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Optimizing the Collaborative Development Pathway of Big Data-Driven Tourism Economy and Universities in Greater Sanya

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Abstract With the rapid development of tourism, tourism highways play an increasingly important role in promoting the integrated development of local economy and tourism. Especially in the Greater Sanya region, the optimization of the design and construction of tourism highways can effectively enhance the synergistic development of the regional tourism economy and highway transportation system. The “double leaders” of universities have a unique role in promoting such projects, which can contribute to the improvement of policies, the optimization of industrial structure and the enhancement of regional economy. This paper adopts a combination of qualitative and quantitative methods to study the linkage development path of the Greater Sanya Tourism Highway Economy, and analyzes the synergistic role played by university “double leaders” in this process. Firstly, an evaluation system for the linkage development of tourism and highway economy in Greater Sanya was established, covering the dimension of tourism economy and highway transportation. Second, the entropy value method was used to assign weights to the indicators, and the comprehensive development level of tourism highway economy and transportation was evaluated. The results show that the number of domestic tourists received is the most important in the economic dimension of tourist highways, accounting for 17.715%, while in the dimension of highway transportation, the weights of "highway passenger traffic" and "highway mileage" are higher, 16.846% and 16.430%, respectively. Finally, the expert scores indicate that the economic and transportation system development levels of the Greater Sanya Tourist Highway are good to excellent, with a composite score of 4.32 and 4.35, respectively. It is concluded that the economic development model of the tourist highway, which is based on the collaborative planning of the university's “two leaders”, is effective and operable.

Index Terms Tourist highway, economic linkage, university “double leader”, entropy value method, comprehensive development level, highway passenger transportation volume

I. Introduction

In recent years, tourism in Sanya City has flourished and quickly become one of the most popular tourist cities in China [1]. As a typical marine tourism city in China, Sanya City has unique natural resources, as well as constantly improving infrastructure and service quality, and all tourism development indicators have maintained rapid growth [2], [3]. Among them, Sanya tourism highway economic linkage is an important way to promote Sanya's economic growth and tourism upgrade [4]. By improving highway infrastructure, it can enhance the accessibility of tourist attractions and drive the development of tourism resources along the route [5], [6]. At the same time, the development of tourism industry also brings new vitality to the highway economy and promotes the prosperity of catering, accommodation and other services around the highway [7], [8]. The linkage between the two can realize resource sharing and complementary advantages, forming a benign interactive development pattern.

However, in the process of economic linkage development of Sanya's tourist highway, it is inseparable from the support of talents [9]. As an important institution for talent training, the innovative model of dual leaders can provide a steady stream of talents for the development of Sanya's tourism highway economy [10], [11]. "Double leaders" refer to the standard of one good and two strong (good ideological and political quality, strong party work ability, and strong academic and scientific research ability) in the party branches of college teachers [12]-[14]. The purpose of implementing the "double leader" plan is to promote the improvement of the ideological and theoretical level of the party members of the teacher's party branch with the "double leader" as the yardstick [15], [16]. With the title of "double leader" as an incentive method, the party branch secretary of the "double leader" can demand himself with stricter standards, comprehensively promote the organizational construction of colleges and universities, and further promote the cultivation of innovative talents by virtue and organization of colleges and universities [17]-[19]. The

synergy between the "double leaders" and the economic linkage of Sanya Tourism Highway will contribute to the sustainable development of Sanya's tourism, and promote the efficiency of talent training and employment in colleges and universities.

This study focuses on the role of university “double leaders” in the construction of regional tourism highway economy. University “double leaders” can not only play a leading role in policy making and industrial development, but also promote the deep integration of tourism highway economy and local industry through collaborative innovation. The study firstly analyzes the tourism highway in Sanya in detail, and constructs the corresponding economic and transportation evaluation index system. Second, big data analysis tools are used to weight these indicators, explore the relationship between highway traffic and tourism economy, and propose optimization schemes. Finally, the feasibility of the proposed path is examined by evaluating the data results, and finally specific policy recommendations are provided for the economic development of tourism highways in Greater Sanya.

II. Research methodology

II. A. Landscape design-based approach to the economic construction of tourist highways

II. A. 1) Linear landscape planning and design

(1) Linear design

Due to the limitation of natural conditions such as topography and geomorphology, the line shape of the tourism highway around the scenic area can be seen as a space curve composed of straight lines, flat curves and vertical curves in general. Guided by the principle of aesthetics, the relevant technology and methods are flexibly used to deal with the coordination of highway and environment as well as the coordination of the highway line shape itself.

