mountainous and hill are the main terrain, and the Yangtze River Basin is the main area. Southern Anhui is famous for its superior physical and geographical conditions, abundant tourist attractions, rich cultural connotations, high forest coverage and excellent ecological environment. It is an important tourist area with distinctive characteristics of tourism resources in China and all over the world [1].

With the development of remote sensing technology, people have made great progress in data acquisition ability. Remote sensing technology can obtain surface information in a large range and high efficiency, and it obtains the data in a short time that takes several months or even several years to acquire, and the data is accurate and abundant. At the same time, with the continuous improvement of spatial data mining technology, people can better process and analyze the acquired remote sensing image data and make full use of remote sensing data. This also provides a technical means for the evaluation of ecosystems [2]. In practice, spatial data is huge and has various sources. Geographic Information System (GIS) can manage and analyze multi-source data skilfully. Relying on its powerful spatial data analysis capability, remote sensing technology has been widely used in environmental monitoring, disaster early warning, scientific planning and other fields.

2. State of the art

Ecosystem evaluation method is the basis of ecosystem service value research. The diversity of evaluation methods promotes the emergence of a large number of empirical studies. With the introduction of remote sensing technology, the exploration of ecosystem services value assessment has undergone revolutionary changes. Remote sensing technology plays a key role in data acquisition, spatial-temporal analysis and integration platform, which greatly broadens the research ideas of ecologists.

In recent years, with the maturity and practicality of remote sensing technology and its integrated system, practical benefits have been achieved in many aspects, such as resource management, regional development decision-making, environmental management, and environmental evolution and so on. This has brought fundamental changes to the traditional technology and methods in the field of geoscience and ecology, and promoted the research of ecosystem from qualitative to qualitative, from static to dynamic, from single description to comprehensive evaluation, and from single scale to multi-scale rapid development [3]. Remote sensing technology provides data source for ecosystem service value evaluation, effectively resolves the dynamic, spatial heterogeneity and scale problems, and achieves automatic accurate accounting and visual expression, which greatly changes the research methods of ecosystem research and provides an extremely effective research tool for ecosystem research.

3. Methodology

3.1. Development of tourism

Southern Anhui is rich in tourist attraction species. In recent years, both domestic and foreign tourists and total tourism revenue have increased rapidly, showing good economic and social benefits. According to the latest report of the Anhui Provincial Government, the total tourism revenue of the demonstration area reached 259.3996 billion yuan in 2016, 39.832 million foreign tourists and 263 million domestic tourists, respectively, 18.8%, 10.3% and 17.0% longer than last year, accounting for 52.59%, 82.06% and 50.43% of the total in the province, respectively. This shows that the growth of tourism in Southern Anhui is obvious, and it is the most potential tourism focus area in Anhui Province. It has become the preferred destination for domestic and overseas tourists to visit Anhui [4].

Table 1. Tourism image of cities in Southern Anhui

City	Wuhu	Ma'an shan	Tongling	Anqing	Chizhou	Xuancheng
Tourism image positioning	Wanjiang pearl, the city of dreams	Landscape poetry, leisure city	The capital of Chinese copper culture	Huangmei hometown	Jiuhua, the kingdom of Buddhism, ecological chizhou	Home of the four treasures of Chinese study

3.2. Geometric correction

Correction processing, also known as image restoration or image restoration, is the first step of remote sensing preprocessing. Geometric correction is the first step for any remote sensing data that needs to be processed and analyzed. Geometric correction of remote sensing images is an important guarantee for the accuracy of classification and spatial analysis of remote sensing images in the later stage [5]. Erdas 9.2 image geometry correction module is used here, Image to Image geometry correction method is selected, and second-order polynomial fitting correction formula is used to correct 3-year remote sensing images. The accuracy of the corrected data is evaluated to ensure that the corrected results meet the operational requirements.

3.3. Image clipping

The remote sensing image downloaded from the official website is a standard image that meets the uniform specifications. The research area may only be a part of the image, so the non-research area needs to be cut off, and this step is called image clipping. The convenience of image clipping is usually administrative boundaries or natural boundaries. Its process is divided into two steps: vector rasterization and mask calculation [6]. The boundary processing of the study area is completed in ArcGIS 1.0, and the three-phase remote sensing data are imported into ArcGIS 1.0. Then, the three-year remote sensing image is processed by using the raster clipping function of ArcToolbox module data management tool, and the Southern Anhui area is extracted.

