

Article

Evaluation of Spatial Reconstruction and Driving Factors of Tourism-Based Countryside

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Abstract: The spatial reconstruction process of suburban villages is an important aspect of integrated urban–rural development. Evaluating the level of spatial reconstruction of tourist villages and the characteristics of their developmental stages has become a critical issue in current rural development. Exploring the spatial reconstruction of typical tourist-oriented villages can help provide experiences for other rural spatial reconstructions. In this study, East Tumen Village and West Tumen Village in Shijiazhuang City, Hebei Province, were selected as the research objects of rural tourism space. Through in-depth interviews and human–computer interactive interpretation of remote sensing images, this study traced the process of rural spatial reconstruction. The spatial reconstruction index of the rural tourism space was constructed from three dimensions: production space (product production capacity, industrial development activity, production space foundation), living space (living space convenience, tourism space convenience, living space comfort, living space foundation), and ecological space (ecological space regulation ability, ecological space stability capacity, ecological space foundation). Using the rural spatial reconstruction intensity index and rural spatial reconstruction contribution rate, this study quantitatively evaluated the spatial development level of tourism villages on a microscopic scale and examined the stage characteristics of their spatial reconstruction. The results show that the two villages experienced a budding stage, a development stage, and an accelerated development stage from 2005 to 2020 and have not yet reached a stable stage of relative balance and coordination; production activities are integrated into other spaces, and single-function space has become production–living and production–ecology composite space. The spatial reconstruction of East and West Tumen villages is driven by a combination of ‘top-down’ external drivers, such as rural tourism development, multi-governance subject participation, and public policy, and ‘bottom-up’ internal drivers, such as production demand, living demand, and ecological demand.

Keywords: rural space reconstruction; evaluation; stage characteristics; driving factor; tourism-based countryside; GIS



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1. Introduction

Rural tourism has become an important engine for China’s rural revitalisation and urban–rural integration development in the modern era [1,2]. Driven by tourism development, the population flow and traffic-carrying capacity of countryside tourist areas have dramatically increased [3,4]. To meet the needs of countryside tourism construction, various infrastructural constructions have gradually occupied the production, living, and ecological spaces of rural areas, and the spatial structure, spatial layout, landscape form, production, and lifestyle of rural areas have been reconstructed [5,6]. The traditional rural spatial form is directly or indirectly influenced by tourism development, forming stage-specific spatial characteristics. The evaluation of the level of spatial reconstruction, development stage

characteristics, and driving factors of rural tourism areas has become a critical issue in current rural development [7].

Since the 1950s, developed countries have generally experienced reconstruction processes, and rural spaces have been continuously reconstructed [8–10]. With continuous urbanisation and industrialisation in China, rural spaces are constantly exchanging material, energy, and information with the outside world. Rural spatial reconstruction is a process of spatial form optimisation caused by the transformation of rural socio-economic structures in the accelerated urbanisation and industrialisation process, driven by both endogenous rural demand and external driving forces [11,12]. Rural spatial reconstruction can be a positive qualitative change process in the rural space or a transformation and upgrading process formed by quantitative changes [13].

With in-depth research on rural spatial reconstruction, an increasing number of people have started to pay attention to the evolution process in rural space [14], rural economic and industrial reconstruction [15], and rural spatial reconstruction [16]. Based on remote sensing images and land use data, some studies have used geographic information system (GIS) software to study the stage characteristics of rural spatial reconstruction in macro-regions such as counties, cities, provinces, and watersheds through a land use transfer matrix [17–19], dynamic degree of land use, distance buffer analysis, settlement landscape index, and expansion intensity index [20,21]. Some studies have explored the stage characteristics of rural spatial reconstruction on the village scale in terms of spatial morphology, land use, and landscape patterns [22,23].

Participatory in-depth interviews and remote sensing image data were used to construct a rural development index, rural reconstruction intensity index, and rural reconstruction contribution rate using GIS spatial analysis techniques to conduct quantitative research on rural reconstruction [24,25]. The temporal evolution of the rural spatial reconstruction process is divided into initial, development, and stabilisation stages. The speed of spatial change in rural spatial reconstruction can be divided into low-, medium-, and high-speed stages [26]. There are few quantitative evaluations of the micro-scale rural spatial development level and the characteristics of its reconstruction stages [27]; its evaluation index system is not perfect. Comprehensive research on the optimisation and reconstruction process of production, living, and ecological spaces in rural tourist areas needs to be strengthened. Therefore, by constructing an evaluation index system of spatial reconstruction in tourist villages, this study selected typical villages that promote the reconstruction of rural spatial forms and social organisations due to tourism development as cases and quantitatively evaluated the level, stage, and phase characteristics of spatial reconstruction in East Tumen Village and West Tumen Village from 2005 to 2020 using GIS technology and participatory evaluation methods.

The factors driving the spatial reconstruction of rural areas are complex and diverse and promote changes in the scale, pattern, morphology, and structure of rural spaces [4]. With the promotion of rural revitalisation in China, the trend of combining agriculture and tourism has become increasingly clear. The accelerated integration of primary, secondary, and tertiary industries and the rapid development of rural tourism not only satisfy urban residents' aspirations for a better countryside [10,28] but also gradually become the main force in promoting the spatial reconstruction of the countryside. Compared to research on the driving factors of rural spatial reconstruction, research on the driving factors of rural tourism spatial reconstruction in China started later.

Studies on the drivers of spatial reconstruction have used regression equations and structural equation models to determine the drivers of spatial reconstruction in tourist villages from various research perspectives [28]. However, there are significant differences in the drivers of the spatial reconstruction of some tourist villages due to the vast area of rural China and obvious differences in topography, slope, hydrology, and transportation [29,30]. Macroscopic studies cannot identify deep-seated regional driving processes. Participatory village assessment, in-depth interviews, and questionnaire methods in field surveys are more suitable for analysing the drivers of rural spatial reconstruction on a small scale.

