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Spatial Performance Measurement and the Resource Organization Mechanism of Rural Tourism Resources in Developing Countries: A Case Study on Jilin Province, China

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Abstract: Many developing countries are challenged with the revival of rural vitality against increasing urbanization. Rural tourism is effective in enhancing the countryside's vitality. Previous studies used qualitative methods to explore the spatial organization of resources, but it was difficult to quantify the effective organization of tourism resources. Taking the example of Jilin Province, China, this study quantitatively measured the use of tourism resources in rural areas at the initial stage and created a developmental model to organize tourism resources more effectively. The organization mechanism has specific reference significance for the optimization model of upgrading rural tourism in developing countries. Spatial performance measurement was used to evaluate the spatial performance of rural tourism resources in the case area. The specific research included analyzing the coupling mechanism of rural tourism resources, constructing an evaluation system, analyzing a resource regulation mechanism, and establishing a rural tourism network model through a complex network analysis method and dynamic simulation. According to the spatial performance analysis, the allocation and linkage of various tourism-related elements are not yet mature. The structural restructuring mode in Jilin Province is mainly divided into internal and external dual-drive guidance, secondary integration, and a characteristic linkage mode. An organizational mechanism for optimizing tourism resources was proposed, which could be referred to for evaluating and optimally organizing the tourism resources in the rural areas of developing countries.

Keywords: rural tourism; developing countries; tourism resource performance; resource organization mechanism

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1. Introduction

With the increase in urbanization, rural decline is particularly prominent in developing countries, and rural tourism is an important means of rural revival [1]. Contrary to urban areas, population and tourism resources are relatively scattered in rural areas. With the development of urbanization, the vitality of rural areas has been declining, especially in China. The Chinese government has adopted rural tourism as a solution to improve rural areas' vitality and resource utilization efficiency. In rural tourism planning, tourism resources are the most important factor in attracting tourists [2]. Quantitatively analyzing the use of tourism resources from the perspective of spatial organization is conducive to a more scientific and objective analysis of the regional tourism spatial structure and the optimization of the organization mechanism of tourism resources [3–5].

The Western developed world has undergone a similar course of development. In the 1990s, there was a revival and reconstruction of the countryside in Western Europe and North America [6]. In the 1990s, Western Europe, North America, and other countries successively achieved rural revival and reconstruction, and the use of rural tourism to reshape urban-rural relations has attracted the attention of scholars [7]. Stansfield first suggested in 1964 that the effective development of rural tourism directly influences the

upgrading of tourism for both urban and rural residents [8]. Tourism resources could act as a catalyst in driving the regeneration and development of rural areas. Xiao noted that in developing rural tourism, the coordinated development of ecological resources and tourism is an important part of promoting the synergy between rural economic and environmental protection [9]. Aurora believed that in improving rural tourism vitality, the formation of a whole regional rural tourism model integrating tourism, sports, leisure, and other multi-industry chains is more conducive to the sustainable development of rural tourism [10]. Barros proposed that the coordination of rural landscape environments and the construction of spatial protection mechanisms are the basis for developing rural tourism [11]. Mustafa proposed that rural tourism development impacts are mainly positive, and the effective management of tourism resources should consider cultural and social resources in the rural Turkish context, including everyday landscapes [12]. In developed countries, when the urbanization rate exceeds 60%, nonurbanized tourism is a tool to promote rural areas. The networked organization of tourism resources is key to revitalizing rural tourism resources and their effective use [13].

However, although some developing countries have relatively rich tourism resources in rural areas, there are problems with resource utilization. Taking China as an example, as of 2021, 500 million people lived in rural areas, and the average annual compound growth rate of rural tourism from 2012 to 2019 was as high as 31.2%. The National Bureau of Statistics survey data shows that rural tourism accounts for more than 50% of domestic tourist arrivals in 2021. However, city tours still dominate the market, with rural tourism accounting for less than 20% of the total tourism revenue [14], especially in northeast China, such as Jilin Province. Scattered resources have caused many problems, such as low utilization efficiency and the rigidity of secondary resources.

China's state council, the ministry of national tourism, and other government departments have also identified the potential and challenges of tourism development in rural areas [15] and have joined forces to promote a region-wide rural tourism program. Since 2016, the "National Whole Area Tourism Demonstration Zone Identification Standards", the "Whole region tourism Demonstration Zone Creation and Acceptance Standards", the "Guiding Opinions on Promoting the Development of Whole Region Tourism", and other important documents to promote the development of the tourism industry have also been issued. The requirements and application paths for the coordinated development of whole region resources in developing rural tourism were also proposed. In 2019, the ministry of culture and tourism and the national development and reform commission announced that 320 key villages would receive government funding for the enhancement of rural tourism, including tourism road construction, resource maintenance and management, accommodation upgrading, catering, and other related industries, 70% of which were subject to an overly fragmented resource organization model, in which the stock of resources has not yet been fully activated. Especially in northeastern China's village areas, such as Jilin Province, agroforestry tourism resources and ecotourism resources account for over 80% of the total land resources; however, with the scattering and homogenization of rural tourism, it is difficult to accomplish the basic goal of "ecological livability" in rural revitalization by continuing to use the previous methods of resource organization and spatial construction [16]. As can be seen, resource regulation and scientific planning are key to upgrading the quality of rural tourism, especially for developing countries, and the coordinated operation of resources across the region helps to reduce the operational costs of managing tourism resources. If the construction site selection and investment proportion of these infrastructures are misjudged, the investment would be wasted. Therefore, the quantitative analysis of tourism resource networks is conducive to locating the content of resource construction investment with the highest comprehensive benefit, which would bring about more efficient management of government investment.

Rural tourism in Jilin Province has ushered in policies. In 2021, the Jilin provincial government proposed that, by 2025, the number of rural tourism receptions and income in the province would increase by more than 20% and 25%, respectively. In 2021, the special fund

for rural revitalization at the provincial level in Jilin Province reached 220 million dollars. However, rural tourism in this province still faces serious problems, such as scattered and homogenized resources. To achieve the set goals and prevent large-scale waste, exploring the "activation" of tourism resources and evaluating the overall planning of space technology are already in important stages that involve tight deadlines and difficult tasks.

From the perspective of resource organization methods [17], the network reorganization of resources is the main method for the high-quality development of rural tourism. It is also a key means for the rapid advancement of rural rejuvenation. For example, the UK has formed a functional portfolio of agrotourism in rural tourism based on the strengths of agricultural resources, activating dispersed resources through a network of industrial tourism [18]. In the United States, rural tourism has developed rapidly, based on the ecological advantages of the resources and the transformation of the tourism space into a network [19]. The "combination" of resources plays a key role in activating rural space and the development of rural tourism. In this regard, remote sensing techniques, network analysis, and other methods are widely used. For example, a land suitability assessment could be used to obtain the coupling mechanism of tourism resources. In the structural analysis, the corridor evaluation model is combined with geographic information system (GIS) technology, ecological resource coupling, and measurement methods [20]. With the complexity of network resource relations, digital model analysis has become the mainstream research method. Complex networks have become the cutting-edge technologies of networked organizations related to tourism resources due to their complex topological structures and dynamic behavior characterization advantages, including land use and cover change research, landscape structure, and spatial pattern change research [21], and rural ecological network construction research [22].

This study's spatial performance measurement of tourism resources refers to comprehensive spatial evaluation, using the indicators selected to characterize the attractive capacity and spatial radiation effect of resources. However, there are relatively few studies on tourism resource performance based on spatial analysis, among which tourism network structure is often used as an effective carrier for the spatial performance analysis of tourism resources [23]. The spatial network aggregation state formed by the interaction of tourism resources reflects the spatial attributes and spatial network interrelationship of rural tourism activities. Wang Degen proposed the theory of the "point-axis" structure of tourist destination spatial abstraction in studying destination spatial structures [24]. The "point" in the "point-axis" theory is generally a tourist resource point, a central town, or a settlement in the destination area. The "axis" generally contains transport and energy corridors, which have a strong economic attraction and cohesion for the regions on either side. A large number of "points" and "axes" are connected to form a spatial network driven by multiple elements of regional tourism [25]. Since the tourist destination is affected by various internal and external factors, its structural optimization and development are divided into three stages, from the initial "polar core" to the "point-axis" spatial structure, before finally being transformed into a mature "network" spatial structure. Since whole-region tourism destinations have certain basic conditions, China's existing whole-region tourism destinations are at least in the "polar core" stage in the development of spatial structure [26], and the focus of space construction is to change to a network-based structure organization and improve resource integration and point-axis radiation capabilities in a networked manner. This study measured the spatial performance of tourism resources in the rural areas of Jilin Province, China. It established a rural tourism network model through numerical model analysis (a complex network analysis method) and a dynamic simulation method to achieve the optimal regulation of tourism resources. The research areas we focused on were nonurban areas, which have resources close to the city and tourism resources far away. Therefore, using networked quantitative analysis methods is more conducive to the overall regulation of tourism resources on a larger scale. The dispersion of tourism resources in rural areas has resulted in difficulties with the effective organization of tourism resources. Therefore, this study aimed to provide a more effective

way to organize rural tourism resources in developing countries by exploring a new model of whole region rural tourism and resource network regulation and control in Jilin Province.

2. Materials and Methods

2.1. Basic Information about the Study Area

Jilin Province is located in the northeastern region of China, at the geographical center of Northeast Asia. Nineteen villages in Jilin Province were selected in the second round of the national rural tourism key village list in July 2020. The focus of this study included these 19 villages (see Figure 1) and important scenic spots in the province's rural areas (see Figure 2). According to China's GB/T 18972-2003 "Classification, Investigation, and Evaluation of Tourism Resources" document, the tourism resource nodes of Jilin Province include cultural activity spaces, garden recreation spaces, celebrities' former residences, residences, historical buildings, and health and leisure centers. The tourism resources used in Jilian Province cover a comprehensive area and have a certain combination of characteristics in the planning foundation. From the classification standard of China's GB50298-1999 "Planning Code for Scenic Areas" document, the tourism-related resources in Jilin Province include architectural, gardening, heritage, and recreational resources. In this study, more comprehensive elements, such as ecology, life, and production in rural areas, were included to enhance the impact of tourism networks, including natural and cultural amenities.