1) Coordination between highway and environment

In the planning and arrangement stage of the route, make full use of the line along the stream, ridge line or over the ridge line to make the route and the terrain organic combination, correctly deal with the relationship between the route and the scenic area along the route, forest area, places of interest, etc., and make full use of the local scenic resources, so as to make it become an attractive landscape by the side of the road.

2) The coordination of the line itself

Tourism highway line design around the scenic area should be based on the characteristics of the region, the formation of three-dimensional three-dimensional spatial combination. Combination of three-dimensional line shape in addition to consider the balance of flat vertical and horizontal line shape, to maintain the consistency of the line shape design. Should also try to avoid the line is isolated or hard cut off the natural landscape and visual space, at the same time should also have the ability to sight guide, maintain the continuity of the line with predictable performance so that drivers and passengers in the physiological and psychological sense of security and a sense of comfort.

(2) Linear landscape design

Linear landscape design should strive to achieve highway lines, slopes, sub-belt, greening and other continuous, smooth, natural and good visual effects, and environmental landscape elements compatible and coordinated. The point landscape along the way to the traveler's impression should be clear, eye-catching, height, color coordination, style unity, so this part of the landscape design focus should be placed on the “shape” of the portrayal and processing. In the node design, pay attention to the detail design of some important nodes, through the toll station, service area and other nodes of the planning and design of the small environment and the greening of the retaining wall along the line and other measures to achieve the strengthening of the details of the highway landscape.

II. A. 2) Landscape integration and coordinated planning and design

Using the design method of landscape integration planning, landscape design should be coordinated and integrated organically with the overall design of the road, embodied in three aspects: the coordinated integration of landscape and road structure, the coordinated integration of landscape and local terroir and history, and the coordinated integration of landscape and the sense of the times. A good tourist highway should be able to fully reflect the regional characteristics and show the beautiful scenery along the route, the landscape integration approach to the surrounding beautiful natural landscape, high ornamental value of the humanities landscape elements into the tourist highway landscape design, and give the times, information and entertainment, to maximize the satisfaction of the user's needs.

II. A. 3) Landscape Excitement and Spatial Sequence Planning and Design

(1) Landscape Excitement Design

Highway landscape as a kind of linear landscape, is a kind of continuous, dynamic landscape sequence space, traverses the geographical area is more, along the route of a variety of natural landscape and humanities landscape contains both point-style landscape nodes, but also into a piece of patchy piece of farmland, grassland, waters,

mountains and forests landscape. In landscape design, excitement design refers to the combination of highway landscape sequence spatial layout of the actual situation, reasonable and orderly along the way can be directly perceived by the human sensory organs of the natural and humanistic landscape or can play a role in the aesthetic subconscious contained in a variety of landscapes of the potential information to show to the tourists, highway landscape planning and design as a whole to stimulate the excitement of the tourists.

(2) Landscape space sequence planning and design

Tourist highway landscape planning and design around the scenic area, landscape sequence organization is related to the overall structure of the overall problem. In landscape planning and design, the landscape sequence not only requires a starting scene, climax, ending scene, but also need to have a transition space, sequence scene, turning and other parts, so that the space is clearly divided into main and secondary, open, closed, gather appropriate, size and scale is appropriate. Tourist highway landscape sequence can be borrowed from the landscape sequence, according to the highway landscape type distribution law and the results of the current evaluation of the highway landscape first determine the form of the whole sequence. Using landscape excitement design method to divide each sub-sequence space of different components, for tourism highway landscape design to provide the sequence of spatial orientation.

II. A. 4) Integration of vegetation restoration and landscape design

The selection of plants for vegetation restoration is limited by geographical conditions and the function of the landscape area, and the selection of suitable plants according to local conditions is the key to the success of greening. Take native tree species as the main, at the same time introduced suitable for the growth of the local environment, with beautification, economic, efficient, applicable and other multi-purpose, multi-purpose, multi-functional tree species, to enrich the local plant resources, to create a distinctive road environment landscape. Landscape design using the principles of landscape ecology, green landscape and terrain, landforms, features and other natural landscape and meet the human spiritual needs, artistic pursuit of human landscape harmony and optimization, to create a blend of science, art, gardening, ecology, environmental protection, aesthetics and other functions in one of the ecological landscape project.