In this study, a spatial reconstruction index of countryside tourism was constructed from three dimensions: production, living, and ecological spaces. The village spatial reconstruction intensity index and the contribution rate of village spatial reconstruction were used to quantitatively evaluate the spatial development level of tourism villages on a microscopic scale and to study the stage characteristics of their spatial reconstruction. Through all-round and multi-angle in-depth interviews with village cadres, villagers, tourism development companies, and government staff, we familiarised ourselves with the historical and cultural background and economic development of local villages, understood villagers' support for tourism villages, systematically analysed the development process and stage characteristics of the rural tourism industry, and explored the factors driving the spatial reconstruction of tourism villages. The study enriches the index system and cases of spatial evaluation of villages in China and can provide a reference for the spatial development evaluation of other tourist villages.

2. Materials and Methods

2.1. Overview of East and West Tumen Villages

East Tumen Village and West Tumen Village are located in Bailuquan Township, Shijiazhuang City, Hebei Province, separated by the Taiping River, with a total area of 6 km², 17.5 km east of Shijiazhuang City. Tumen Village has a history of more than 2000 years and has profound cultural accumulation. Tumen Pass is one of the 'Nine Forts of China', a strategic place, historically known as the throat of the traffic artery, with distinctive regional characteristics and cultural values. In 2006, the tourism project 'Tumenguan Yidao Town' settled in the two villages, intensifying the reconstruction of the rural space and promoting the development of tourism in the villages. The villages are typical of rapidly developing tourism villages in China and were therefore jointly selected for the study.

2.2. Materials

Remote sensing image maps of 2005, 2010, 2015, and 2020 were intercepted from Google Earth, and village administrative maps provided by the village committees of East and West Tumen villages were overlaid and intersected with satellite image maps using ArcGIS software. Combined with the histories of the two villages, in-depth interviews were conducted with the administrative personnel of Bailuquan town, the directors of the committees of the two villages, members of the village history editing team, villagers, and managers and staff of the rural tourism company during 4–6 June 2020. Through the field survey, we understood the development process of the two villages, grasped the changes in land use types there, became familiar with the construction and development of rural tourism, and proofread the remote sensing interpretation data. Supplementary investigations were conducted on 15–16 July and 1 August 2020. With reference to the current land use classification system of the Third China Land Survey, the land use types of the two villages were divided into three functional spaces: production space, living space, and ecological space. A rural spatial land use classification system was established by combining the actual development of the two villages and the research results of several experts (Table 1) [5,7,14]. Based on the actual land use situation of the two villages, the remote sensing images of the two villages were interpreted to form four phases of land-use vector data. Further field surveys and interviews were conducted to verify and revise the status and evolution of land use, laying the foundation for the construction of the evaluation index system of the rural spatial development index.

Table 1. Classification system of rural functional space.

Functional Space Type	Land Use Type
Production space	Arable land
	Industrial and mining storage land
	Place of commercial use
	Highway land
	Land for rural road
Living space	Land for transportation service station facilities
	Land for tourism service facilities
	Land for tourism infrastructure
	Land for tourism
	Residential land
Ecological space	Land for public administration and public service
	Special land
	Forest land
	Grassland
	Water area land
	Other land

2.3. Construction of Index System

The evaluation index selection and weight determination of rural spatial reconstruction should be based on improving rural economic efficiency, improving rural living space, protecting the ecological environment, improving social governance, and reasonably arranging rural production, living, and ecological space to meet the needs of rural industrial development. Following the principles of comprehensiveness, dominance, and rationality, referring to the research results refs. [5,31] and absorbing the suggestions of six peer experts, 10 primary indicators and 33 secondary indicators were selected from the three dimensions of production space, living space, and ecological space, according to the spatial characteristics of tourism villages and the actual situation of the two villages, to establish a village-scale spatial development index system for tourism villages (Table 2). To evaluate the level of production space development, three indicators were selected (production capacity, industrial development vitality, and production space foundation). To evaluate the development of living space, four indicators were selected (living space convenience, tourism space convenience, living space comfort, and living space foundation). To evaluate ecological space development, three indicators were selected (ecological space regulation capacity, ecological space stability capacity, and ecological space foundation).

In the evaluation index system of the rural production space development index, the rational degree of agricultural production space layout is a negative indicator. Agricultural production space refers to arable land. The higher the number of arable land patches, the smaller the average area of arable land, and the higher the degree of fragmentation, which makes it difficult to carry out large-scale and specialised mechanised planting and harvesting, the lower the production efficiency. The reasonableness of the spatial layout of non-agricultural production refers to the number of patches of other production land besides arable land, such as industrial and mining storage land, land for tourism service facilities, commercial land, and other land-use types. This is a positive indicator. With the development of the countryside, new types of rural land use have emerged, and non-agricultural production space is constantly upgraded and transformed. The higher the number of patches, the richer the rural land use types. Countryside landscape comfort refers to the area of grassland, woodland, water, and other land used for tourism activities. The comfort of rural landscapes is closely related to rural tourism, and the ornamental nature of a tourist landscape can directly reflect the development of rural tourism to a certain extent.

Table 2. Evaluation index system of rural space development index.

Target Layer	Primary Index	Secondary Index	Weight	Attribute
Production space	Production capacity	Arable land area	0.049	+
		Total food output	0.04	+
		Average arable land area	0.024	+
		Supporting facilities for agricultural production	0.021	+
	Industrial development vitality	Land transfer rate	0.011	+
		Rural tourism service facilities	0.052	+
		Rural tourism infrastructure	0.044	+
		Landscape comfort	0.026	+
		Number of public toilets	0.033	+
		Number of rural tourism spots	0.047	+
	Production space Foundation	Aggregation degree of rural tourism spots	0.028	+
		Proportion of production land	0.038	+
		Rationality of spatial distribution of agricultural production	0.014	-
		Rationality of spatial distribution of non-agricultural production	0.039	+
Living space	Living space convenience	Number of schools	0.009	+
		Number of supermarkets	0.038	+
		Number of public management and public services	0.025	+
		Area of rural roads	0.041	+
	Tourism space convenience	External traffic accessibility	0.054	+
		Density of road network	0.018	+
		Road hardening rate	0.021	+
		Population density	0.017	+
	Living space comfort	Housing area per capita	0.008	+
		Neatness of village appearance	0.023	+
		Idle housing rate	0.059	-
		Proportion of residential land	0.025	+
Ecological space	Living space foundation	Rationality of living space layout	0.034	+
		Green vegetation coverage rate	0.044	+
	Ecological space regulation ability	Biological abundance index	0.049	+
		Geological hazard level	0.01	-
		Slope of terrain	0.008	-
	Ecological space stability capacity	Proportion of ecological land	0.036	+
		Rationality of ecological spatial layout	0.021	+