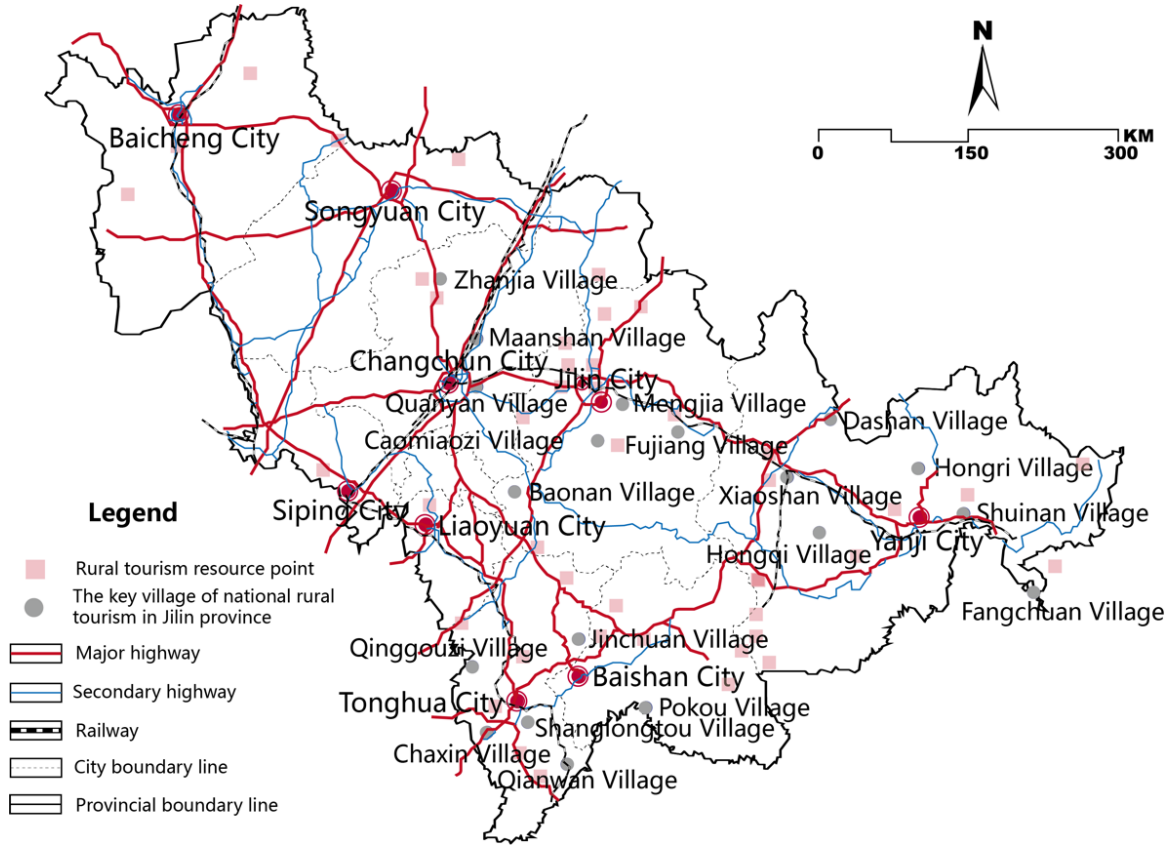

Figure 1. Distribution of the key villages for national rural tourism.

The spatial analysis of these tourism resources indicates that the resource corridors are concentrated in the main urban area, the Changbaishan scenic area, and the Bohai Kingdom Shangjing site group and that the secondary corridors have shown a more obvious fishbone spatial distribution structure. Corridors are tourism flow connection channels for different tourism resources, such as ecological, industrial, and residential resources. These corridors create a small, local-area network in the Changbai Mountain

tourist scenic area and surrounding areas. In general, the corridor resources are scattered. They have not yet formed a system, and the network of corridor links is not close enough to activate the development of the overall tourism network.

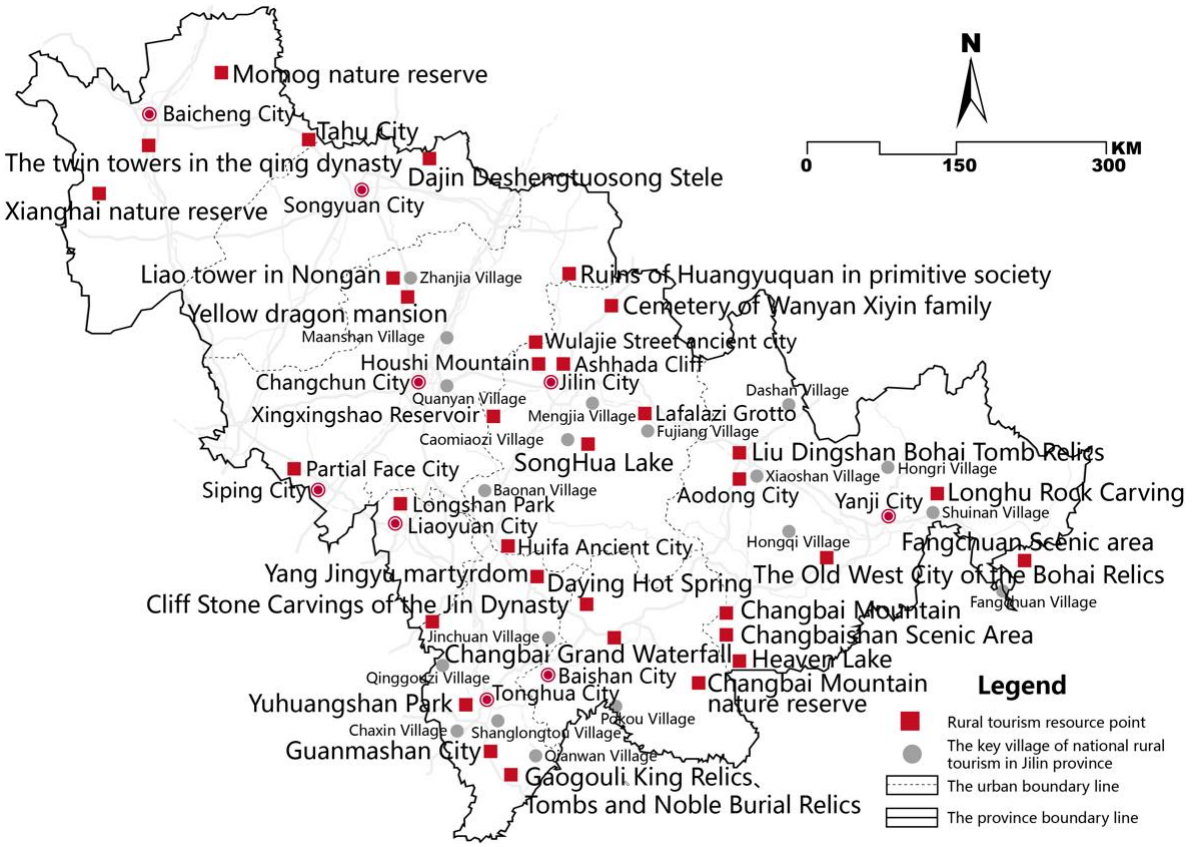

Figure 2. Distribution of the key resource nodes.

2.2. Spatial Performance Analysis Path of Rural Tourism Resource Elements

The spatial performance analysis of rural tourism resources in this study included the determination of resistance and gravitational values of tourism resource elements, the measurement of mutual attractiveness between resource elements, and the measurement of resource node centrality and supply-demand ratios.

2.2.1. Resistance and Gravitational Values of Tourism Resource Elements

The resistance value and gravitational value of the resource elements are based on the concept of element landscape resistance in landscape ecology. Their concepts are extended from a single ecological field to resources related to whole region tourism. The resistance value reflects the degree of obstruction of functional circulation and the support of resource elements for spatial performance, which are used to characterize the rate at which tourism flows between the resource nodes and resource corridors.

(1) Resource element resistance values

The comprehensive resistance of the resource elements reflects the difficulty of the network function flow moving between different resource node units in ecology, production, and life. The energy flow between different sources and targets overcomes certain resistance in the operation of various tourism resources, and the road connection distance characterizes the resistance value of the resource elements in tourism networks.

(2) Resource element gravity values

The gravitational value of the source element is formed from its characteristics and based on the composite of its multiple functions, mainly reflecting the flow of people, capital, and functions brought about by the multiple attributes of the element itself. The resource function composite focuses on the dispersion of energy flows across the network when the resource nodes are connected into a network by ecological, human, industrial, and recreational factors. From the perspective of whole region tourism, the key resources in the gravitational assignment of resource elements include ecological resources such as wetlands, rivers, nonproductive woodlands, and grasslands; living resources such as cultural sites, folk scenic spots, and residential land; and production resources such as agriculture and forestry, industry, and road transportation. Since there are differences in values between various types of resources, the weights are formed with different values in the compound. In determining the weight values, we invited 20 experts from tourism management, urban and rural planning, ecology, and other related majors to obtain the final weight values through three rounds of back-to-back scoring (see Figure 3).

