

Evaluation of development potential of sports tourism resources under the carbon neutrality background: Empirical study on the core economic zone in the upper reaches of Yellow River Basin

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Abstract: Low carbon evaluation of sports tourism resources is of great significance for promoting the economic benefits of sports tourism industry, increasing tourists' awareness of green tourism and improving the environment for sustainable development of sports tourism. On the basis of constructing the PSR framework system, this paper evaluated the development potential of sports tourism resources in the core economic zone in the upper reaches of Yellow River Basin from the carbon neutrality background by using AHP, questionnaire survey and mathematical calculation model. On this basis, the ecological cooperation strategies of strengthening the low-carbon sports tourism resources in the study area have been proposed. And from the angle of establishing tourism cooperation areas, it will develop a typical ecological sports tourism landscape model with Lanzhou, Xining and Yinchuan as lines. In order to make important contributions to the low-carbon development of the Yellow River Basin, and also provide a reference for the rational development of regional sports tourism resources.

Keywords: sports tourism resources; carbon neutrality; development potential; core economic zone in the upper reaches of Yellow River Basin

1. Introduction

As carbon dioxide emissions leads to greenhouse gases, low-carbon governance is the key to protect the ecological environment and reduce greenhouse gas. Therefore, to improve global warming is essential for reducing carbon emissions ^[1, 2]. In October 2022, the 20th National Congress of the CPC clearly pointed out that we should actively and steadily promote carbon peak and carbon neutrality, and actively participate in global governance to address climate change. These indicate China's determination of making great contribution to global carbon emissions ^[3].

"Low-carbon tourism" is a new model of green travelling based on low energy consumption, low emission and low pollution ^[4]. It concretely demonstrates green development philosophy and low-carbon economy in the field of tourism, and plays a vital role in its sustainable development ^[5, 6]. Low carbon work includes energy conservation and emissions reduction from all aspects so that multi-dimensional measures can be taken. The hot tourism, however, offers a promising development opportunity ^[7].

The concept of Xilanyin Economic Zone was first proposed by Lanzhou scholar, He Yingqin in 2005 and later developed into the economic zone in the upper reaches of the Yellow River Basin (URYRB) by the China Democratic National Construction Association in 2011 ^[8]. The aim of maintaining the ecological environment is to promote sports tourism, and the development of Yellow River Basin is essential for the evaluation of urban resource development ^[9]. The development of sports tourism resources, an important part of ecological resources protection, takes low-carbon and ecologicalization as the action criteria and developing circular economy as the guidance ^[10, 11].

Based on the construction of PSR framework system, this paper uses analytic hierarchy process, questionnaire survey, mathematical calculation model and other methods to reveal the potential value of low-carbon development of sports tourism resources in the URYRB. The results are beneficial to optimize the product structure and spatial distribution of sports tourism resources in the core economic zone (CEZ) of URYRB. This is of great significance to regional ecological environment protection and green and low-carbon development.

2. Materials and methods

2.1. Study area

The economic zone in the URYRB is one of the ten national economic zones divided by the National Development and Reform Commission in 1989, including Gansu, Ningxia and Qinghai provinces. The core areas are Lanzhou, Xining and Yinchuan, with a population of 973.4265 million and a total area of 29,785.38 square kilometers. The current sports tourism resources in the research area: Lanzhou, Yinchuan, Golmud, Tianshui and Dunhuang are the five tourist cities as the center^[12]. The construction of low-carbon sports tourism has become an important city business card for the future development of “Lanxiyin” and an important driving force for low-carbon ecological economy.

2.2. The establishment of low-carbon sports tourism evaluation index system

(1) The framework of evaluation index system

PSR (Pressure-State-Response) model, proposed by the Organisation for Economic Co-operation and Development (OECD), now is commonly used to evaluate low-carbon tourism at home and abroad and to study environmental issues^[13, 14]. The pressure index represents the main source of carbon emissions from people’s tourism activities, the status index represents the state of sports tourism resources, environment and ecosystem, and the response index is the countermeasures taken by people to deal with the negative impact of individuals or society on the environment^[15, 16]. The framework model of the low-carbon sports tourism index system in this study is shown in Figure 1.