In the evaluation index system of the rural living space development index, with the improvement of villagers' economic income and living standards, public attention to the quality of physical health is rising yearly. Coupled with the high degree of ageing in the village, the quality of physical health has become the most important concern, and improving the standard of living has become the top priority. Therefore, improving the quality of village habitat, forming a living environment conducive to improving the quality of villagers' health, and strengthening the coordination and interaction between urban and rural areas are necessary paths for the development of village living spaces. The degree of village cleanliness can directly respond to changes in the internal sanitary conditions, living environment, and comfort of villages. The rate of idle dwellings in villages was a negative indicator. The higher the rate of idle dwellings, the more serious the phenomenon of population exodus from villages, the higher the level of hollowing out, and the more backwards the development level of villages.

In the evaluation index system of the rural ecological space development index, the biological abundance index and rural ecological space regulation function are positively correlated; the higher the value of the biological abundance index, the more diverse the biological species and vegetation in the rural ecological space, and the higher the level of rural ecological space regulation. The proportion and layout of ecological spaces are also important bases for ecological space. In addition, the smaller the slope and the fewer the natural disasters, the better the ecological stability.

To determine the index weight, this study invited nine experts in the field of rural spatial reconstruction to determine the index weight by Analytic Hierarchy Process (AHP); the sum of all index weights is 1 (Table 1).

2.4. Characteristic Analysis Method of Rural Space Reconstruction Stage

2.4.1. Normalisation Processing

There are many indicators in the evaluation index system, and dimensional units are not unified and cannot be compared. The differences between different units should be eliminated, and all evaluation indicators should be processed as dimensionless to make them scalars. The following formula was used:

$$\text{Positive indicators : } RSDL_i = \frac{rsdl_i - \min_i}{\max_i - \min_i}, \quad (1)$$

$$\text{Reverse index : } RSDL_i = \frac{\max_i - rsdl_i}{\max_i - \min_i}, \quad (2)$$

where $RSDL_i$ is the normalised value of the rural spatial development index i , $rsdl_i$ is the value of the rural spatial development index i before normalisation, $\max_i$ is the maximum value of the rural spatial development index, and $\min_i$ is the minimum value of the rural spatial development index.

2.4.2. Rural Spatial Development Level Index

The evaluation of the weighted summation method is in line with the people's evaluation method, which makes the evaluation results more acceptable. Simultaneously, the weight distinguishes the importance of the indicators and makes the evaluation more accurate. The following formula was used:

$$RSRI = \sum_{i=1} \sum_{j=1} RDSL_{ij} W_{ij}, \quad (3)$$

where $RSRI$ refers to the rural spatial development index of East Tumen Village and West Tumen Village, i is the number of criterion layers, j is the number of indicators, $RDSL_{ij}$ is the standardised value of the j index of the i criterion layer, and W_{ij} is the weight value of the j index of the i criterion layer.

2.4.3. Rural Spatial Reconstruction Intensity Index

The intensity of rural spatial reconstruction is an indicator of the degree of rural evolution. The intensity of rural spatial reconstruction varies with time and is closely related to the level of spatial development. Based on comparative analysis of rural spatial development in different periods, the following formula was developed:

$$RSDL = \frac{RSDL_i}{RSDL_j}, \quad (4)$$

where $RSDL$ is the intensity index of the rural spatial reconstruction, $RSDL_i$ is the rural spatial development index at the end of the study period, and $RSDL_j$ is the rural spatial development index at the beginning of the study period. $RSDL > 1$ indicates positive spatial reconstruction in the countryside.

2.4.4. Contribution Rate of Rural Spatial Reconstruction

The contribution rate of rural space reconstruction was used to calculate the proportion of each period in the entire study period and then analyse the speed of rural space reconstruction in each period. The following formula was used:

$$RSRC_n = \frac{RSDL_{ni} - RSDL_{nj}}{RSDL_{2020} - RSDL_{2005}} \times 100 \quad ((RSDL_{ni} - RSDL_{nj}) > 0), \quad (5)$$

where $RSRC_n$ is the contribution rate of rural spatial reconstruction in n period, n is the number of study periods, $RSDL_{ni}$ is the rural spatial development index at the end of study period n , $RSDL_{nj}$ is the rural spatial development index at the beginning of n research period, $RSDL_{2020}$ is the rural spatial development index in 2020, and $RSDL_{2005}$ is the rural spatial development index in 2005.

2.4.5. In-Depth Interview

According to the agreed interview content, the research team conducted interviews with the managers of Bailuquan Town, the directors of the committees of the two villages, and the managers of the tourism company and relevant supporting materials were provided. This provided us with an overall understanding of the development process in East Tumen Village and West Tumen Village and the reasons for those measures of space reconstruction at that time. Then, through random in-depth interviews with members of the village history editing team, villagers, and tourists, we learned about the individuals' participation in the reconstruction of rural space and the reasons thereof.

3. Results

3.1. Rural Space Reconstruction

The general trend of rural spatial reconstruction in East Tumen Village and West Tumen Village showed a sharp decrease in the area of productive land, a steady increase in the area of living land, and fluctuating increase in the area of ecological land (Figure 1).