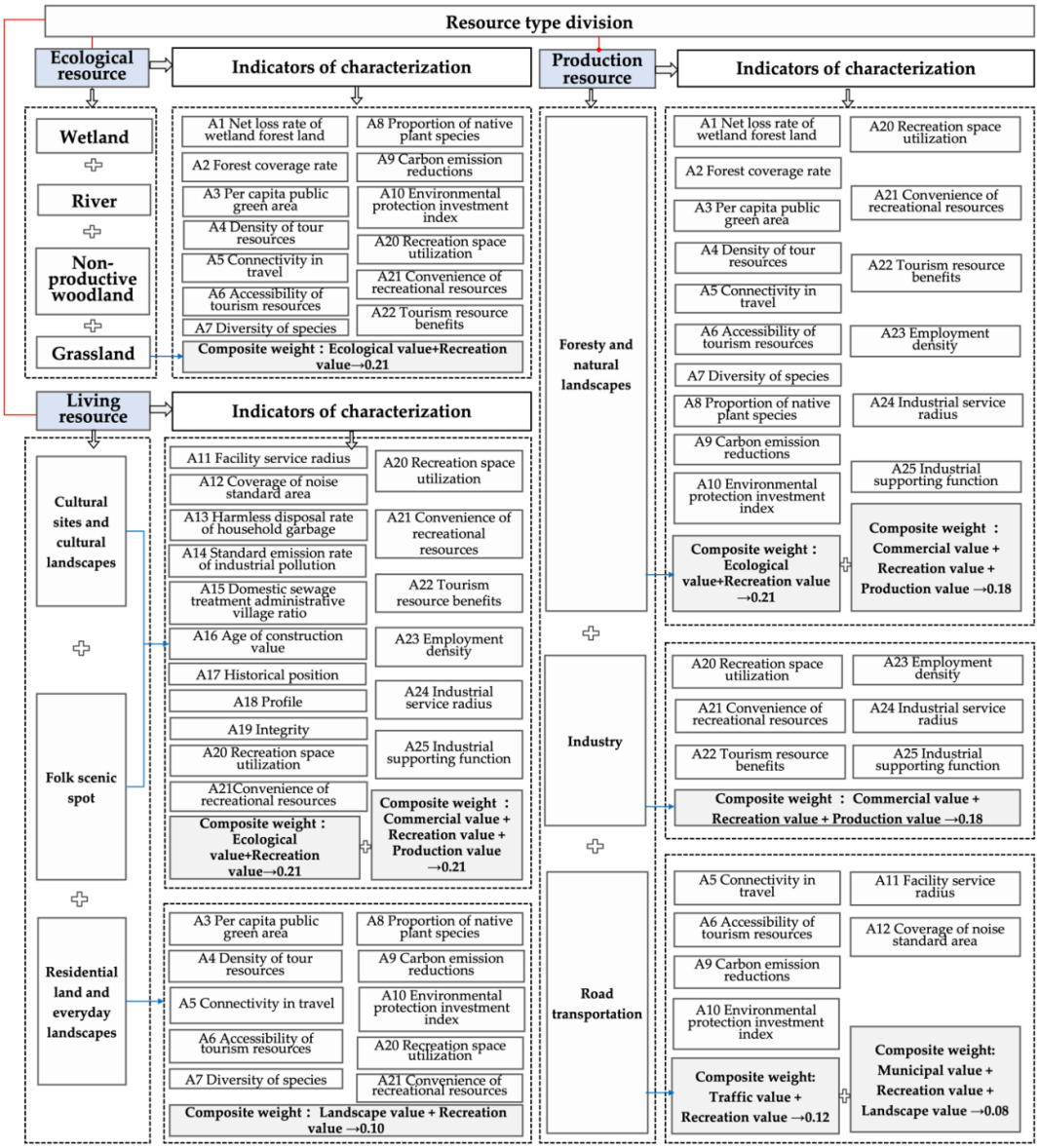

Figure 3. Representation and compound weights of the resource factor attraction indicators.

2.2.2. Measurement of the Mutual Attractiveness between Resource Elements

The abstract network structure is the basis for the spatial performance measurement of rural tourism from the perspective of whole region tourism. The abstraction of resource nodes and corridors explores the connection between the resource elements and network generation modes [27]. The mutual attraction between the resource elements of the whole region tourism network is a quantitative representation of the dynamic correlation between the elements of the whole region's spatial system, that is, the measurement of the interaction and influence between the elements in the network system when the functional flow is stable under the influence of their gravity and resistance.

In the spatial performance measurement of tourism resources, this study took the degree of interconnection between the resource elements of the whole region tourism network in the network system as the result of the action of the "gravity-resistance" system, that is, the tourism flow measurement method of the mutual attractiveness between the resource elements of the whole region tourism network [28]. Based on the gravitational model, the "mass" is replaced by the gravitational value of the resource nodes themselves, the "distance" is replaced by the actual distance between the resource nodes, and their drag coefficient is the resource drag distance [29]. The improved gravitational formula is expressed as:

$$F_{ij} = R_i R_j / L_{min} = R_i R_j / (D_{ij} f_i f_j),\ i = 1 \ldots n,\ j = 1 \ldots n, \quad (1)$$

where F_{ij} denotes the gravitational force between resource nodes i and j, R_i and R_j are the values of the gravitational force of resource nodes i and j themselves, and L_{min} denotes the integrated resistance distance between resource nodes i and j. D_{ij} denotes the spatial distance between nodes i and j, which generates the flow matrix of mutual attraction capacity among n resource nodes in the territory-wide tourism network.

The gravitational value R of the relevant resources is obtained based on the organization relationship of the resource functions of the tourism network and the composite weight values of ecological resources, living resources, and production resources (see Table 1); the stronger the composite function, the higher the gravitational value of the resources.

Table 1. Self-gravitational values for different resource types.

Type of Resource	Resource Subcategory	Self-Gravitational Value (R)
Ecological resources	Wetlands River Nonproductive forest land Grassland	0.21 ($A_1 + \ldots + A_{10} + A_{20} + \ldots + A_{22}$)
Living resources	Cultural sites Folklore scenery	0.21 ($A_{11} + \ldots + A_{21}$) + 0.18 ($A_{22} + \ldots + A_{25}$)
	Residential land use	0.10 ($A_3 + \ldots + A_{10} + A_{20} + A_{21}$)
Production resources	Agroforestry	0.21 ($A_1 + \ldots + A_{10}$) + 0.18 ($A_{20} + \ldots + A_{25}$)
	Industrial	0.18 ($A_{20} + \ldots + A_{25}$)
	Road tourism flow	0.12 ($A_5 + A_6 + A_9 + A_{10}$) + 0.08 ($A_{11} + A_{12}$)

By measuring the mutual attractiveness, the functional flow between the resource nodes of the whole tourism network could be obtained. The greater the mutual attractiveness between the network resource nodes, the greater the functional flow of the resource corridor, indicating a higher impact capacity and comprehensive value of the tourism resources, and vice versa with lower values. Based on the mutual attraction between the resource nodes, the natural breakpoint method tool of the GIS platform was used in the flow classification of the tourism resource corridor to reflect the network flow degree of tourism function flow by flow classification.

2.2.3. Resource Node Centrality and Supply-Demand Ratio Measurement

The measurement of the tourism resource nodes was mostly based on the degree of centrality under the influence of node connectivity and the Euclidean distance between the nodes, resulting in the measurement of centrality not taking into account the properties and functions of the resources themselves. The flow between resource nodes expresses the ability of mutual attraction between resources from another perspective. The supply-demand ratio of the resource nodes could be used to analyze the practical problems of comprehensive tourism flow, such as the life function flow, production function flow, and ecological function flow driven by whole region tourism for the selection of composite resource nodes and the difference between daily and rest day resource utilization. The supply capacity of a resource node is expressed as the ratio of its gravitational force to the gravitational force of other nodes in the network, combined with the measurement of the differences in supply and demand indices for different age groups, different land types, and high and low tourism flow peaks to obtain the supply capacity and demand trends of the resource node in the tourism network.

(1) Resource node centrality measurement

From the perspective of whole region tourism, measuring the center of tourism resource nodes is based on the mutual attractiveness between resources. [30]. The *i*-th resource node centrality expression C_i is:

$$C_i = \frac{\Sigma_{j=1, j\neq i}^{N} F_{ij}}{N-1} \quad (2)$$

where N represents the number of resource nodes and F_{ij} is the strength of mutual attraction between resource nodes i and j (i.e., the functional flow). The more resource nodes in the area of strong interaction force, the easier it is to form a strong interaction force with other resource nodes. The more resource nodes in the area of strong interaction force, the easier it is to form a strong interaction force with additional other resource nodes; the higher the centrality of the resource node, the weaker it is. The natural breakpoint method tool in the GIS was used to classify the centrality hierarchy.

(2) Resource node supply-demand ratio measurement

The supply-demand ratio measurement reflects the demand of residents and the public service capacity in the resource nodes in the form of tourism flow. The supply-demand ratio index could more objectively evaluate the importance of tourism resource nodes' recreation function in the whole area network [31]. The expression for the resource node supply-demand ratio measurement is:

$$L_i = S_i / D_i = R_i / \sum_{i=1}^{n} (F_{1n} + F_{2n} + \ldots F_{(n-1)n} + F_{n1} + F_{n2} + \ldots + F_{n(n-1)}), \quad (3)$$

where L_i is the supply/demand ratio of resource node i, S_i is the supply capacity of the ith resource node, D_i is the demand of resource node i. The GIS natural breakpoint method tool was used to classify the resource nodes with different centrality and supply-demand ratios. The resource node tourism flow is optimal at supply-demand equilibrium, with excess resource tourism flow at high supply-demand ratios, while resource nodes with supply-demand ratios below 1 need to acquire more tourism flow in redistribution to reach equilibrium.

3. Results

(1) Tourism network characteristics and connectivity

The resource corridor elements of the rural tourism network in Jilin Province were extracted into resource nodes and corridors, which laid a foundation for the subsequent domination ability, grade division, and evaluation of tourism resource elements (see Figure 4). The tourism resource nodes were numbered from 1 to 30, and resource corridors from

1 to 25 (see Figure 5). Eight key tourism resource nodes were not connected to the network; some resources could not promote the construction of whole region tourism with networking. Although most of the extracted resource nodes were connected by one or more resource corridors, under the action of the dendritic end and the semi-dumbbell corridor system, the existing resource nodes had relatively isolated and point-like structural problems. Additionally, the number of corridors and connection methods resulted in intermittent connectivity between the resource nodes, resulting in faults, and no relatively effective tourism connection channel was formed. Currently, the fragmentation of the tourism resources across the region has intensified, and the abstraction of the corridor system has shown a lack of obvious network characteristics and connectivity. The effective connectivity of tourism resources in some rural areas is good, but further cross-functional integration with end-of-network resources is required.