II. B.Path of "Double Leaders" in Universities and Colleges to Collaborate in Tourism Highway Economy Construction

Greater Sanya tourism highway economic linkage development is a systematic project, give full play to the role of the university "double leader", can greatly promote the economic development of the tourism industry in Greater Sanya.

II. B. 1) Sound policy measures

Elite theory holds that elites should generally have criteria that can be objectively evaluated and judged, such as "height" and "quality". Therefore, elites should not only have a higher position or social status and other "heights" that are different from ordinary people, but also have certain "qualities" that are superior to ordinary people, such as intelligence, skills, and connotations. Therefore, it is suggested to improve the cultivation mechanism of "double leaders" in colleges and universities from three aspects: first, improve the supply mechanism of the selection and breeding policy, further refine and clarify the selection conditions, and accurately identify the selection objects. The second is to improve the cultivation system, strengthen the training content, and improve the ability of "double leaders" to start a business and lead the poor. The third is to establish and improve the employment assistance mechanism to promote more "double leaders" to successfully start their own businesses.

II. B. 2) Strengthening government services

The theory of elite recycling holds that, with the development of science and technology and social civilization, the old elite, which has already formed an inherent class, is unwilling to change in order to maintain its vested interests, and will gradually fail to adapt to the development of society or even inhibit social progress, which will lead to its gradual replacement by the new elite, which is more characteristic of the times and adaptable to the times. The theory of elite reproduction also emphasizes the mobility of social classes, namely, "the mobility of the bottom layer of society - elite layer". It is easy to see that with the development of economy and society, economic development requires the birth of new elite groups. Therefore, it is suggested that the government of Greater Sanya should further strengthen the government's service consciousness, establish a positive incentive mechanism, and innovate the benefit linkage mechanism, so as to improve the economic development policy of tourism highway and promote the birth of elites.

II. B. 3) Optimization of industrial structure

Integration of tourism and transportation and economic development industry is not only the main hand of the university “double leaders” to drive the income of Sanya, but also an effective measure to promote the economic and social development of the region. Whether the industrial structure is reasonable or not will directly relate to the productivity level and economic development speed of the region, and indirectly affect the entrepreneurial direction, entrepreneurial quantity and entrepreneurial quality of the “double leaders”. Therefore, the local government of Dasanya needs to grasp the effective measures to optimize the industrial structure and industrial development path, to promote the overall development of the local economy and society, and to help the “double leaders” of universities to succeed in entrepreneurship.

II. B. 4) Enhancement of sensitization and guidance

In general, elites are well-organized and highly cohesive, and are able to exercise or use their power effectively in society. While using the power they have acquired to maintain existing interests, they will promote and encourage limited changes in society, pursuing higher goals when it is conducive to their realization. Therefore, it is recommended that the Government of Greater Sanya actively guide the “double leaders” to participate in the tourism highway economic development project and accelerate the process of promoting the “double leaders” to facilitate the development of the tourism highway economy in Greater Sanya.

II. B. 5) Improvement of regulatory mechanisms

Good work efficiency is based on a sound management mechanism, and local governments should incorporate the cultivation of "double leaders" into the daily evaluation and assessment system. Promote the institutionalization and normalization of the cultivation of "double leaders", effectively build a "task force" for poor areas, and lay solid human resources for rural revitalization. The first is to strengthen the selection and assessment, strictly control the selection of "double leaders", the second is to strengthen entrepreneurial management, and the third is to strengthen performance appraisal. At the same time, the "double leaders" will be dynamically managed, and the "double leaders" who will play a full role will continue to be supported by the tourism highway economic development project. For the "double leaders" who do not play an ideal role, do not act, or act slowly, they should terminate the support policy in a timely manner, and recover the relevant defaulted funds.

II. C.Evaluation of Economic Development of Road Transportation and Tourism Integration

II. C. 1) Evaluation of the indicator system

After reviewing, collecting, integrating and combing a large amount of relevant literature and information data, combined with the actual situation of Greater Sanya, and following the principles of science, rationality and operability, an evaluation system for the economic linkage development of tourism highway in Greater Sanya has been established, which includes an indicator system for the tourism economy dimension and highway transportation dimension. Among them:

(1) Indicators reflecting the tourism economy include 8 indicators: total tourism revenue, foreign exchange income from international tourism, tourism investment, number of domestic tourists, reception of international tourists, A-class tourist attractions, star-rated hotels, and number of travel agencies.