3.1.1. Changes in Production Space

The area of production land decreased significantly, while the areas of arable land, tourism land, and highway land changed significantly (Figures 1–3). Among them, the change in arable land was the most obvious, showing an accelerated downward trend, from a large area distributed in the north and south of East Tumen Village and the north, northwest, and southwest of West Tumen Village, to a small area on the south of Taiping River and the north of residential land, and a small area in the southwest, with an obvious spatial change. From 2005 to 2010, a large amount of arable land in the two villages was occupied due to the construction of the Shijiazhuang zoo, the Tourism Bureau Phase I project, the high-speed railway in the south of the village, the expansion of streets in the north of the village, and the Zhongcheng golf course in the south of the village. After 2010, nearly 80% of the arable land in the village was transferred and contracted. The Zhongcheng golf course rented 0.73 km² of land in East Tumen Village, which is mainly distributed in the southeast of East Tumen Village, and a small part is located on both sides of the central river at the junction of the two villages. In 2017, the construction of the Tumenguan Yidao Town project increased the area of tourism land. From 2015 to 2020, tourism land increased sharply, and the highway land area continued to rise. The construction and widening of Shanqian Avenue, the construction of Baoduzhai street in the north of the village, and the development of the 'Tumenguan Yidao Town' project at the junction of the two villages have made transportation in the two villages more convenient. The land area for tourism infrastructure and service facilities has increased significantly and is still rising. The land for industrial and mining storage continues to decrease, and environment-polluting enterprises in the village are gradually being suspended. By 2015, the land for industrial and mining storage was completely withdrawn from the development history of the two villages. The

new public transport passenger station has significantly improved villagers' daily travel and external contact. With the continuous improvement of the socio-economic dimension of the two villages and the construction and operation of 'Tumenguan Yidao Town', the area of commercial land increased rapidly from 2015 to 2020, showing a rising trend.

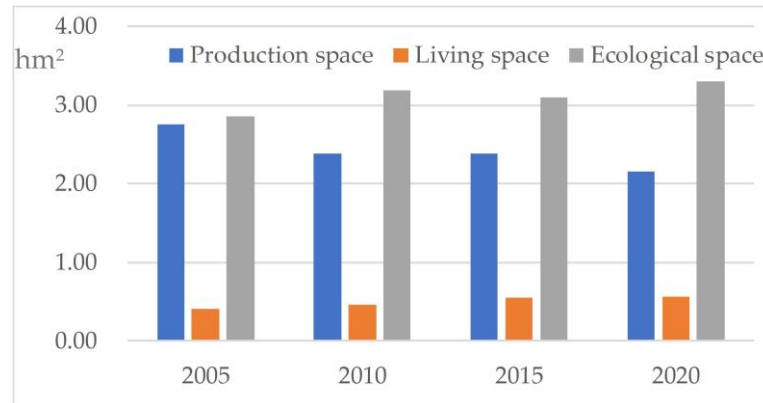


Figure 1. The temporal change in production–living–ecological space in East Tumen Village and West Tumen Village in 2005, 2010, 2015, and 2020.

3.1.2. Changes in Living Space

The area of living land showed a steady upward trend, and the areas of residential land and public service land changed significantly. From 2005 to 2020, residential land initially increased and then decreased. The proportion of residential land increased from 5.59% in 2005 to 6.89% in 2020. From 2015 to 2020, the two villages continued to transform their abandoned houses and renovate their idle houses, resulting in a reduction in residential land. The land for public services is dotted and scattered on both sides of the internal trunk roads of East and West Tumen Villages, showing a rapid upward trend after slow growth. With improvement in the economic level of the two villages and the promotion of the construction of beautiful villages, infrastructure construction has gradually improved, and the construction of harmonious and liveable villages has accelerated. The special land in the northwest of West Tumen Village is a religious land, which is an ancient architectural complex of the Lianhua Mountain. From 2015 to 2020, West Tumen Village hardened and widened the road to Lianhua Mountain and repaired and expanded the temple.

3.1.3. Changes in Ecological Space

The ecological land area showed a fluctuating trend of first rising, then falling, and finally rising again. The area of forest land increased significantly, and the area of grassland and water decreased gradually. The proportion of forest land increased from 27.53% to 34.89%, an increase of 7.36 percentage points. In 2002, East Tumen Village implemented a policy of returning farmland to forests, according to the national forestry development policy. Forestry growers received a forestry subsidy of 2250 yuan per hectare per year, which was changed to 1125 yuan per hectare after 2010, and the tax on agricultural and forestry speciality products was abolished. The number of farmers engaged in forestry planting gradually increased, and the forest land area increased accordingly. More stringent environmental protection measures have been implemented in West Tumen Village, and green vegetation coverage has increased significantly from Lianhua Mountain to Yu'er Mountain and Wangpo Mountain. The grassland area first increased, then decreased, and finally increased. The water area first decreased and then increased gradually.

