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Research on ecological investigation and evaluation of highway area in mountainous area based on RS and GIS

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Abstract: With the development of economy, the road construction of our country gets a rapid progress. Especially in mountain roads, the influence of road construction on environment has increasingly been focused. The environmental problems of road construction on project are mostly embodied in those problems of water, air, and ecology. landscape, this paper is taking the Baise-Leye highway as the study area, using the remote sensing and GIS technique to investigate the eco-environment. With RS, GIS, from Remote sensing analysis and ecological degradation degree evaluation, comprehensive consideration of the ecological characteristics, economic and cultural development level, environmental pollution prevention, etc. Investigate and study the ecological status of roads before and after highway construction. Provide a basis for the rational presentation of ecological restoration measures, system of highway ecological landscape by using 3S technology and analytic hierarchy process.

1. Introduction

Ecology investigation is the base of environmental impact assessment of highway construction. The core content is also the focus and heat of ecological research at home and abroad. Ecological problems arising from road construction and operation, due to wide spatial range, long duration, high ecological monitoring and evaluation costs. The reason is that road ecological impact assessment has been difficult to be accurate and quantitative. Remote sensing (RS) in all types of scale, long-term monitoring with the advantages and low cost, and its monitoring indicators are stable, Geographic Information System (GIS) has a strong spatial analytical function make the analysis of highway ecological impact more scientific. Therefore, RS and GIS can solve traditional roads well. This paper is taking into account the natural and social environment along the Baise-Leye highway, combined with 3S technology, through the field survey and remote sensing image analysis, the characteristics and distribution of the natural landscape resources and human landscape resources of the project are extracted.

2. Construction of evaluation index system

Based on the principles of science, reality, operability, comparability, conciseness and comprehensiveness. According to the results of the investigation and collection and monitoring, a comprehensive evaluation index system will be formed. Landscape evaluation of road high-grade highways is a multi-level and highly integrated evaluation system. In actual project application, the selection of specific indicators varies with the different aspects of landscape evaluation of different



projects. In the evaluation process, a hierarchical evaluation system is constructed according to the characteristics of the evaluation area and the overall target requirements for evaluation. According to the specific content of the “Environmental Impact Assessment Standards for Highway Construction Projects”, the first-level indicators that constitute landscape quality are divided into three aspects: the road itself, the background landscape on both sides of the road, and the artificial landscape on both sides of the road. The secondary vegetation is finalized according to the typical characteristics of the project, namely the high-grade highway in the karst area. According to the above factors and referring to the principle of landscape evaluation, screening is performed, and finally several factors are selected. The road itself includes the road's own factors, such as closure, curvature, etc.; slope conditions, such as slope height, slope length, slope and so on. The background landscape on both sides of the road includes topography, vegetation, ecological environment damage and water conditions. The human landscape, urban landscape, historical and cultural monuments on both sides of the highway, the impact of highway construction, such as the degree of damage, scenic spots and mining landscapes.