(2) Indicators reflecting the highway transportation system include eight indicators: highway construction investment, highway mileage, class highway mileage, high-speed class highway mileage, first-class class highway mileage, highway network density, highway passenger traffic volume, and highway passenger turnover.

II. C. 2) Data sources

To ensure the accuracy and reliability of the coupling coordination analysis, the data used in this analysis are derived from the aggregated statistics from the China Statistical Yearbook, the website of the Greater Sanya District, the website of the Greater Sanya Culture and Tourism Department, and the websites of the municipal governments of the Greater Sanya Union. The main research time interval is from 2018 to 2024.

II. C. 3) Methodology for evaluating the level of integrated development

(1) Evaluation model

Based on the research results of the previous research on the “environment and economic system coordination model”, before measuring the degree of coordination of the coupling of the tourism industry and the regional highway transportation system, a linear weighting method is used to calculate the comprehensive development level of the two systems:

$$u_i = \sum_{i=1}^{n} w_{ij} \times u_{ij} \tag{1}$$

where, u_i is the value of the comprehensive development level of the system in the i year, n indicates the number of indicators of each system u_{ij} is the magnitude of the efficacy contribution of the indicator j to the system. w_{ij} is the weight of the indicator, and the efficacy contribution u_{ij} is calculated based on the role of the indicator on the system, using the analysis of each indicator to obtain the results.

(2) Data processing

Due to the existence of the index data with the difference of the scale, the first step is to carry out the standard processing of the index data without the scale. This paper adopts the standard method for dimensionless processing, and uses the entropy value method to objectively assign the indicators. The entropy value assignment method determines the weight according to the size of the information provided by each indicator data, which can effectively avoid the influence of human subjective factors. The calculation is as follows:

$$u_{ij} = (x_{ij} - x_{j\min}) / (x_{j\max} - x_{j\min}) + 0.01 \tag{2}$$

where, u_{ij} is the contribution of the indicator to the efficacy of the system, the value range is [0, 1], $x_{j\max}, x_{j\min}$ is the maximum and minimum value of the first j indicator, the weight of the indicator w_{ij} is determined by the entropy value assignment method. In order to avoid the logarithmic “0” value after standardized calculation, the standardized data will be added 0.01 without difference to get the standard value u_{ij} .

III. Results and analysis

III. A. Evaluation of the economic construction of the “double-banded” tourist highway

The "double leaders" of colleges and universities should not only be based on their job responsibilities, but also focus on their comprehensive and free development, and this section evaluates the construction role of the "double leaders" of colleges and universities in the economic linkage development of the Greater Sanya Tourist Highway. 50 members of the construction of the Greater Sanya Tourist Highway Economic Linkage Development Project were invited to evaluate the political leadership, organization and coordination, pioneering and innovative ability and lifelong learning ability of the "double leaders" of colleges and universities in the economic development and construction of the tourist highway. The Richter 5-level scale was used for analysis, and the higher the score, the stronger the ability of the "double leaders" in colleges and universities.

The evaluation results of the economic linkage construction of "double leaders" tourism highways in colleges and universities are shown in Figure 1. It can be seen that the construction members of the Greater Sanya Tourist Highway Economic Linkage Development Project have shown high recognition of the ability of the "double leaders" of colleges and universities. The average scores of political leadership, organization and coordination, pioneering and innovative ability, and lifelong learning ability of the "double leaders" in colleges and universities were 4.26, 4.63, 4.47, and 4.13, respectively. Political leadership ability is the core ability of the "double leader", in the construction of tourism highway economic linkage, the "double leader" of colleges and universities has the ability to grasp the direction, grasp the general trend, grasp the overall situation, and influence the construction members with a clear and noble political personality. The organization and coordination ability of the "double leaders" of colleges and universities reflects their high professional level in the analysis and judgment, planning and decision-making, communication and coordination, and leadership art of the economic linkage construction of Greater Sanya. At the same time, in the project construction innovation, the "double leaders" of colleges and universities have the tenacity to overcome difficulties and overcome difficulties. Finally, the "double leaders" of colleges and universities effectively screened, evaluated and applied digital information technology to build the Greater Sanya Tourist Highway Economic Project by continuously learning information technology tools and establishing information learning networks.