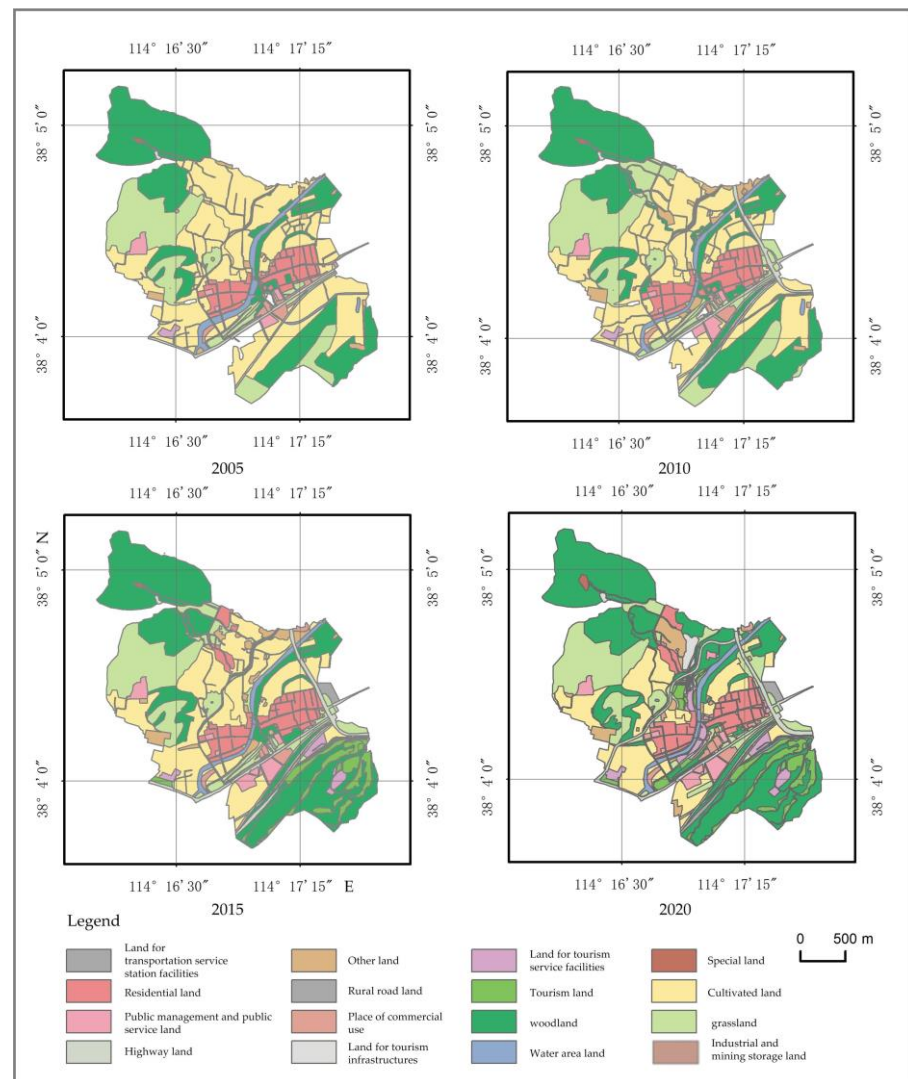


Figure 2. The current land use situation of East Tumen Village and West Tumen Village from 2005 to 2020.

3.2. Stage Characteristics of Rural Spatial Reconstruction

3.2.1. Level of Rural Spatial Reconstruction

The production, living, and ecological spatial development levels of East Tumen Village and West Tumen Village in 2005, 2010, 2015, and 2020 were determined based on the rural spatial development index (Table 3). The spatial development levels of the two villages showed an accelerated upward trend, with rural spatial development level indices of 0.25, 0.37, 0.50, and 0.77, respectively. Production space development decreased from 2005 to 2010 and increased from 2010 to 2020, showing a trend of first decreasing and then increasing. Among these, the largest change in production space was in the dynamics of industrial development. The evaluation results of the living space development level showed that it had been growing from 2005 to 2020, with a sign of accelerated development. The increase in travel convenience was mainly influenced by four indicators: the area of rural roads, accessibility of external traffic, the density of rural road networks, and the hardening rate of rural roads. The evaluation results of the ecological space development level showed a fluctuating upward trend with an upward trend from 2005 to 2010, decreasing from 2010 to 2015, and an upward trend from 2015 to 2020. The ecological spatial foundation had the greatest influence on the ecological spatial development level, including the proportion of ecological land and rationality of the ecological spatial layout.

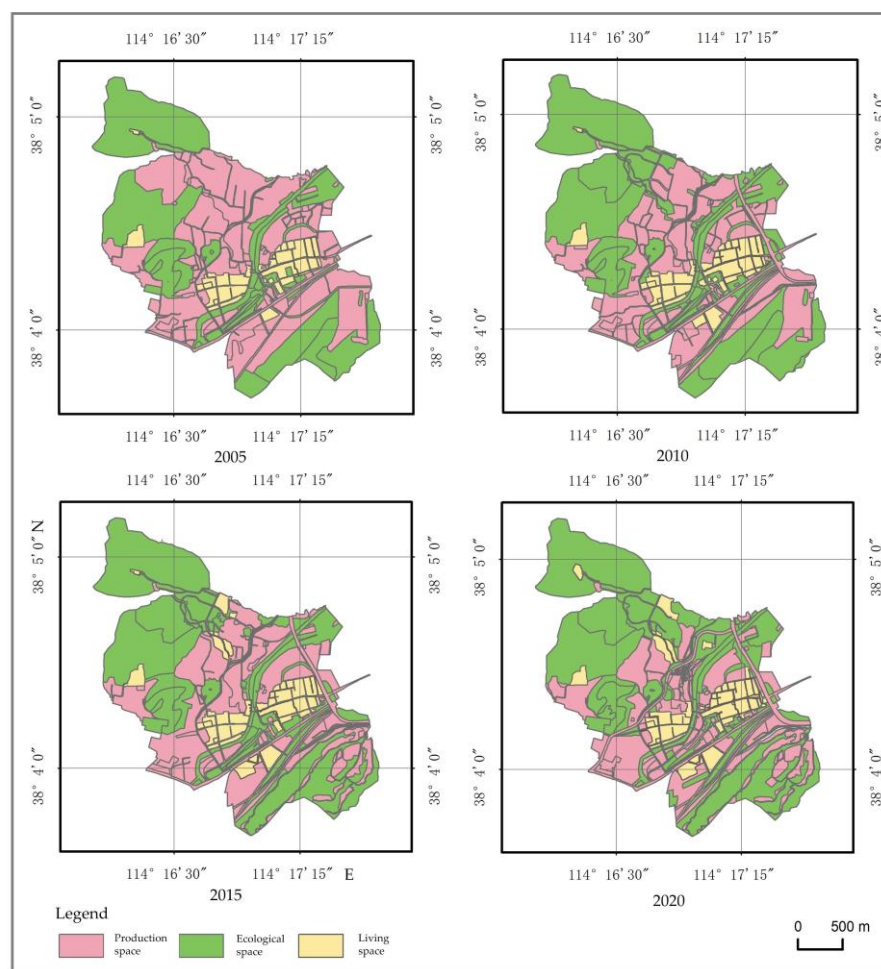


Figure 3. The spatial distribution of production–living–ecological space in East Tumen Village and West Tumen Village from 2005 to 2020.

Table 3. Evaluation results of rural spatial development level (RSDL) index in East Tumen Village and West Tumen Village.