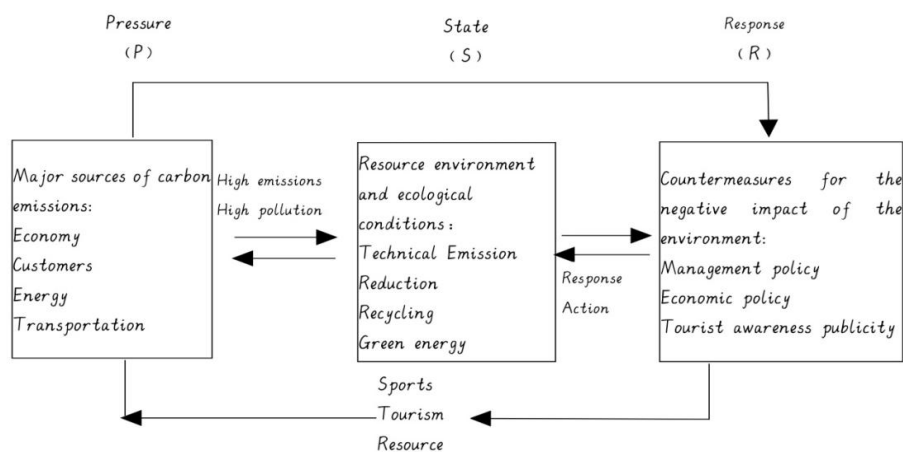


Figure 1: Low carbon sports tourism Pressure-State-Response (PSR) Model

(2) The construction of index system

According to Li Xiaoqin and other scholars^[17], for the construction of low-carbon tourism scenic spot system, five dimensions of low-carbon sports tourism economy, ecology, operation and management are selected to establish a comprehensive evaluation system. Combined with the regional characteristics of “Lanxiyin”, the above aspects in the CEZ of URYRB are comprehensively evaluated.

This paper obtains the original data of the weight value of evaluation factors by consulting expert opinions. Then, we use the analytic hierarchy process (AHP) combined with the 1-9 scale method to construct the matrix.

2.3. Evaluation methods of sports tourism resources’ development potential

(1) Evaluation index system calculation

Through the construction of the index system, a total of 26 index factors were finally established, including 12 quantitative evaluation indexes and 14 qualitative evaluation indexes. We adopted the linear normalization method to carry out the nondimensionalization. For qualitative indicators, the questionnaire is designed by using analytic hierarchy process (AHP), and 10 experts in tourism and sports are scored according to the evaluation indicators.

(2) Comprehensive evaluation

L is the total score (i.e., the comprehensive evaluation value), X_j is the score value of a single index, R_j is the weight of a single index at that level, W_i is the weight of the criterion layer, m and n are the number of criterion layers and evaluation factors, respectively. In the evaluation system, $m=5$, $n=26$. The specific evaluation formula is as follows:

$$L = \sum_{i=1}^m \left(\sum_{j=1}^n x_j \cdot R_j \right) \cdot W_i$$

Set evaluation criteria. On the basis of referring to relevant literature and consulting experts [18], this paper sets the evaluation criteria into five levels.

3. Results

3.1. The comprehensive evaluation grade of the development potential of sports tourism resources in the CEZ of URYRB

According to the combination of quantitative calculation and qualitative evaluation, the score values of all indicators are calculated, and the data are processed by percentage system. The final evaluation results are shown in Table 1. The comprehensive score of low carbon sports tourism resources evaluation in Lanzhou is 50.09, in Xining is 51.70, in Yinchuan is 46.67. According to the evaluation criteria set by the model, the overall low-carbon sports tourism in the CEZ of URYRB is in the preliminary low-carbon stage, indicating that the low-carbon sports tourism in the study area is in the stage of regenerative development, which lays a foundation for the future development.