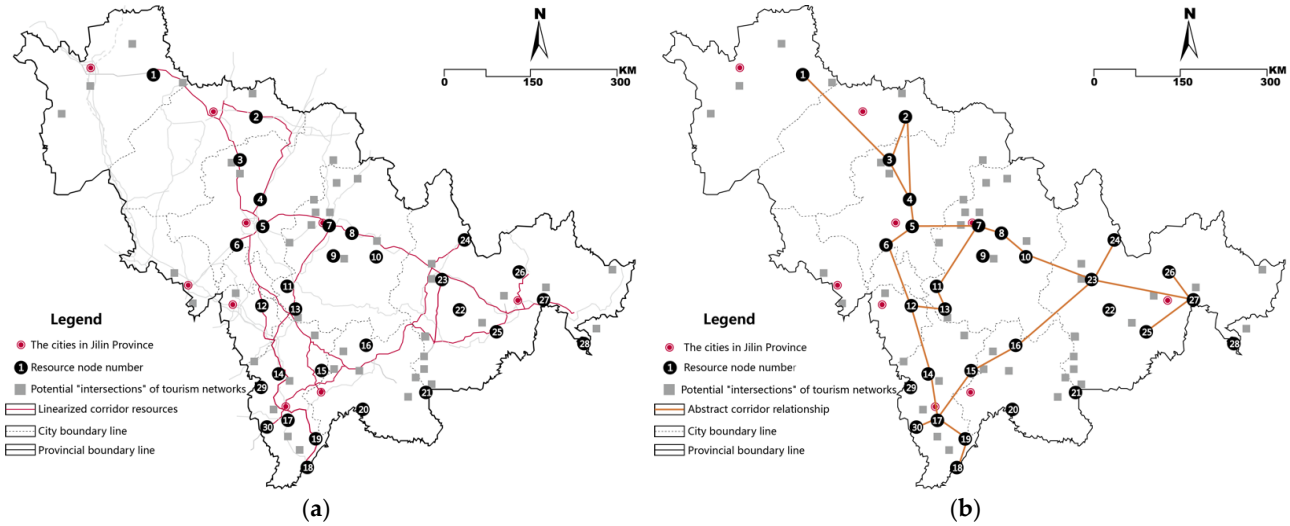

Figure 4. Abstraction of existing corridors of the tourism network: (**a**) linearized abstraction of the resource corridor relationships; (**b**) abstraction of the resource corridor linkages.

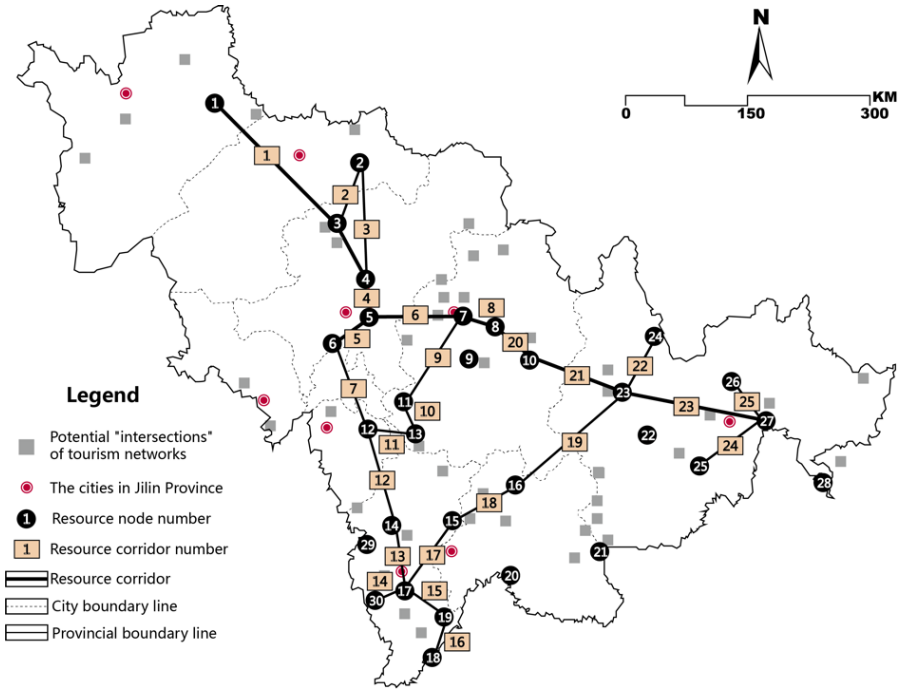

Figure 5. Abstract network status element numbering.

(2) Spatial performance measurement result

Based on the mutual attraction between the resource nodes, the spatial performance measurement results of the tourism resources are reflected by the tourism flow grading with the help of the natural breakpoint method tool of the GIS platform (see Figure 6), divided into high-functional flow corridors, medium-functional flow corridors, and low-functional flow corridors. From the overall distribution of tourism flow, the comparatively high-grade resource corridors show a relatively concentrated distribution in the central city, especially between the central city and the Changbaishan Scenic Area, while the northern resource corridors have a lower tourism flow grade. The results of the resource node centrality measurement show a large difference across the region (see Figure 7). The high-centrality resource nodes are mainly located in the Changbaishan Scenic Area and along the railway line. Some valleys of spatial performance and marginal areas also have high-centrality resource nodes. Such resource nodes have a strongly dominant role in enhancing the tourism functions in the surrounding region as a whole, acting as an expansion of tourism flows to the peripheral areas of the region.

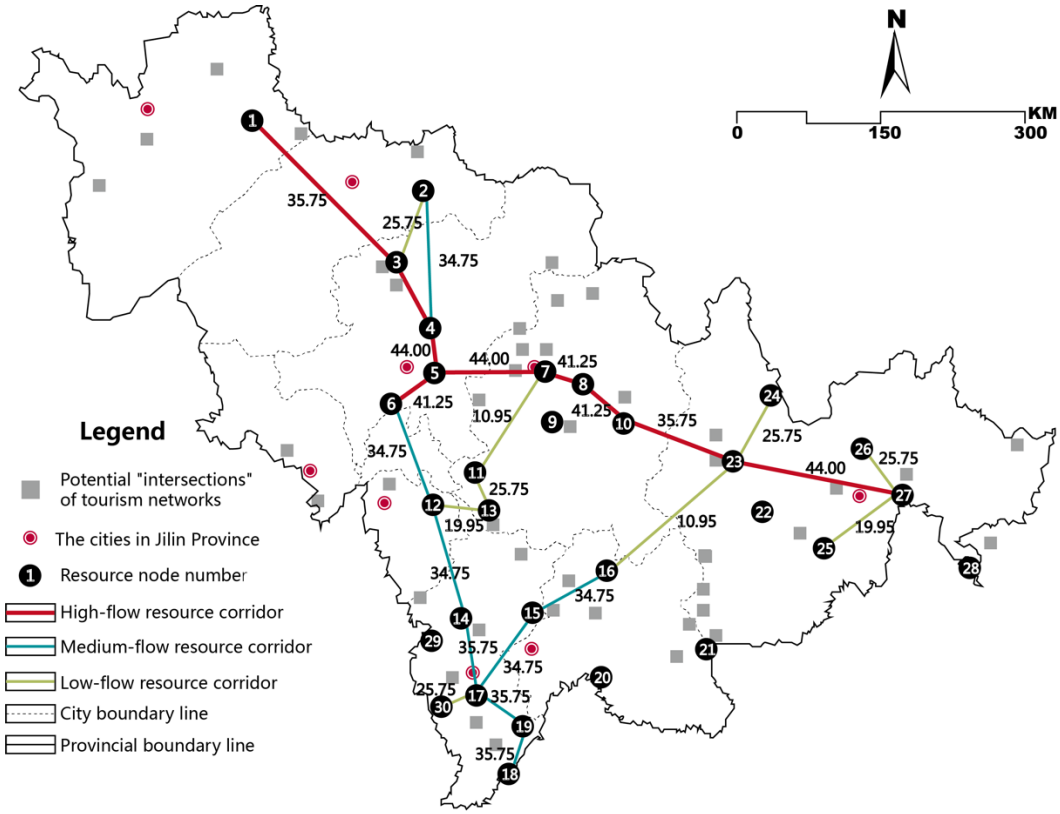

Figure 6. Distribution of the current network tourism flow measurements across the region.

(3) Supply-demand ratio measurement result

Regarding the overall supply-demand situation for the resource nodes across the region, the resource nodes with supply–demand ratios between 1 and 35.25 are more balanced regarding supply and demand (see Figure 8). The composite value base of secondary tourism resources, such as the location of the Bohai-era city of Xi, has reached a certain value between supply and demand. This value could be enhanced in a balanced manner as the overall value of the network increases. At the same time, the Changbaishan Scenic Area shows a significant concentration of resources with a high supply-demand ratio; in other words, the current imbalance in the flow of relevant resource nodes in the Changbaishan Scenic Area has become more serious and needs to be enhanced to balance the supply-demand ratio and achieve a balanced flow. The more balanced areas of supply

and demand are mainly located in the outer areas of the main city, including Songhua Lake and Momog Nature Reserve, forming an adequate area for the supply and demand of daily leisure. The supply-demand ratio in these areas is above 35.21, and the higher resource nodes are mainly located in the scenic peripheral regions and the peripheral areas of the province, especially in the southeastern part of the province, which is closer to Changbaishan. The daily recreational function of such resource nodes is poor.

