

Construction of Key Environmental Factors Index System for Ecological Route Selection in Subtropical Mountainous Highway

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Abstract: Based on the study of the ecosystem of the Huizhou-Qingyuan section of the Shantou-Zhanjiang Expressway, this paper is taking the sub-tropical mountain ecosystem as a reference. The author is selecting indicators from the three aspects of the ecosystem's composition, function and habitat. The paper is applying the mathematical analysis methods such as component analysis and non-repeating two-factor analysis of variance to obtain an index system including the diagnosis of the degree of ecosystem degradation in the subtropical mountainous areas.

1 Introduction

The highway engineering ecological route selection index system is established to make the construction unit and related units understand the importance of ecological services, and at the same time can provide a basis for the construction unit's green route selection and land saving route selection to guide the development of environmentally friendly highway construction projects to truly achieve the goals of "green highways, ecological highways", etc.

The information required by decision makers will change continuously, and the selection of indicators to adapt to this change requires the use of some index selection methods. Scientific index selection methods are the prerequisites for correct selection of indicators. For a complex system project, we cannot rely on a certain principle to determine the choice of indicators, but we must comprehensively consider it. Therefore, relevant evaluators are required to have a comprehensive knowledge of the evaluation system.

The index system of ecological route selection of highway engineering involves complex content, and many factors need to be considered when selecting indicators. Therefore, when selecting the ecological system of highway route selection indicator system, the actual situation of the corridor and the environmental impact of the highway construction project should be comprehensive. At the same time learn from domestic and foreign engineering environmental supervision evaluation index system research to establish an index system.

2 Methodology

There are many methods for constructing the index system. Currently, more investigation methods, target decomposition methods, and multivariate statistical methods are used.

(1) Investigation and research method

Based on the investigation and research of the project and based on the collection of relevant indicators of the project, the index system is summarized and summarized through a comparative induction method, and then the evaluation index system is determined based on the systematic evaluation goals. Finally, a good evaluation index system will be determined. A way to fill in the questionnaires by mailing them to experts.

(2) Object decomposition method

It refers to the construction of the corresponding evaluation index system by analysing and researching its tasks and goals. Decomposition of the research object, starting from the overall goal, it is decomposed one by one according to relevant content, until the finally decomposed index can reach the measurable.

(3) Multivariate statistical method

It uses cluster analysis and factor analysis to find the key indicators from the initially developed indicators. Specifically, a qualitative analysis is first performed, and various elements to be evaluated by the research object are initially prepared before being carried out. The next stage of quantitative analysis is to further deepen and expand the analysis results of the previous stage.

(4) Information extraction method based on remote sensing image

For ecological impact construction projects, this method has the advantages of wide coverage, strong timeliness, strong visibility, and dynamic detection for the extraction of environmental factor change

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information during the construction period. The traditional method for ecological factor changes is unmatched by traditional methods. Advantages, so it can also be used as a method to extract changes in ecological factors during highway construction and restoration effects of ecological protection projects.

3 Index System Construction Principles

In order for the established evaluation index system to comprehensively reflect all aspects of ecological selection of highway engineering, the following principles should be followed in the construction of the evaluation index system:

(1) Scientific and overall optimization principles

Highway engineering ecological route selection is not only a theoretical issue but also a practical issue. Its indicator system must be based on science. Select indicators with strong stability and good correlation. The determination of indicator weights must be scientific, data selection, calculation and synthesis required. Pay attention to science, authenticity and standardization. The overall optimization is mainly to check the coordination between the indicators in the indicator system. The overall necessity. The overall completeness.

(2) Principles of operability and reliability

The index is the combination of theoretical research and practical operation. The construction of highway engineering evaluation index system must be based on relevant theories, and at the same time, the feasibility of practical operation and actual data must be considered

In order for the established evaluation index system to comprehensively reflect all aspects of ecological selection of highway engineering, the following principles should be followed in the construction of the evaluation index system:

(3) The principle of comparability and scalability

The meaning of each indicator: The statistical caliber and applicable scope must be consistent for different regions, that is, be comparable; the selected indicators should be able to be measured according to related measurement methods, and it should also be convenient to compare related research projects.

(4) Systematic and holistic principles

The evaluation index system of highway route ecological selection must comprehensively and systematically reflect the main objectives of ecological route selection. The selection of indicators must be comprehensive and highly general. The indicators in the indicator system are not simple additions of indicators. Instead, they are organically linked to form a hierarchical system.

(5) Principles of representativeness and pertinence

It is necessary to select typical indicators with strong representativeness, and use the least indicators as much as possible to contain the most information, and to avoid the reuse of information between indicators. The highway engineering ecological route selection indicator system should be targeted, that is, The composition should be closely surrounding the environmental supervision of the project during the construction period of the highway construction.

Tab1. List of ecologically sensitive factors along the Huiqing highway

	Target layer	Criterion layer	Index factor	Description	Index properties
Index System of Highway Selection in Subtropical Mountainous Area	Ecological adaptability A ₁	Ecological services B ₁	NDVI C ₁	Vegetation index (NDVI) is used to detect vegetation growth status, vegetation coverage and eliminate some radiation errors.	Quantitative
			Biodiversity C ₂	One is the richness of species in a certain area, which can be called regional species diversity.	Quantitative
		Ecological sensitivity B ₂	Vegetation diversity C ₃	One is the abundance of vegetation species in a certain area, which can be called regional species diversity.	Quantitative
			Nature reserve C ₄	A nature reserve refers to the land, land waters or sea areas where protected objects such as representative natural ecosystems, natural concentrated distribution of rare and endangered wild animal and plant species, and natural monuments of special significance are located. A certain area is designated according to law to be specially designated. Protected and managed area.	Qualitative
		Climate B ₃	Rain C ₅	Rainfall levels are divided into: light rain, moderate rain, heavy rain, heavy rain, heavy rain and extreme heavy rain.	Quantitative
			Soil Erosion C ₆	The process by which soil or other ground constituents are eroded, destroyed, separated, transported, and deposited under the influence of natural forces or the combined effects of natural forces and human activities.	Quantitative
			Storm runoff C ₇	Rainstorm runoff is the current produced by a rainstorm.	Quantitative

		Soil sensitivity B ₄	Soil fertility C ₈	It is a measure of the ability of the soil to provide the nutrients needed for crop growth.	Quantitative
			Land thickness C ₉	Soil fertility thickness.	Quantitative
		Water sensitivity B ₅	Water area C ₁₀	The area of water area is lake water or other water resources. The area occupied by it is the area of static water.	Quantitative
			Water source protection area C ₁₁	Areas designated by the State for special protection of some particularly important bodies of water.	Quantitative
		Topography B ₆	Elevation C ₁₂	The distance from a point to the absolute base along the direction of the plumb line.	Quantitative
			Aspect C ₁₃	The direction in which the slope normal is projected on the horizontal plane.	Quantitative
	Slope C ₁₄		Steep cell.	Quantitative	
	Visual psychological assessment A ₂	Landscape Odour B ₇	Open and close space C ₁₅	Continuity of closed, open spaces in mountainous areas.	Quantitative
		Landscape richness B ₈	Feature richness C ₁₆	The abundance of features passing by the expressway.	Quantitative

4 Results

Highway engineering ecological route selection index system is a complex systematic project, which involves many types of indicators and various forms. In order to establish a set of practical and complete evaluation index system that can fully reflect the essence of the research problem in this paper, study relevant domestic and foreign route selection theories and methods, and refer to relevant national codes and standards, combine highway engineering characteristics (technical characteristics of environmental factor extraction, and analyse and screen indicators)

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