III. B. Determination of the weights of economic indicators of road transportation and tourism

From a qualitative and quantitative point of view, for the comprehensive evaluation of the economic development of the tourism highway in Greater Sanya from a qualitative and quantitative point of view, 16 evaluation indicators involved in 2 aspects of the tourism highway network in the tourism economy dimension and highway transportation dimension are analyzed in a comprehensive evaluation. According to the above comprehensive evaluation index system of tourism highway and economic development in Greater Sanya, the index system is divided into two levels,

A and B. Among them, the second-level indicators under the two dimensions are represented by A1~A8 and B1~B8, respectively.

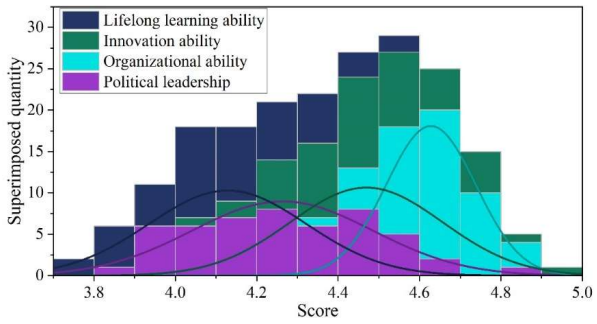

Figure 1: Evaluation of the economic linkage construction of the double belt

After applying the entropy weight method and calculating through SPSS, the weights of each indicator of tourism highway economic dimension and highway transportation dimension are obtained as shown in Table 1 and Table 2 respectively. Combined with the table, it can be seen that for the economic dimension in the Greater Sanya Tourism Highway Network, “the number of domestic tourists received” (A4) occupies the largest weight, which is 17.715%, and the weight of the remaining indicators is relatively uniformly distributed, ranging from 8% to 14%. As for the dimension of road transportation, the weights of “road passenger traffic” and “road mileage” are relatively high, at 16.846% and 16.430%, respectively, while the rest of the indicators are evenly distributed between 8% and 14%. The mileage of the Greater Sanya Tourism Highway determines the scope of the highway landscape, and the larger the highway mileage is, the more highway landscapes can be placed. While the highway passenger traffic is an important indicator of the economic conversion of the tourist highway, the more passenger traffic can promote the economic development of the Greater Sanya Tourist Highway.

Table 1: The economic dimension of the tourist highway is weighted

Number	Index	Entropy	Utility value	Weight (%)
A1	Tourism revenue	0.835	0.170	13.924
A2	International tourism revenue	0.868	0.116	8.109
A3	Tourist investment	0.848	0.118	10.793
A4	Number of domestic tourists	0.731	0.218	17.715
A5	Host country	0.793	0.188	13.824
A6	A tourist scenic area	0.907	0.184	11.714
A7	Star hotel	0.828	0.149	10.580
A8	Number of travel agents	0.874	0.158	13.341

Table 2: The weight of each index of the tourist road traffic dimension

Number	Index	Entropy	Utility value	Weight (%)
B1	Highway mileage	0.960	0.120	9.447
B2	Passenger traffic	0.895	0.212	16.846
B3	Network density	0.840	0.175	13.990
B4	Road passenger turnover	0.803	0.159	11.785
B5	First class grade road mileage	0.936	0.119	9.930
B6	Road mileage	0.807	0.195	16.430
B7	Road construction investment	0.824	0.109	8.360
B8	Grade mileage	0.828	0.194	13.212

III. C. Level of integrated development of tourism highway economy and transportation

According to Richter's 5-level evaluation dimensions, this paper divides the tourism highway economic linkage planning into 5 evaluation levels, which are excellent, good, average, poor and poor, and are expressed by rating 5~1. Invite 10 experts to score the economic development dimension and highway transportation dimension in the evaluation system of economic linkage development of tourism highway in Greater Sanya, take the average of the

scoring results of the 10 experts and round up to the nearest whole number, and finally get the evaluation results of the comprehensive development level of tourism highway economy in Greater Sanya as shown in Figure 2.

According to the scoring results of 10 experts for each indicator of the economic development dimension, it can be seen that in the economic development of tourism highway total income from tourism, foreign exchange income from international tourism, tourism investment, the number of domestic tourists, the number of international tourists received, the number of A-class tourist attractions, star-rated hotels, and travel agencies are scored between 4.06 and 4.53 points. Among them, in terms of tourism investment, the Greater Sanya Tourism Highway Network still needs to be improved and progressed. Based on the weights of the indicators obtained above, the weighted rating value of the economic development level of the tourism highway in Greater Sanya is obtained as 4.32, which is between good and excellent.