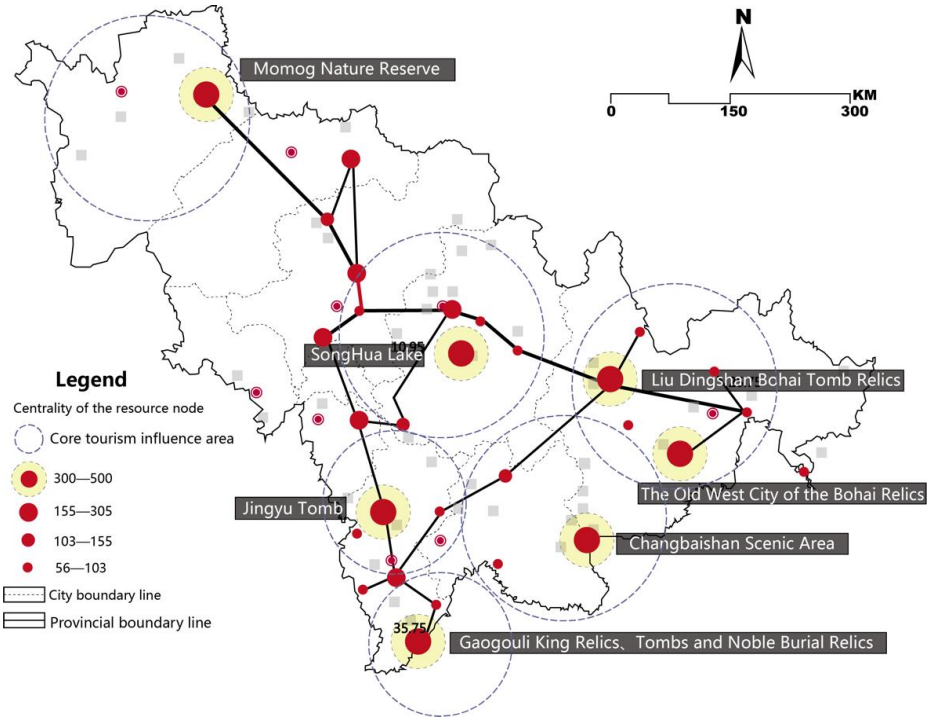

Figure 7. Resource node centrality measurement results.

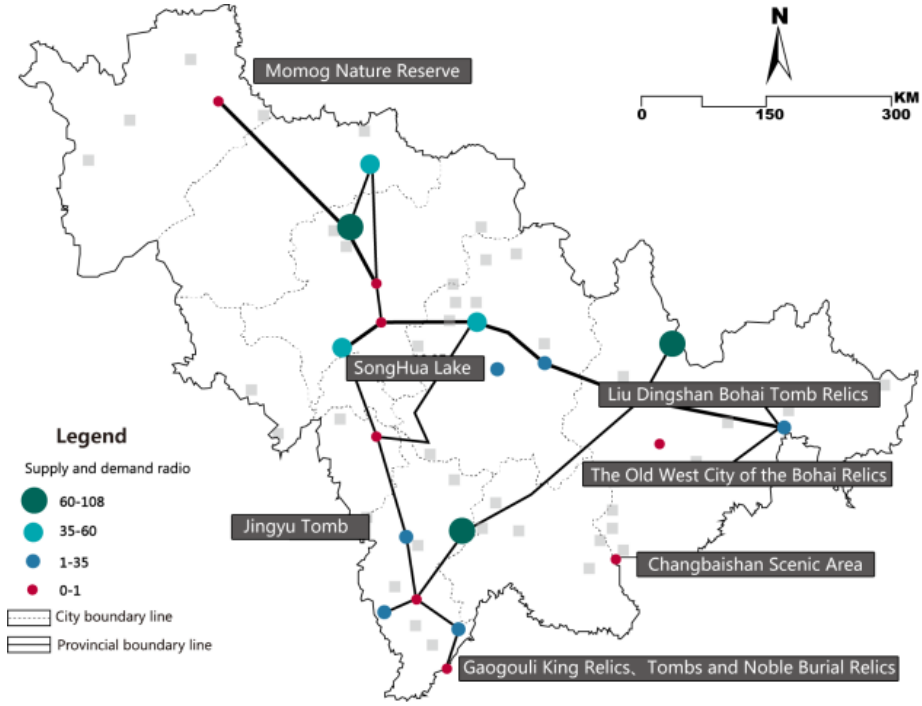

Figure 8. Resource node supply-demand ratio measurement results.

In general, based on the spatial measurement of the tourism network, the results show that the cooperation between resources needs to be optimized, and the resources located at the edge of provinces play a relatively weak role in developing a rural tourism network. The network structure centered on Changbaishan Scenic Area obviously, but its driving role in the overall rural area of the province is still limited.

4. Discussion

According to the overall tourism planning of Jilin Province (2013-2030), Changbai Mountain remains the core of tourism planning in nonurban areas, and other cores have not been highlighted. However, relevant studies have pointed out the disadvantages of the unbalanced development of rural tourism in Jilin Province. The multi-core development model proposed in this study is conducive to the coordinated utilization of resources in rural areas. Compared with existing research, the contents that could be used as a supplement are as follows:

4.1. Resource Organization Mechanism

(1) Influence of internal and external driving forces

Based on the analysis of the tourism network resource nodes and resource corridor measurements, the polarization effect of the entire Jilin Province, with the Changbaishan Scenic Area and Songhua Lake Scenic Area as the core, is still strengthening, and several new cores have emerged. However, tourism flow connections between regions are still sluggish, and the radial capacity between nodes needs to be increased. A "five-core" distribution model is more suitable for balancing the network tourism flow (see Figure 9). It is necessary to improve the core connectivity of resource elements further, strengthen the core location and role, and enhance the radiation range of corridors. Therefore, the Songhua Lake Scenic Area, the Jingyu Tomb site, and other tourism resources in this location could become a new core for future development, landscape, and industry connections. Media attention could increase and reconfigure the network tourism flow in this area. The internal optimization of these cores could be promoted through key village settlements, the agricultural and forestry industry, transportation structures, and the direction of spatial development. Promoting the external drive of the tourism network using circle linkage development is conducive to weakening the administrative boundaries and strengthening the connection and sharing of tourism resources. The priority development of the Gaogouli King Relics and the Liu Dingshan Bohai Tomb Relics as outlying areas of the established tourism core would facilitate the equalization of the local through-tourism flow network and lead to the clustering and development of resources across Jilin Province, as well as the surrounding tourism resources.

(2) Increased synergy of resources

The combination of resource nodes with similar functions and properties would facilitate the further concentration of quality tourism resources, resulting in more influential regional nodes and a more efficient cooperative development relationship between the nodes. According to the spatial performance analysis, there are large areas of forestland, mountains, and other resources in the marginal areas of Jilin Province. The secondary resources between the core resources and the edge resources are areas with a high degree of whole region resource superposition.

Organizing tourism resources through a "whole region tourism" paradigm is more conducive to the steady use and coordinated development of resources. Key recreational resource areas are linked in secondary networks with the main objective of enhancing leisure resource utilization. This is achieved by integrating the evaluation and analysis of the current area-wide resources, linking ecological resource flows into the secondary network structure, and enhancing the integrity of ecological landscape flows in the secondary network, using human resources as a medium to enhance the secondary tourism protection and radiation of network structures such as folklore resources and historical

sites in the flow connection, and moving industrial resources into secondary networks to enhance relative tourism economic development.

(3) Featured linkage of resources

In the characteristic linkage model, approximately 65% of the resources in the whole region are at a lower utilization stage, and the human resources are more numerous, but utilization and protection are in a slow development state, constituting a marginal area for the development of tourism in the entire region. According to the characteristics of resource node agglomeration, the flow diffusion method shows the characteristics of settlement-led agglomeration, ecological agglomeration, humanistic conservation, and industrial enhancement (see Figure 10). The distribution of tourism resources in the peripheral areas is more fragmented, and the structural base and overall degree of resource synergy are relatively weak. At the same time, the tourism resource nodes in the fringe area still have some potential for distinctive development. In the control and domination of resource hierarchy, the key is to guide the flow of hinterland villages and towns through the development of regional tourism into areas of rural tourism advantage in an orderly manner, alleviating the flow imbalance in the "core-edge" model.