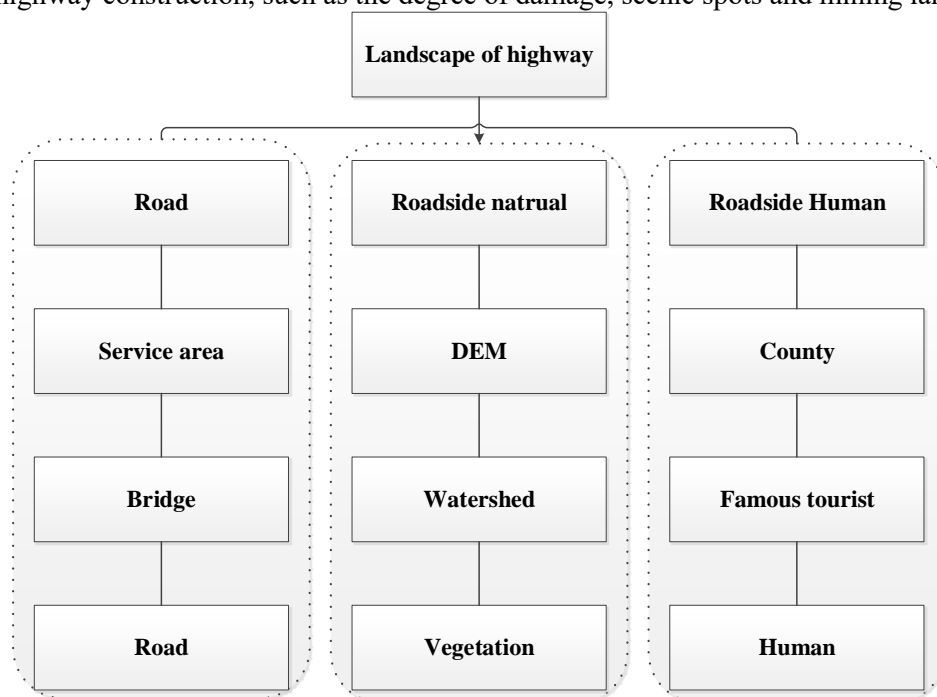


Fig 1. Level 1 indicator of landscape evaluation system

3. Eco-environment monitoring by different scale

The large-scale problem refers to the ecological pattern generated by roads. The scale is above 1 km, which is reflected in the composition of the landscape structure succession. From the scale of the ecological problem of the evaluation object, the road student. As an interference body, the road changed the landscape pattern. Sufficient attention must be paid to the road ecological impact assessment. This article is using Landsat-TM8 to get the landscape ecological pattern of the road area.

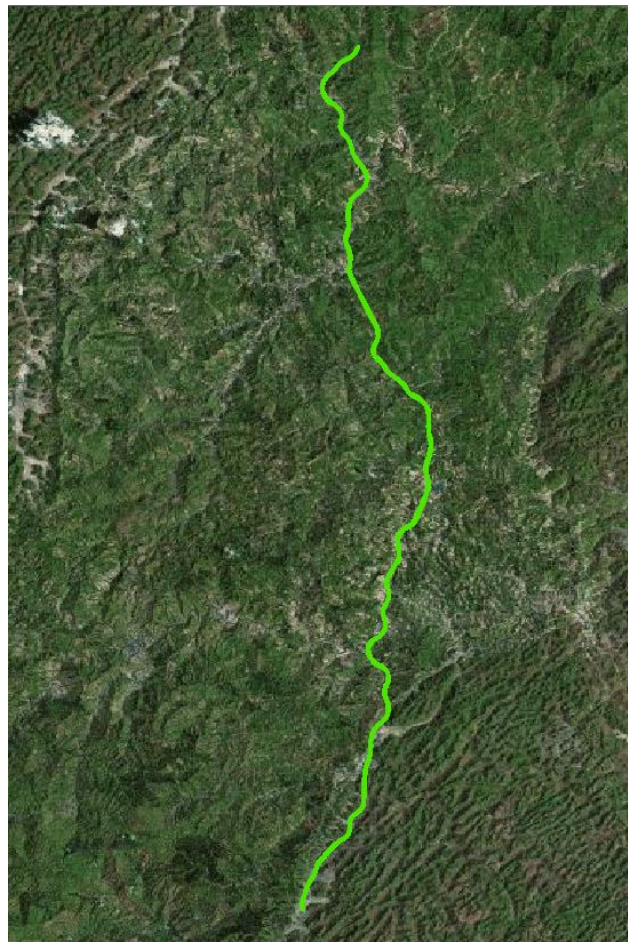


Fig 2. Landsat-TM8 of Baise-Leye highway, 2018.04

The middle-scale problem is the focus of highway ecology research, with a scale of about 200-1km, mainly related to the vegetation characteristics along the highway, including the direct and indirect effects generated during road construction and operation. In addition to the direct damage to the habitat caused by the land occupation, it is more important to affect many ecological factors, thus indirectly affecting vegetation and movement.

Small-scale ecological problems are mainly caused by the road construction process. The ecological impact is the main content of the current highway ecological impact assessment. Small-area vegetation destruction, with a scale of about 200m the following. Take the Baise-Leye highway as an example. Using QB (0.61 m) and UAV image to evaluate the impact of the highway on it.



Fig 3. UVA image of Baise-Leye highway, 2017.06

4. Conclusion

(1) With the RS and GIS methods, there are effective and long-term monitoring, while remote sensing contributes to road environmental assessment and acceptance

The comprehensive development of the work has avoided the inability to achieve the lack of point-to-face is taken by the network-based ecological survey.

(2) Study highways on ecology through RS and GIS methods the impact of the three major ecological scales: Landscape of the state, the degree of fragmentation of the landscape along the highway increases, and the landscape is stable.

The degree of decline, while the decline in the spread, the animal migration has been a certain degree of influence; on the mesoscale, there is a certain impact on the vegetation along the line. The construction and operation of the expressway caused different paths to the surrounding vegetation.

The impact of the degree, the impact of the later period is higher than the impact of the pre-construction period, the ecological measures on small scales have a significant effect.

(3) Using the combination of RS and GIS, it is beneficial to the public. Minimize the avoidance of important habitat spots during road design and EIA.

The impact of the block, and after the road is built, by taking small plaques. And ecological corridors to reduce its negative impact.

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