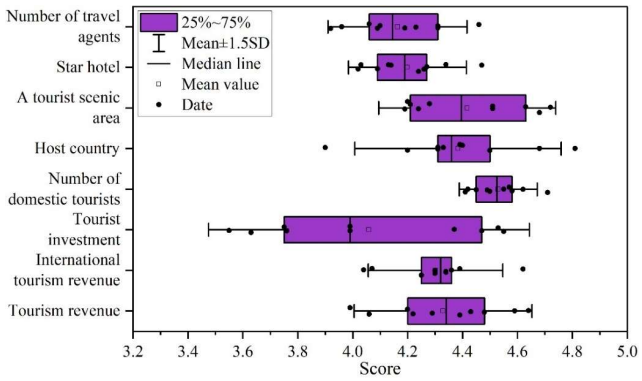

Figure 2: Economic and comprehensive development level evaluation results

In addition, the evaluation results of the comprehensive development level of highway traffic on the Greater Sanya Tourist Highway were statistically obtained as shown in Figure 3. For the evaluation indexes of the development level of highway traffic on the Greater Sanya Tourist Highway, the average rating values of 10 experts for the investment in highway construction, highway mileage, mileage of grade highway, mileage of high-speed grade highway, mileage of Class I grade highway, density of highway network, highway passenger traffic, and highway passenger turnover were 4.15, 4.22, 4.29, 4.48, 4.42, 4.56, and 4.33, respectively, 4.33, and the same calculation yields a rating of 4.35 for the comprehensive development level of the highway transportation system, which is also between good and excellent.

The expert evaluation results also show that the planning of tourism highway network in Greater Sanya is scientific and reasonable, which also confirms that the method of collaborative planning of regional tourism highway network by using “double leaders” from universities is a scientific and feasible method of tourism highway network planning.

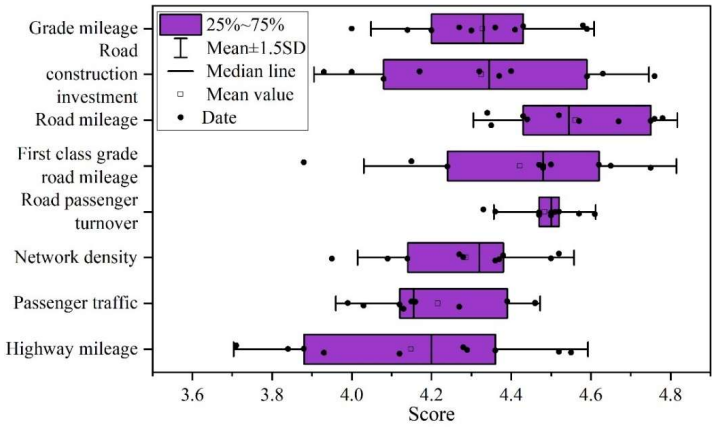

Figure 3: Evaluation of traffic comprehensive development level

IV. Conclusion

In the evaluation of the linkage development of tourism highway economy in Greater Sanya, the construction of tourism highway and the improvement of transportation system significantly promote the growth of regional economy.

From the results of the expert evaluation, the comprehensive development levels of the tourism economy dimension and the highway transportation dimension both reached good to excellent levels, with comprehensive scores of 4.32 and 4.35, respectively. This indicates that the design and optimization of tourism highways not only enhance the regional tourism revenue, but also promote the overall coordinated development of the transportation system.

By calculating the weights of the indicators through the entropy method, the importance of the indicators in each dimension of the “Greater Sanya Tourism Highway” is clarified. In the dimension of tourism economy, the weight of “the number of domestic tourists received” is the largest, reaching 17.715%, which reflects the dominant position of tourism in the economic development of the Greater Sanya region. In the dimension of road transportation, “road passenger traffic” and “road mileage” occupy 16.846% and 16.430% of the weight respectively, indicating that the road transportation system's role in promoting economic linkage should not be ignored.

Overall, the tourism highway economic linkage development model of Greater Sanya has achieved remarkable results in promoting local economic development, enhancing tourism revenue, and optimizing the highway transportation system, which provides a strong reference and practical experience for other regions. At the same time, this study also provides theoretical basis and practical guidance for the role of university “double leaders” in local economic development.

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