Target Layer	Primary Index	2005	2010	2015	2020
RSDL·(P)	Product production capacity	0.1092	0.0904	0.0622	0.0316
	Industrial development vitality	0.0002	0.0015	0.0634	0.2288
	Production space foundation	0.0510	0.0183	0.0427	0.0390
	Total	0.1605	0.1102	0.1684	0.2995
RSDL·(L)	Living space convenience	0.0001	0.0059	0.0487	0.0631
	Travel space convenience	0.0001	0.0869	0.1000	0.1336
	Comfort degree of living space	0.0393	0.0219	0.0359	0.0986
	Tourism space convenience	0.0001	0.0250	0.0474	0.0588
RSDL·(E)	Total	0.0396	0.1396	0.2320	0.3541
	Ecological space regulation ability	0.0442	0.0781	0.0450	0.0488
	Ecological spatial stability	0.0097	0.0026	0.0149	0.0175
	Ecological space stability capacity	0.0001	0.0414	0.0407	0.0505
Total		0.0540	0.1221	0.1006	0.1168
RSDL		0.2541	0.3720	0.5010	0.7704

3.2.2. Evaluation of Rural Spatial Reconstruction Stages

According to the calculation results, the comprehensive spatial reconstruction intensity indexes of East Tumen Village and West Tumen Village were 1.46, 1.35, and 1.54 in the T1 (2005–2010), T2 (2010–2015), and T3 (2015–2020) periods, respectively, indicating that the

spatial reconstruction of both villages occurred in the three time periods. The contribution rates of rural spatial reconstruction in the T1, T2, and T3 periods were 22.82%, 24.99%, and 52.19%, respectively, showing an increasing trend each year (Figure 4). Based on the level of rural spatial development and the speed of rural spatial reconstruction, it can be inferred that the spatial reconstruction of the two villages went through the initial stage (IP), the development stage (DP), and the accelerated development stage (AP).

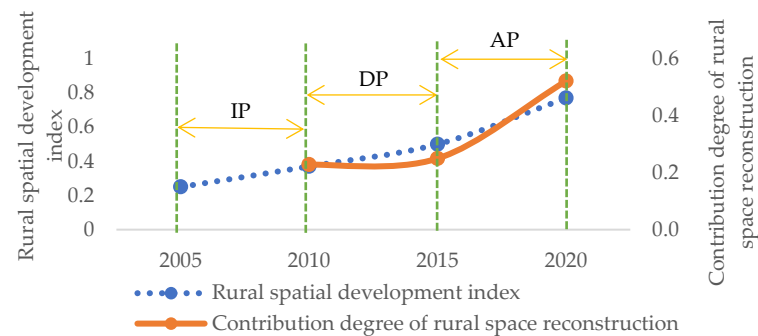


Figure 4. Phases of rural space reconstruction in East Tumen Village and West Tumen Village.

With the transformation of the industrial structure from traditional agriculture to commercial tourism services, the spaces in the two villages have undergone remarkable reconstruction. The resident population of the two villages gradually increased to 1601, 1743, 1922, and 2129 in 2005, 2010, 2015, and 2020, respectively. The change from the initial stage to the development stage was mainly caused by external environmental factors in the two villages. In 2010, the Zhongcheng Golf course was introduced to the two villages. Thereafter, the woodlands and grasslands in the two villages began to take on the nature of tourist land, and spatial reconstruction gradually accelerated, laying a solid foundation for the development of tourist villages. The transition from the development stage to the accelerated development stage was marked by rapid tourism development in the two villages. In an environment of free flow of urban and rural elements, the two villages use the ancient post road as a brand to attract tourists from the surrounding areas. The construction of the Tumenguan tourist scenic area pushed the development of rural space in the two villages to a new level. The number of tourists increased sharply, the construction of tourism-related facilities improved, and spatial transformation accelerated. Tumenguan Yidao Town, which opened in October 2017, received 142,000 tourists during China's National Day holidays, and the total number of tourists in 2018 and 2019 exceeded 1 million. The number of tourists in 2020 slid to less than 1 million due to the COVID-19 outbreak. As tours are mainly short-term and short-distance, the accommodation facility completed in 2019 provides only 32 rooms of different levels.

3.2.3. Stages of Rural Space Reconstruction

In the initial stage, from 2005 to 2010, East Tumen Village and West Tumen Village were in a period of traditional agricultural economic development, and rural space was a natural form of space. The areas of commercial land, industrial and mining storage land, and arable land began to decrease. Fragmented arable land occupied most of the production space, and the fragmentation of agricultural production space coexisted with the improvement of production conditions. Reconstruction of the production space was not obvious. The sanitary conditions of the living environment and the appearance of villages improved at this stage. Rural public services and infrastructure construction are gradually being optimised, and transportation is becoming more convenient. The reconstruction of living spaces has been highlighted. Environment-polluting enterprises gradually ceased production, pasture and woodland areas expanded significantly, and the ecological environment improved.

During the development phase from 2010 to 2015, East Tumen Village and West Tumen Village were in a period of rapid development in the market economy, and the rural space gradually improved. In terms of production space, industrial and mining storage land disappeared, arable land decreased significantly, the agricultural production function weakened, tourism infrastructural land expanded significantly, and tourism land and transportation service stations began to appear. Consequently, the production space began to be reconstructed and developed rapidly. Due to the implementation of some livelihood projects enacted by China's beautiful countryside policy, the living space has changed from the previous low level of internal filling to a trend of expansion and optimisation. Living space has entered a rapid reconstruction phase. The large-scale increase in woodland and grassland has significantly increased the area of ecological space, and land for tourism has greatly improved the ecological environment.

During the accelerated development phase from 2015 to 2020, both East Tumen Village and West Tumen Village entered a period of accelerated development driven by rural tourism, with strong momentum in the reconstruction of rural space. Driven by rural tourism, the traditional agricultural production space in the two villages has declined sharply, and nearly half of the space has been transformed into tourism land, forming a complex production–living space. The construction of new communities and tourism development have promoted the optimisation of living spaces, the transformation and enhancement of the rural landscape, and the landscape embellishment of living spaces. The reconstruction of living spaces has entered a rapid development stage. The area of ecological space has been increasing, and a production–ecological composite space has emerged.

3.3. Drivers of Rural Spatial Reconstruction

Many factors affect the spatial reconfiguration of villages, and the process is complex. Through in-depth interviews with the administrative personnel of Bailuquan Town, the directors of the committees of the two villages, members of the village history editing team, villagers, and managers and staff of the rural tourism company, it was found that the main influencing factors are both internal and external. The internal factors mainly include production methods, demand for conducive living conditions, and ecological environmental needs, while external factors include public policy, development of rural tourism, and participation of multiple governance subjects (Figure 5).