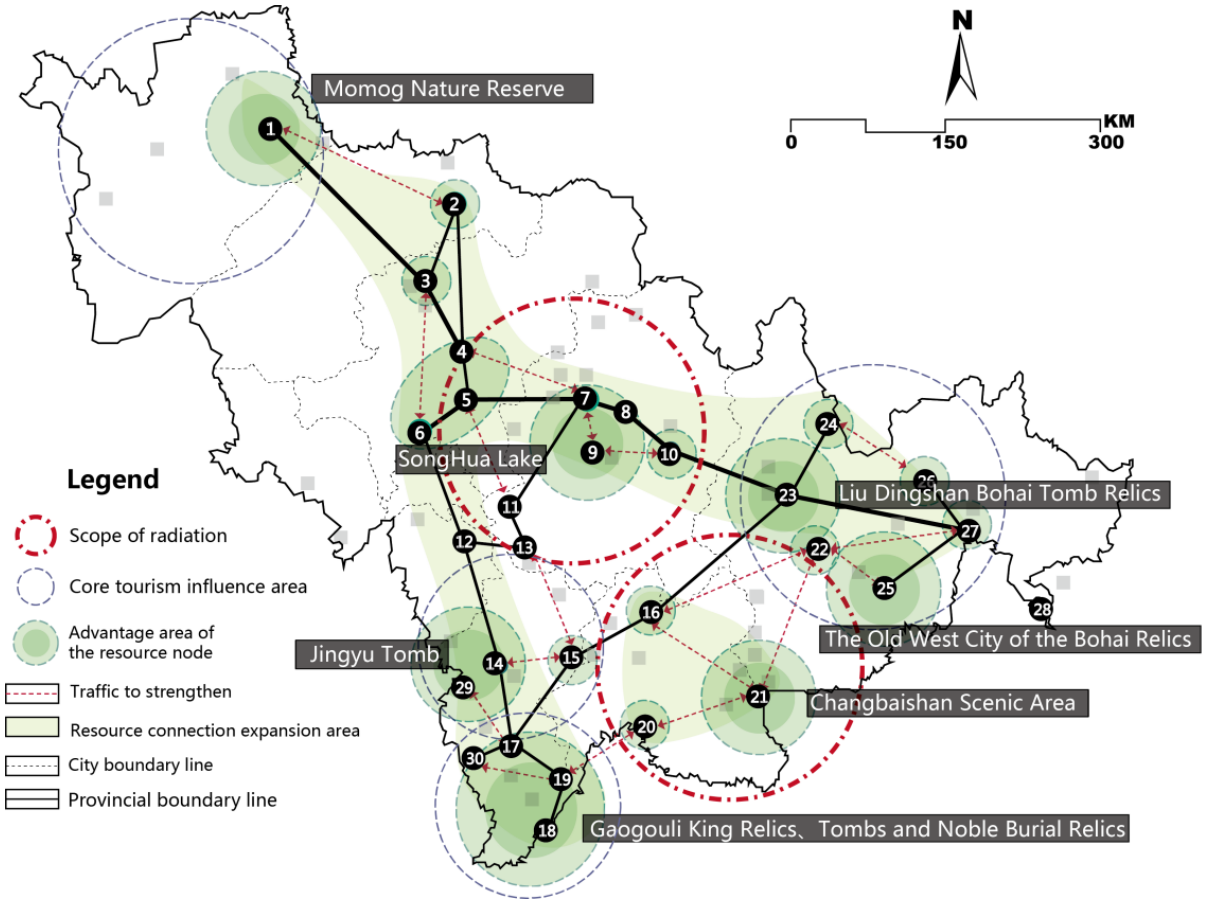

Figure 9. Network connections in the quad-core driving mode.

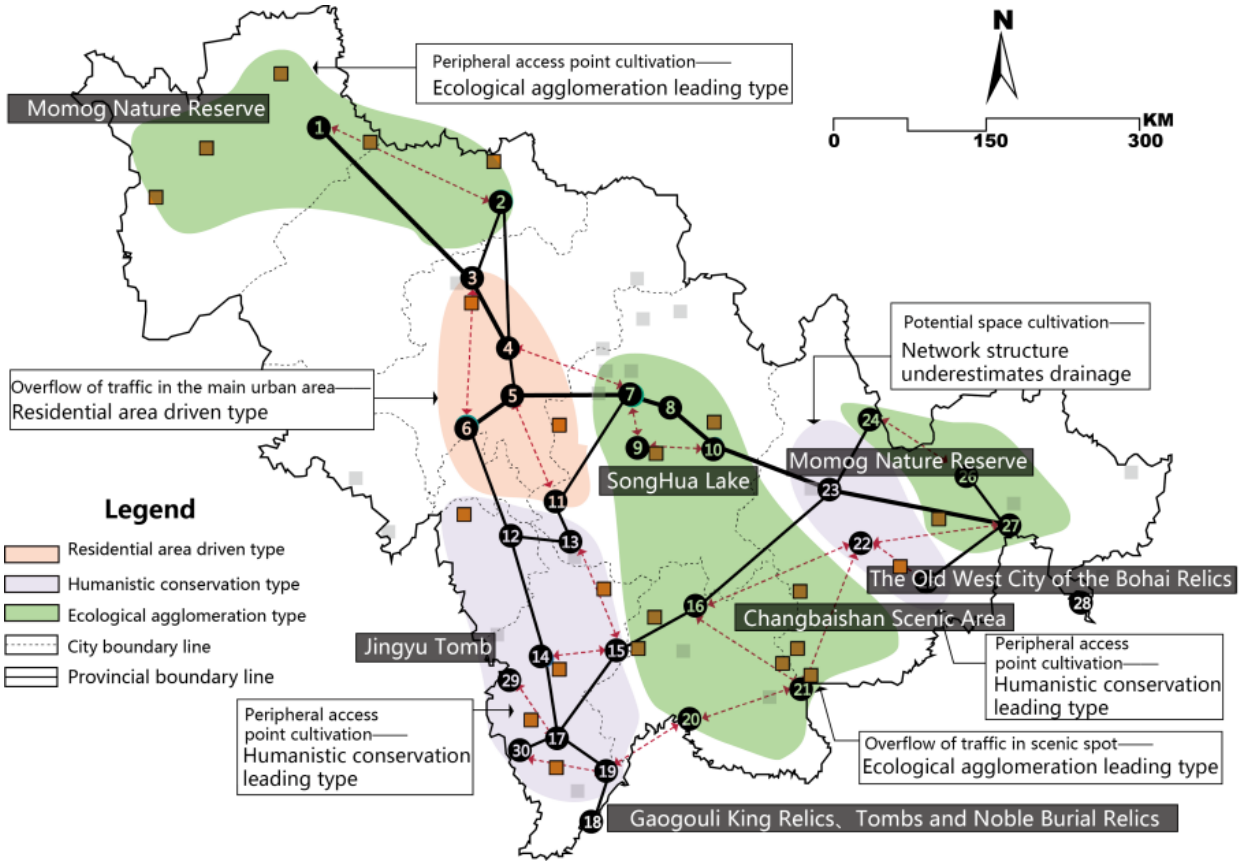

Figure 10. Three-tier resource tourism flow organization model under edge linkage.

4.2. Spatial Restructuring and Resource Performance Enhancement

Using the performance measurement results of the rural tourism resources, we could reconstruct the resource flow organization method in the dominant areas of different modes (see Figure 11). First, in the advantageous areas formed under the five-core driving mode, by focusing on the improvement of resource tourism flow in the new core area, the network structure tourism flow is increased to the average tourism flow level of the advantageous area to influence the diffusion of the whole region tourism function in the network and aid in the generation of the new core. In the primary tourism flow redistribution, the central axis tourism flow increased to reach the average level of the primary structure network tourism flow. In particular, the Momog Nature Reserve, Nongan Liaojing, and the Changbaishan Scenic Area received an overall boost in tourism flow allocation to strengthen the cumulative capacity of the network tourism flow skeleton to expand outwards. The Momog Nature Reserve at the end of the primary structure received a significant increase in flow and formed an important resource node. At the same time, the flow of The Old West city of the Bohai Relics scenic resource node significantly increased to drive its full tourism function flow to the central and east sides of the end of the structure expansion. The increased flow of tourism resources related to the eastern Yanji region is conducive to the increased intensity of the flow of tourism resources in the substructure, promoting the formation of new flow channels and the expansion of new core tourism functions on the eastern side. In the southern Changbaishan Scenic Area, the increase in local network tourism flow is conducive to a further increase in southbound tourism flow in the secondary structure, promoting structural stability and co-integration of the secondary network structure. Once again, to promote the diffusion of region-wide tourism function flows to the fringes in the flow balancing of the region-wide edge network structure, using resource node flow enhancement to drive resource corridor attractiveness is an efficient way to equalize flows.

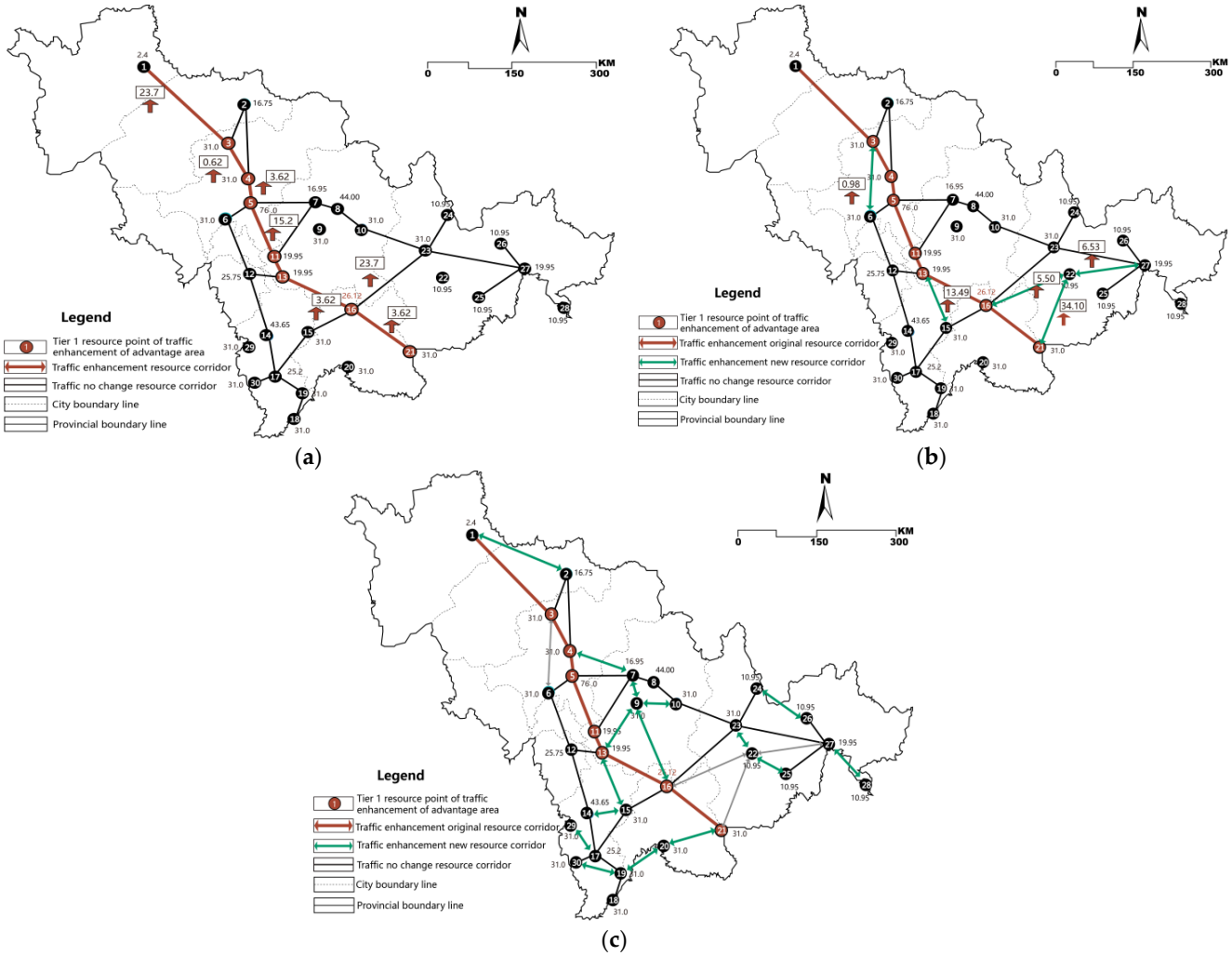

Figure 11. Redistribution of flow in the tourism network: (**a**) allocation of resource flows within dominant regions; (**b**) substructure resource flow allocation; (**c**) edge flow enhanced mode.