Table 1: Comprehensive evaluation results of the development potential of low-carbon sports tourism in the CEZ of URYRB

Comprehensive Score Area	W1	W2	W3	W4	W5	L
Lanzhou	16.03	3.88	11.34	2.58	16.26	50.09
Xining	15.99	3.93	11.36	2.66	17.76	51.70
Yinchuan	12.06	3.96	11.33	2.59	16.73	46.67

3.2. The analysis of current situation and factors

Combined with the evaluation results of each index in the evaluation index system of low-carbon sports tourism in the CEZ of URYRB, the status quo of resource evaluation is analyzed as follows:

(1) From the index score of Lanzhou City, low-carbon sports tourism economy has a high score, among which landscaping index accounts for a relatively high proportion after weight calculation. According to the survey data of Lanzhou Statistical Yearbook 2019 and Lanzhou Ecology and Environment Bureau, the total landscaping area in Lanzhou built-up areas reached 7,868.46 hectares in 2019, which accounted for a large proportion of urban green area, indicating that the low-carbon economy has a favorable development environment and conditions. In general, Lanzhou lacks the ability to operate low-carbon sports tourism. The government should strengthen the low-carbon management in this field and create a progressive ecological environment.

(2) From the index score of Xining City, the index score of low-carbon sports tourism management is the highest, 17.76. The evaluation results reflects the good momentum of the low-carbon tourism management in Xining. On the one hand, it results from the strong support of the local government. The government actively promotes the new model of "new energy + energy storage", which also makes due contribution to the development of urban low-carbon tourism. On the other hand, Xining has unique low-carbon tourism resources, which provide favorable conditions.

(3) From the index score of Yinchuan City, the technical index score of low-carbon sports tourism is low, the green area is less, and the low-carbon ecological tourism needs improving. This is mainly reflected in two aspects: firstly, some necessary low-carbon green buildings and waste recycling equipment are not sufficient; Secondly, desert tourism scenic spots in Yinchuan occupy a relatively high proportion of resources.

3.3. Measures and suggestions

(1) The development potential of low-carbon sports tourism resources in the CEZ of URYRB is between 40 and 60, indicating that the study area has the basic ability and space for development. With the government regulating and managing specific objectives and actions, vehicles in scenic spots should be well-equipped and more ecological trails be built in parks ^[19].

(2) To reduce the ecological pressure in the URYRB and promote the construction and protection of the ecological environment in northwest China, it is necessary to strengthen the regional cooperation of low carbon sports tourism in “Lanxiyin” City and build a low-carbon sports tourism ecosphere. Lanxi City Clusters was deployed by General Secretary, which is aimed to safeguard the ecology in the URYRB ^[20].

(3) From the perspective of establishing a tourism cooperation area, to strengthen the cooperation of low carbon sports tourism ecology in the URYRB, we should not only consider the tourism circle of the local area, but also establish a tourism regional joint circle based on the center city ^[21]. We should strengthen the ecological advantages and expand low-carbon sports tourism. To build a demonstration base of low-carbon ecological sports tourism brand to drive the development of the surrounding scenic spots, which fully exerts the driving force of the base.

4. Conclusion

By combining qualitative and quantitative methods, this paper evaluates the low-carbon ecological sports tourism resources in the CEZ of URYRB. The comprehensive score of low-carbon sports tourism resources in Xiling City is the highest (51.70), followed by Lanzhou City (50.09), and Yinchuan City is the lowest (46.67). It indicates that the development potential of low carbon sports tourism resources in the CEZ of URYRB is in the preliminary stage and has the most basic development potential. From the analysis of the current situation, we should accelerate the low-carbon ecological transformation and carry out scientific and systematic management, so as to integrate low-carbon brand construction of ecological cities, low-carbon brand construction and low-carbon civilization construction of new formats. And a multifunctional sports tourism ecosystem will be established according to local conditions.

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