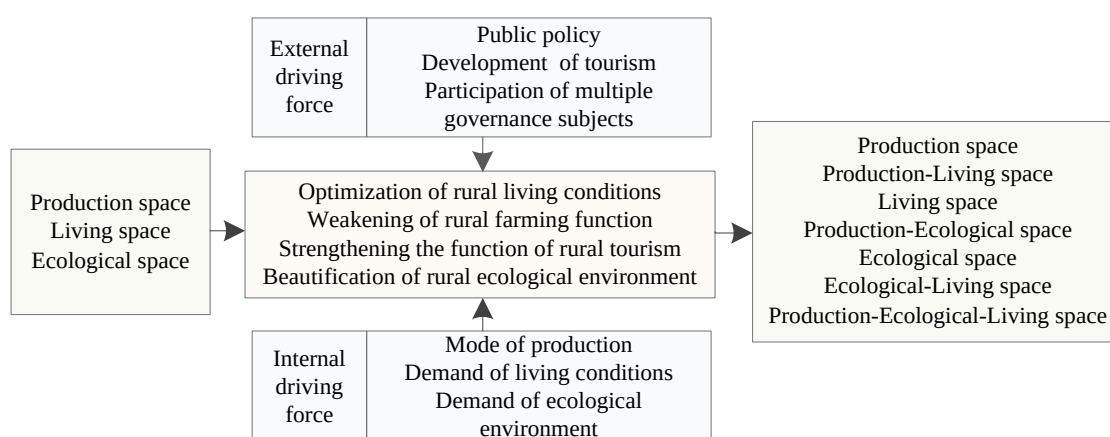


Figure 5. Driving mechanism of space reconstruction of rural tourism areas.

3.3.1. Internal Drivers

Production Methods

With economic and technological developments, farmers in East Tumen Village and West Tumen Village have continuously improved the level of agricultural mechanisation in the process of agricultural production and greatly improved the efficiency of agricultural

production by changing production tools. The two villages continue to promote the transfer of arable land and implement standardised agricultural management and large-scale operations, thus changing the production model of small-scale scattered cultivation and accelerating the reconstruction of the production space. With the development of tourism, agricultural production has gradually changed to commercial tourism services. Agricultural production spaces have transformed into commercial and cultural tourism spaces. Some spaces have been transformed from single-function to composite-function spaces. The employees of the tourism company said that they lived here for the convenience of work. The living space near the tourism space and the living space on both sides of the main roads of the two villages began as production–living composite spaces, such as agricultural caravans and catering B&Bs, and there is a trend of gradual expansion. The area of production–ecological composite space has increased significantly.

Demand for Conducive Living Conditions

Initially, the residential buildings of the villagers were similar to traditional rural buildings, and the living space did not change significantly. In the development and accelerated development stages, the economic status of the two villages has improved significantly, and the public service support system and infrastructure construction have improved significantly. The village head said that the introduction of the tourism company improved village infrastructure and saved money. The main and secondary streets in the villages have been classified and hardened, night lighting facilities have been installed, and landscape vignettes have become increasingly abundant. At the same time, production–living complex spaces that provide services for tourism began to appear in the living space, and the process of internal optimisation of the living space accelerated. With the influence of rural tourism, the living standards of villagers in East and West Tumen Villages have been further improved to meet the growing demand for conducive living conditions, realising the need to move from survival to the pursuit of higher quality living space and driving the acceleration of the transformation of rural living spaces. The two villages use idle land to build new public activity facilities, transform the external style and internal details of the original living space, and integrate more interactive functions of rural tourism, such as dining, leisure, and living. Villagers said that they enjoyed the reconstructed rural living spaces. The original fragmented rural living space was developed into a more continuous and comprehensive living space to improve the recognisability of rural tourism.

Ecological Environmental Needs

With the improvement in living standards, people are paying more attention to human health, and a good ecological environment is an important factor for people to maintain a good physical and mental state. Under this influence, polluting factories in the village have been transformed or closed one after another. The improvement of the ecological environment has not only satisfied the ecological needs of the villagers but has also attracted more tourists and improved the tourism experience. Some ecological spaces in the village have been transformed into tourism production spaces, and some ecological spaces have been transformed from single spaces to production–ecological composite function spaces. The survey found that the administrative personnel of Bailuquan town and the villagers actively supported and were satisfied with the ecological environment management.

3.3.2. External Drivers

Public Policy

Driven by China's rural revitalisation strategy and the construction of beautiful countryside, the governments of Hebei Province and Shijiazhuang successively issued relevant policies to support and encourage the development of rural tourism. Shijiazhuang City held a tourism development conference to promote all-area tourism and accelerate the organic combination of tourism and rural industry through 'tourism+'. Luquan District focuses on the construction of beautiful countryside, improving the rural environment, and

enhancing the rural internal living space. According to the survey, the villagers responded positively to the policy of returning farmland to forest and grass, providing forestry planters with an annual forestry subsidy of 2 yuan/m², and taking strict measures to protect the environment and green the mountains and forests. An increasing number of farmers are engaged in forestry planting, and the ecological area is increasing.

Development of Rural Tourism

The development of rural tourism has had a significant impact on the industrial and income structures of East and West Tumen Villages, which in turn has affected the transformation of land-use types. The rapid development of rural tourism contributed to a small increase in the resident population in both villages. Tourism operators and workers live close to villages to save time and reduce their cost of living. In addition, the two villages have taken measures to repair and utilise unused houses for agrotourism development, which has further influenced the layout structure of the living space within the countryside, and the living space has been activated and optimised. The rural ecological environment has greatly improved, and the transformation from 'architectural beauty' to 'ecological beauty' has been realised. Tourists generally say that they like this tourist destination very much and often visit it.