4.3. Implementation Mechanism of Spatial Reconfiguration

In the reorganization of the spatial structure of rural tourism resources, the distribution of tourism forms at all levels and the connection of resources need to be further developed into an integrated system of implementation in the form of tourism-specific planning through the organization of the abstract structure of the whole tourism network, the connection of elements, and the adjustment of spatial synergies (see Figure 12). Beginning with developing and balancing key spaces and progressing with the opening and transformation of nonadvantageous areas, expanding marginal areas, and integrating resources, a spatial planning strategy of tourism networks at all levels is proposed. The complementary and improved functions of the core circle, the internal optimization and external cooperation of the substructure, and the cultivation of tourism terminal resource functions are used to support the improvement of tourism resources.

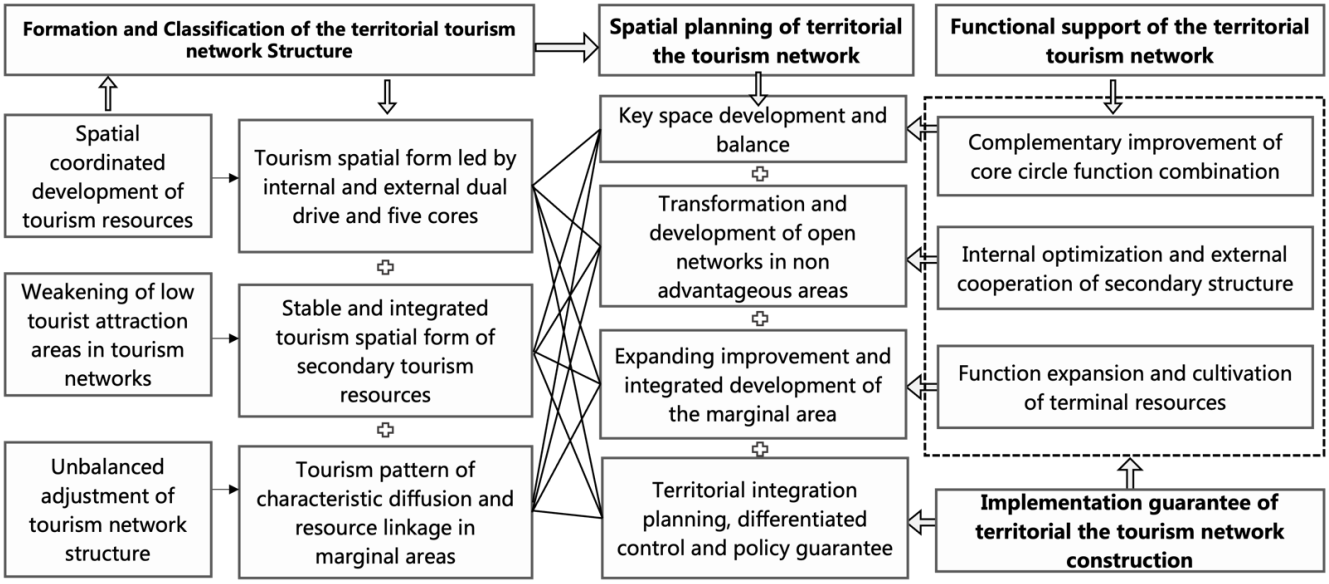

Figure 12. The general path of rural tourism network management implementation.

4.3.1. Spatial Development of Core Circle Tourism Spaces with Functional Enhancement

The spatial planning of rural tourism in Jilin Province is a step-by-step development process, and it is necessary to implement a strategic planning path of "key cultivation and balanced development of the whole region" according to the development goals of the "five cores" structure and the individual development conditions of each resource node and corridor. According to the whole region tourism network structure and tourism flow reorganization, one may guide the development of key spaces under the core circle, use this as a space carrier to cultivate superior spatial resources and the industrial chain upgrading clusters of whole region tourism development, establish the ecological connection between resources, and establish the ecological connection between resources and the recreation industry. The core tourism circle considers the difference between the ecological functions of various main functional areas in the whole region and the difference in industrial development types. Additionally, this circle appropriately balances development opportunities in key spaces so that each township could form a virtuous cycle of the regional economy in which tourism-related industries are supported, and the industrial chain of whole region tourism planning is utilized. This illustrates that matching supply and complementary functional combinations are the focus of the sustainable development of tourism in Jilin Province. In addition, through the auxiliary guarantee of domestic tourism and the construction of space facilities, the use of resources at all levels may be promoted by the flow of people in the whole region.

4.3.2. Network Transformation and Management in Nondominant Areas

In the context of realistic economic, social, and tourism-industry development in Jilin Province, the resources and elements of all-area tourism are significant. They have rich connotations in the development of tourism spaces. At present, from the perspective of the whole region network form generation, nondominant areas could only achieve equilibrium in the tourism network's spatial structure by transforming from closed areas to areas of network expansion. Nondominant areas mainly include the secondary structure of the whole region tourism network and surrounding areas. The enhancement of transportation and industrial connectivity in external expansion is the key to further weakening administrative boundaries and enabling the construction of a whole region tourism network system. In the transformation of nondominant areas, the ecological functions and outward expansion planning of the main axis are the focus of improvement.

4.3.3. Spatial Expansion and the Integration of Special Resources in Villages and Towns

Based on the background of the overall development of provincial land space and the restructuring of the whole region tourism space, the focus of the whole region tourism space network in Jilin Province is the reorganization of the whole region tourism network pattern in villages and towns in the peripheral areas. This highlights the coordinated development of "three birth" resources in the organization of urban and rural multi-level networks and forms the support of the whole region network and the driving force of whole region tourism development with the expansion of terminal spaces such as villages and town settlements. In the resource organization, combining complex environmental and characteristic resources is important for cultivating high-quality tourism resources in villages and towns. It is also the fundamental way in which the entire urban and rural space of Jilin Province could promote whole region tourism and improve the tourism space network. The key to getting out of the trough of network tourism flow in the peripheral areas is to effectively upgrade the existing low-tourism flow resource nodes while simultaneously efficiently using the village and town space in these areas so that they could actively integrate into the core circle layer of the dominant areas and the green economic network, increase the branch structure and functional extension at the end of the tourism network, improve the value upgrade and entire region overall planning of resources in the regional linkage network, and form "three lives" under the promotion of space and function in the process of combining characteristic resources and tourism networks in the peripheral areas. The functional advantages and construction of surrounding villages and towns in the whole region form a mutual promotion of positive development.

4.4. Implementation of the Functional Classification Mode

Combined with the "Development Plan of Changtong Baiyanji Changchun Summer and Leisure Ice and Snow Tourism Grand Ring Road" in the "Jilin Province Land and Space Master Plan (2021–2035)", the construction of the "Changchun-Changbai Mountain" dual gateway occupies an important position in the improvement of the whole region tourism function. According to the "Jilin Province Land and Space Master Plan (2021–2035)", whole regional development, all-season potential mining, and full-chain integration are important parts of functional construction. The integration of whole region tourism functions is the key to supporting tourism's sustainable development and growth at all levels of the whole region tourism network. At all levels, it is necessary to adhere to the principle of coordinated development of whole region resources during implementation and to form a differentiated "tourism" multi-functional organization. At the macro level, the tourism network planning of Jilin Province is included in the planning of provincial strategy, ecological resource protection, and whole region tourism as a regional spatial development strategy, focusing on improving the functional combination of resources at the core circle level. At the meso level, the connection of potential spaces focuses on the internal functional optimization of resource nodes and external functional integration to form functional expansions and upgrades, using tourism resources across the region as touch points to organize an efficient networked spatial pattern of tourism resources across the region. At the micro level, terminal tourism's expansion and functional cultivation play a strong role in promoting the functional optimization of the whole region tourism network. Under the guidance of superior planning, the tourism network is integrated into local residential life with the help of functional integration strategies such as tourism, industrial, and ecological resources. Combined with the network structure analysis in the previous chapter, the suggestions for the planning, improvement, and optimization of the whole region tourism network are shown in Figure 13.