3.4. *Image enhancement*

There are many contents in a remote sensing image. There may be overlapping information among the complex contents. Observing some parts will be disturbed by other factors [7]. Therefore, it is necessary to use image enhancement to highlight the part of the image that needs to be observed and suppress other useless information. Through image enhancement, it is helpful to improve the accuracy of manual interpretation and recognition and computer automatic processing. After image enhancement, the remote sensing image does not follow the real characteristics, but highlights the part that is conducive to be recognized by the observation. The histogram equalization is chosen to perform the radiation enhancement. Using the radiation enhancement tool in Erdas 9.2 image interpreter module [8], the histogram equalization tool is selected to complete the radiation enhancement operation of remote sensing images.

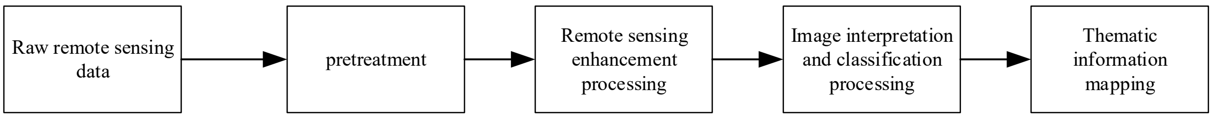

Figure. 1 Remote sensing image interpretation flow chart

4. Study on eco-environmental evaluation

4.1. *Space variation analysis*

By comparing the distribution of ecosystem service value with the previous land use distribution in Southern Anhui, it is found that there is a correlation between them. The ecosystem service value per unit area of forest land, garden land and other land types is higher, while that of construction land, transportation facilities land and coastal beach is lower. It reflects the imbalance of contribution of different ecosystems to the total value of services, and the degradation of high-value regions has a profound impact on the change of the total value of services.

4.2. *Time variation analysis*

Five ecological service functions are evaluated: organic matter production function, soil conservation function, nutrient recycling function, gas regulation function and water conservation function. The ranking of contribution rate of service function is basically the same. In 2004 and 2014, the ranking from big to small is: organic matter production function > nutrient recycling function > soil conservation function > gas regulation function > water conservation function. In 2009, the ranking from big to small is: organic matter production function > nutrient recycling function > soil conservation function > water conservation function > gas regulation function. There are only differences between gas regulation function and water conservation function [8]. In 2004, the order of service value of different ecosystems is: forest land > garden land > arable land > water area > construction land > beach land > unused land > facility farmland > transportation facility land; in 2009, the order of service value of different ecosystems is: forest land > garden land > arable land > water area > construction land > unused land > facility farmland > land use > transportation facility land > beach. In 2014, the order of service value of different ecosystems is: forest land > garden land > arable land > water area > construction land > unused land > transportation facility land > beach land > facility farmland.

4.3. Impact of tourism development on the value of ecosystem services

Through previous studies, it is known that Southern Anhui as a typical region of tourism development, there is a significant correlation between tourism development and land use. Land is the carrier of terrestrial ecosystem, and land use type is the manifestation of ecosystem type in land use. Therefore, ecosystem service value will respond to land use change. As one of the driving forces of regional development, tourism does not directly affect the change of ecosystem service value, but indirectly affects ecosystem service value by driving land use change [9]. Tourism, as a resource-dependent industry, the most fundamental force to attract tourists is the tourism resources, which are composed of ecological environment. The ecological environment plays an important supporting role in the process of tourism development.

4.4. Countermeasures for improving the value of ecosystem services

The ecological environment objectively affects the attractiveness of tourist destinations. Southern Anhui as a tourist city, the ecological environment is more important for urban development. However, in recent years, the total value of ecosystem services has continued to decline, which is not conducive to the long-term development of tourism in Southern Anhui. Southern Anhui needs to take corresponding measures to reverse the current negative trend of the continuous decline of ecosystem service value. Forest land and garden ecosystem have the highest contribution rate in the total value of ecosystem services, and its area change is the key factor causing the change of ecosystem services value. It is necessary to make full use of natural mountain and water conditions in Southern Anhui, strictly control the development intensity of important mountain and water systems and coastal forestry, rationally utilize coastal zones, properly increase nature reserves, and ensure the stability of the total value of ecological services. Starting with the long-term planning of urban development, urban areas are divided and regional functions are defined, and the development intensity and limits of different regions are also defined.

5. Conclusion

Based on remote sensing image as the basic data, the distribution of tourism land in Southern Anhui is extracted by visual interpretation method. In addition, land use change index, land spatial expansion index and complex network model are selected to analyze land use change and tourism land expansion in Southern Anhui. Moreover, an evaluation model with ecological parameters is constructed and used to evaluate the ecosystem service value of Southern Anhui and analyze its change process. Based on the change process of land use and service value, the interaction between tourism development and regional ecosystem service value is discussed. The change of land use has an impact on the terrestrial ecosystem which depends on the land, and the value of ecosystem services changes accordingly. The change of regional ecological environment will affect tourists' experience and attraction, and it is related to the sustainable development of tourism.

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