Participation of Multiple Governance Subjects

The diversification of rural governance subjects plays an important role in the optimisation of rural spaces in East and West Tumen Villages. Governance subjects mainly include villagers, enterprises, village committees, and the government. The different actors provide continuous intellectual and spiritual support and promote the optimisation and reconstruction of rural spaces. Under the guidance of governments at all levels and local elites, the two villages actively introduced tourism development enterprises, unified the planning and construction of tourism infrastructure, improved tourism service functions, and promoted rural spatial agglomeration. Through investigation, it was found that, in this process, the government of Bailuquan Town achieved the goal of revitalising the village. The village committee obtained economic compensation for the land occupied by tourism development. Farmers have not only obtained land compensation but also more employment opportunities and improved living environments. Therefore, all stakeholders are enthusiastic about land transfer, industrial structure adjustment, and new community construction and actively respond to and support the development of the village and rural tourism, thus accelerating the reconstruction of rural spaces.

4. Discussion and Conclusions

4.1. Discussion

The essence of urban–rural integration is to achieve coordinated and integrated urban–rural development based on free flow, equity, and the sharing of urban–rural development factors [2]. At present, the improvement of rural production, living, and ecological spaces requires careful consideration of urban–rural integration and rural industrial development goals [32]. Rural tourism has become an important direction for the future development of urban–rural relationships. Scholars from different fields have attempted to explore the implementation path of tourism-based rural–urban integration based on the advantages of their respective disciplines [33]. Optimising the structure and function of rural territorial systems based on rural spatial reconstruction is an important guarantee to promote the development of urban–rural integration in the new era [34].

The complete process of rural space reconstruction includes the initial development, accelerated development, and stable development stages. A stable development stage means that the development level of rural space is high and in a more stable state than in earlier stages: rural production space, living space, and ecological space reach a relative balance. Therefore, East Tumen Village and West Tumen Village have not yet entered a stage of stable development. Driven by villagers' production, living, and ecological

needs, they consciously optimise and adjust the rural space, which constitutes the intrinsic motivation for the reconstruction of the rural space. Tourism development has led to the integration of the construction and operation of tourism projects in the two villages, promoting the transformation of some agricultural populations engaged in traditional cultivation towards rural tourism. The emergence of new production methods has driven villagers to improve their quality of life and promote the continuous optimisation and reorganisation of rural production and living spaces. In addition, relying on their superior geographical location and long-standing historical and cultural resources, the two villages support and encourage the development of rural tourism, promote the integration between the countryside and tourism, and optimise and reconstruct rural spaces because of the construction requirements of tourism. The active participation of multiple governance bodies in East and West Tumen Villages provides continuous intellectual support for spatial reconstruction and guides spatial development. Driven by the rural development strategy and inclusive policies implemented at the national and local levels, the two villages strengthened the construction of public infrastructure, improved the welfare of villagers, and enhanced the overall development of rural space. The coupling of internal and external drivers promotes reconstruction.

In the process of tourism-based spatial reconstruction in East Tumen Village and West Tumen Village, the module function of rural production space should be improved, with the development of rural tourism businesses and leisure areas suitable for rural tourism development. The service function of rural internal production space and tourism service facilities should be enriched, and the different service function modules of production space should be modified and improved accordingly. The living space should be expanded and renovated to increase public places for social exchange and to build public spaces with historical characteristics of the village for tourists to rest and visit. The content of rural landscape vignettes should be enriched, and rural theatres, ancestral halls, bazaars, and traditional festivals with village characteristics should be reasonably added to rural public places and facilities. Additionally, attention should be paid to landscape authenticity. The more authentic the landscape, the more it will increase visitors' satisfaction with the landscape and the number of revisits. Strengthening ecological environmental protection in and around rural areas, improving the quality of the rural ecological environment, and promoting the integrated development of rural tourism and ecological environmental protection should be prioritised.

The process of rural spatial reconstruction optimises land use structure, coordinates rural spatial social relations, coalesces rural development momentum, and promotes urban–rural integration development [35]. Thus, the field of rural spatial governance should also be extended from the emphasis on rural physical spatial governance to include non-physical spatial governance areas, such as rural spatial tenure relations, spatial organisation patterns, and spatial relationship optimisation, in order to create conditions for deepening the rural governance system and promote integrated urban–rural development.

4.2. Conclusions

This study traces the process of rural spatial reconstruction through in-depth interviews and human–computer interactive interpretation of remote sensing images. The spatial reconstruction index of rural tourism space was constructed from three dimensions: production space (product production capacity, industrial development activity, production space foundation), living space (living space convenience, tourism space convenience, living space comfort, living space foundation), and ecological space (ecological space regulation ability, ecological space stability capacity, ecological space foundation). Using the rural spatial reconstruction intensity index and rural spatial reconstruction contribution rate, this study quantitatively evaluated the spatial development level of tourism villages on a microscopic scale and examined the stage characteristics of their spatial reconstruction. The results showed that the two villages have experienced a budding stage, a development stage, and an accelerated development stage from 2005 to 2020 and have not yet reached a

stable stage of relative balance and coordination; production activities are integrated into other spaces, and single-function space becomes production–living and production–ecology composite space. It was found that the main factors influencing spatial reconstruction are both internal and external. The internal factors mainly include production methods, demand for conducive living conditions, and ecological environmental needs, and the external factors include public policy, development of rural tourism, and participation of multiple governance subjects. The spatial reconstruction of East and West Tumen villages is driven by a combination of ‘top-down’ external drivers, such as the rural tourism development driver, the multi-governance subject participation driver, and the public policy driver, and ‘bottom-up’ internal drivers, such as production demand, living demand, and ecological demand.

At present, the study of tourism-oriented rural spatial reconstruction and its driving mechanism is still in the exploration stage, and the path of rural–urban integration development oriented by rural spatial governance needs to be further clarified. This study attempted to construct an evaluation index system for tourism-oriented rural spatial reconstruction and analysed the characteristics of the rural reconstruction stage using the rural spatial reconstruction intensity index and the spatial reconstruction contribution rate. The study can enrich the index system for quantitative evaluation of rural spatial reconstruction on the micro-scale and is innovative. Because the time of spatial reconstruction of East Tumen Village and West Tumen Village is relatively short and has not developed to a stable stage, it is impossible to provide a complete reconstruction process. Therefore, it is necessary to continue tracking the spatial reconstruction process and continuously improve the relevant theories in the future. This study focused on the drivers of rural spatial reconfiguration using qualitative methods such as in-depth interviews. It is hoped that more precise quantitative research will be conducted in the future.

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