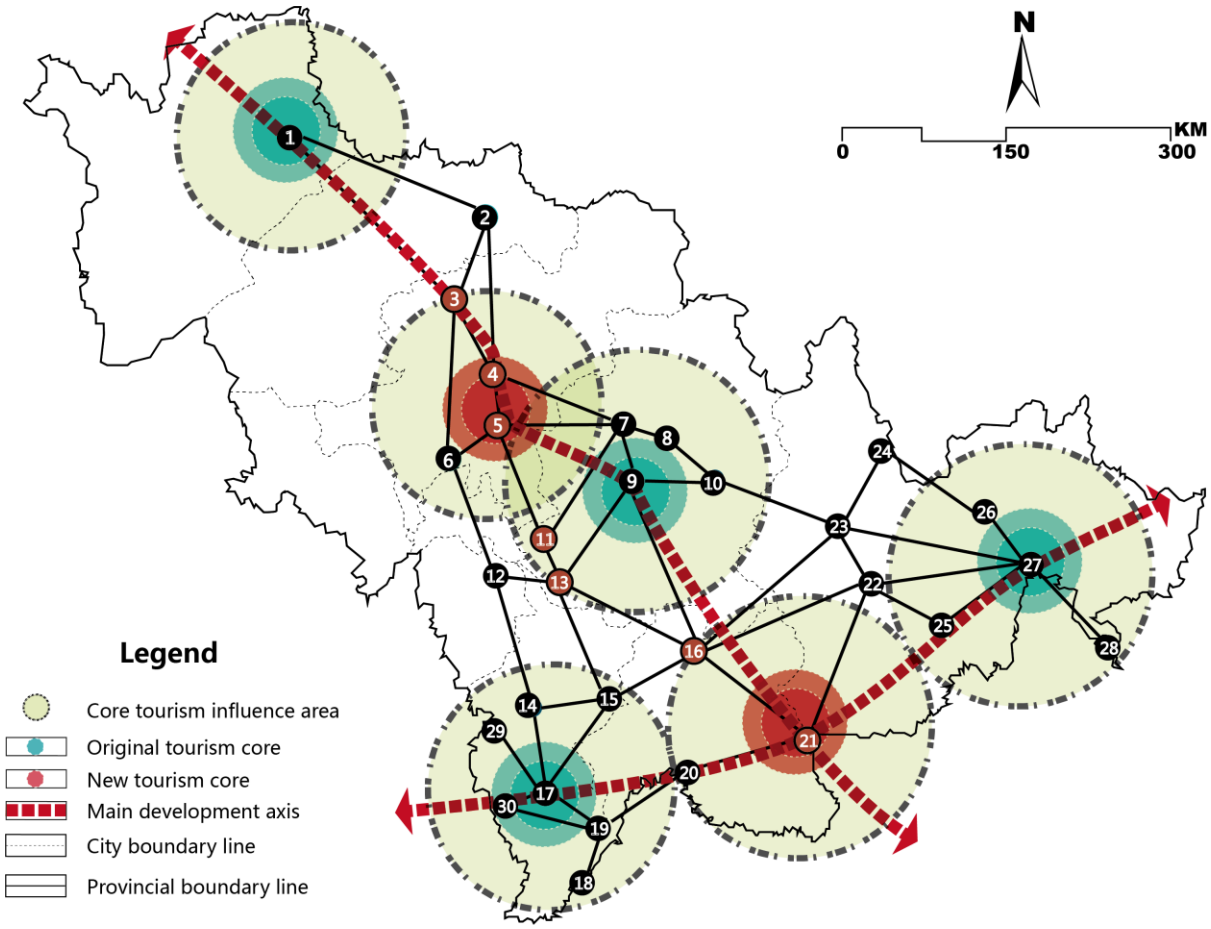

Figure 13. Planning enhancements to the tourism network structure across the region.

5. Conclusions

Rural tourism networks are complex systems and evolutionary forms of ecological, productive, and living integration. These networks, their elemental connections, and their network generation consist of synergistic processes between elements. Taking the rural areas of Jilin Province as an example, this study explored the measurement of spatial resource performance and the organizational path of activation with tourism-driven rural revitalization, constructed the implementation mechanism of rural tourism, and explored the use of local resources and planning directions in developing countries. Specific research included the analysis of the coupling mechanism of rural tourism resources, the construction of an evaluation system (combined with drive-system analysis, entropy method, etc.), the analysis of a resource regulation mechanism, and the establishment of a rural tourism network model through numerical model analysis (a complex network analysis method) and dynamic simulation.

According to the spatial performance analysis, the initial development stage of the rural tourism network in Jilin Province, the level of coordinated development, and the low utilization of various resources have resulted in the limited development of the whole region tourism network. Furthermore, the allocation and linkage of various tourism-related elements are not yet mature. In addition, the whole region tourism network pattern shows many differences in the development of factors between different levels and scales in different regions, and the orderly formation of the network structure needs to be promoted through the combination of elements according to the law and the similarity of resource-level changes in the connection of structural elements. From the perspective of the overall tourism flow reconstruction, the structural restructuring mode in Jilin Province

is mainly divided into internal and external dual-drive guidance, secondary integration, and characteristic linkage mode.

Combined with the exploration of the spatial reorganization model, this study proposed that in the development of rural tourism in Jilin Province, the selection of a resource connection model should pay attention to the concept of resource synergy in the context of whole region tourism and the overall planning of advantageous resource elements should be based on the overall interests of the entire region to promote the coordinated development of secondary resource networks. Specific guidelines are as follows:

(1) The first-level spatial structural promotion paths of the core circle layer

The first-level tourism network embodies the management and regulation of the tourism functions of the core circle at the macro level. Under the guidance of the overall plan and related planning, it starts with the characteristics of the whole region's resources. It builds a composite mode of tourism functions that meets the developmental needs and characteristics of Jilin Province according to local conditions. In implementing the core circle, full consideration is provided to protecting and utilizing high-quality ecological resources such as the Changbaishan Scenic Area, the Songhua Lake Tourism Area, and the Momoge Nature Reserve. Various tourism networks and all-round tourism development methods are formed alongside rich agricultural, forestry, and tourism resources: the core control axis of the tourism network in the main urban area, the "tourism network + scenic area tourism" that coordinates development with the main tourist points of Changbaishan; "tourism network + forestry tourism" in the forest-rich areas on the east side of the province; and a tourism-driven control mechanism in policy management.

The core circle layer involves important resource nodes of the whole region tourism network. Tourism resources, such as agriculture, forestry, and scenic areas, are the center of a functional macro system. In the development of provincial agriculture, forestry and scenic area resources are combined to form "tourism network + forestry tourism," "tourism network + scenic tourism," and other organizational models, integrated with each functional area while forming a differentiated improvement path. Incorporating various industrial tourism development opportunities in Jilin Province into the macro strategy system, which involves major participants including farmers, agricultural managers, forestry managers, scenic spot managers, relevant government personnel, and tourists, is of great significance in expanding the influence of the network and promoting the development of a green economy and macro functional networks in combination with agriculture, forestry, and tourism. At the same time, the implementation of the core circle function is supported by the regulation of "tourism + management," highlighting the policy tilt of the dominant resources of tourism in the macro system tourism network and promoting the tourism network planning function to realize the organization and regulation of the "tourism" function in space and policy.

(2) Internal optimization and external cooperation management paths in secondary potential connection spaces

In the tourism network function support system, secondary tourism, as a transition space connecting the upper and lower functions, is the focus of the internal optimization and outward expansion of potential space functions. Potential space tourism's most basic functional appeal is the integration of ecological functions of various resources with other functions. Combining these functions with urban artificial built environment functions emphasizes that the fit and coordination of landscape ecological functions is the key to internal optimization and the functional output of resources. In optimizing the internal functions of the space, the village-level space is fully integrated into the whole region ecological network in accordance with the topography and geomorphological characteristics of rural areas, forming an extension of the ecological function of the peripheral terminal space. At the same time, the expansion of cultural functions is the main aspect of external function cooperation of potential space, and the integration of cultural landscape functions with tourism, ecology, life, and recreation functions is established to enrich and update the

connotation of cultural functions. In the whole region, ecological restoration, the extension of cultural characteristics, tourism matrix upgrading, the internal optimization of potential space uses secondary tourism resources in spatial connection, as well as the overall planning of agricultural production, ecological reserves, industrial service areas, and other functional areas to divide organic organizational functions. This forms characteristic functional economic driving routes, such as "tourism network + scenic area tourism," "tourism network + ethnic cultural tourism", "tourism network + characteristic industry experience", "tourism network + characteristic residential experience", and so on. In implementing the plan, it is possible to highlight the thematic nature and policy guidance of the tourism network functions in each area and organize functional routes such as leisure and pension, ethnic, cultural tourism, industrial experience, and characteristic residential experience. Combined with the distribution of population density and transportation convenience in each area, the functional path connection is formed, providing urban residents with shared public service facilities within the secondary potential space and increasing the outdoor recreational experience function. At the same time, this would strengthen the investment in green infrastructure with scenic spots as network centers and encourage the development of green industry functions in combination with industrial network center nodes. In implementing secondary tourism network functions, the rapid upgrading and transformation of potential space and trough space are realized by driving transportation functions and industrial function clusters.

(3) Terminal region promotion management path

The tourism terminal space is the key area for the extension and expansion of the functions of the rural tourism network, and whole region tourism function support is reflected in the cultivation of the functional organization and functional connection of the terminal resource nodes, forming a new function expansion core at the end of the network. At the same time, the resource corridor connection is mainly based on existing infrastructure resources, and the broken ecological patch connection is strengthened to improve the basic ecological function. In areas where terminal comprehensive function organization is relatively weak, the tourism and life recreation functions are cultivated with the Momoge Nature Reserve, Siberian Tiger Reserve, and Changbaishan Scenic Area as the core. The functional organization mode of "tourism resources + green facilities + tourism resources" is deeply rooted in the network. Additionally, the Songhua Lake Scenic Area is based on ecological construction and the limited development of recreational functions. The surrounding resources in the village and town construction areas further emphasize the resource combination of "tourism network + people" in cultivating tourism functions so that local villagers become participants and beneficiaries of the "tourism" mode.

In general, whole region tourism plays a driving role in the development of provincial rural tourism. This study used the complex network analysis method to create an application model for tourism network identification, evaluation, and reconstruction. It explored the process of integrating scattered tourism resources into a tourism network by evaluating potential tourism resources and proposed a new paradigm of tourism networking in a rural tourism system. This provides a new path and technical basis for the provincial revitalization of spatial resources and environmental quality and a reference for developing rural tourism resources in other developing countries.

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