COUPLING COORDINATION RELATIONSHIP BETWEEN TOURISM DEVELOPMENT AND URBAN-RURAL INTEGRATION

Zhangxin YIN [1], Liuyan DAI [2], Chang GAN [3], Mihai VODA [4]*

ABSTRACT

Our research aims to explore the coupling coordination relationship between tourism development and the URI (urban-rural integration) and its obstacle factors in the western Hunan Province by adopting modified coupling coordination model, scissor difference model, and grey correlation model. Prime conclusions are as follows. First, the relationship among tourism development and urban-rural integration in western Hunan Province has experienced the evolution process of "moderately uncoordinated–slightly uncoordinated–nearly uncoordinated". Second, the level of tourism development still lagged behind the degree of urban-rural integration. Third, spatial integration, social integration, and tourism scale were main obstacle factors that affects this coupling coordination relationship. Compared with previous research, this study concentrates on the division of evolution periods and the obstacle factors of relationship among tourism development and urban-rural integration. It is of great importance for policy-makers to formulate policies of common prosperity in western Hunan Province, China.

Key-words: *Tourism development; urban-rural integration; Modified coupling coordination model; Coupling coordination; Scissor difference model*

1. INTRODUCTION

With the rapid urbanization, the dichotomy among the prosperity of urban region and the decline of rural region is widespread around the world (Bennett, Yuen, & Blanco-Silva, 2018; Liu & Li, 2017; Ernawati et al., 2018; Lakatos et al., 2023; Magyari-Saska & Dombay, 2016). In China, as relatively independent area, the overall efficiency of resource allocation is relatively low. Meanwhile, the siphoning effect, a phenomenon of the agglomeration of economic factors, is much greater than the radiation effect, a phenomenon of the expansion of economic factors (Yang, Bao, Wang, & Liu, 2021). External manifestations of the urban-rural dichotomy are gradually diversifying from economic to social, cultural and ecological fields, which further hinders sustainable development (Ma, Liu, Fang, Che, & Chen, 2020; Sheng, 2011). Along with the strategy of Rural Revitalization, the relationship among two areas in China is in a stage of restructuring (Chen, Zhou, Huang, & Ye, 2021; Yin et al., 2022). Therefore, boosting urban-rural integration (URI) is a crucial goal for realizing sustainable development goals (SDGs) in social fields.

As a modern service industry with strong integrated effect, wide radiation and large multiplier effect, tourism industry plays an increasing role in the URI as the industrial chain has accelerated and the scale of tourism demand has continued to expand (Buckley, Shekari, Mohammadi, Azizi, & Ziaee,

[1,2] *Business School of Hunan First Normal University, Changsha, 410205 China, nadineyin@hnfnu.edu.cn; dly2022@hnfnu.edu.cn.*

[3] *School of Management, Wuhan Polytechnic University, Wuhan, 430048 China, gzrycxwl@whpu.edu.cn.*

[4] *Geography Department, Dimitrie Cantemir University, Targu Mures, 540545 Romania, corresponding author*, mihaivoda@cantemir.ro.*

2019; Quevedo, Uchiyama, & Kohsaka, 2021; Voda et al., 2019). First, based on the multiplier effect, tourism development can improve the URI by strengthening the interaction, narrowing the income gap, promoting public service, and boosting the eco-environmental management (Gao & Cheng, 2020; Sun, Ling, & Huang, 2020). Second, on the basic of system theory, the URI has expanded the space in terms of tourism economic development through the resources' allocation, the promotion of brands, and the expansion of markets (Luo, Chu, & Gao, 2022; Xu & Cheng, 2019). Coupling coordination relationship means that there is good correlation, coordination and coordination among various sub-systems. Therefore, forming the coupling coordination relationship among tourism development and the URI cannot only realize the SDGs in social field (e.g., narrowing urban-rural gap), but also promote tourism economic development.

Along with tourism economic development, the role that tourism industry plays in the economic growth in areas becomes more important (Sokhanvar, Çiftçioğlu, & Javid, 2018; Gupta et al., 2018). The URI, a manifestation of socio-economic development, has received increasing attention from academic circle. Tourism industry possesses of inclusiveness and universality, exerting a positive influence on the URI. For example, some scholars reveal that tourism development is able to decrease the income gap (Gatti, 2013; Paniagua, 2002). In addition, Kim and Kang (2020) adopted the fixed effect models and revealed that the interaction effect of tourism and FDI can significantly reduce the income disparity. At the level of whole economy, Liu, Nijkamp, and Lin (2017) confirms that tourism growth is beneficial for the decrease of the URI. However, as the increase of gap, the inhibiting effect of tourism development will be weakened. Moreover, the urban-rural migration (Buckley et al., 2019; Sun et al., 2020), social reform (Chen, Clarke, & Hracs, 2022; Gao & Cheng, 2020), and the flow of product factor (Li, Zhang, Zhang, & Abrahams, 2019; Quevedo et al., 2021) induced by the tourism development comes into researchers' perspective. Although quite a few scholars have concentrated on the association among tourism development and the URI, the literature on this coupling coordination association is lack. Additionally, abundant attention needs to be paid for the division of evolution periods regarding association among tourism development and the URI. What's more, the influencing factors affecting the relationship among two system accept little attention from researchers yet.

Taking into account above-mentioned gaps, our research aims to solve these issues. What is the coupling coordination relationship in specific tourist destination? How to divide the evolution periods of relationship between tourism development and the URI? What are the factors influencing this coupling coordination relationship? Therefore, this study not only investigated the evolution trend and period of the coupling coordination relationship among two systems, but also explored the obstacle factors. The contribution of answering the above questions. First, this study captures the bidirectional association among two systems, which offers evidence that tourism development is beneficial for advancing the social welfare and fairness, and thus promoting the SDGs in social field. Second, our research provides an adaptive research framework that integrates the evaluation of coupling coordination degree, the analysis of evolution period, and the investigation of influencing factors, which can be applied to other research samples. Thirdly, this study examines the influencing factors that affect this coupling coordination relationship, offering the recommendation of common prosperity for the policy-makers.

2. THEORATICAL FRAMEWORK

Referring to synergy theory, this study takes "elements-structure-function" as the logical main line to sort out the coupling mechanism between tourism development and the URI. Area is the basic unit connecting tourism development and the URI (Tan & Wang, 2024). Tourism development includes two sub-systems, namely, tourism scale and tourism performance (Gan et al., 2021; Voda et al., 2014). The URI includes four sub-systems, namely, economic integration, spatial integration, social integration, and ecological integration (Luo et al., 2022). The specific framework can be seen in **Fig. 1.**

Tourism development exerts an effect on the URI by the flow of factor, structure change, as well as scale growth. The flow of factor means that capital, technology and information flow between urban and rural areas. The structure change represents that the optimization of industry structure and income structure. The scale growth shows that the economic value added grows. The URI exerts an influence on tourism development through coordinated plan, industrial integration, and fund support. The coordinated plan represents that urban-rural planning is coordinated. Industrial integration refers to the process of interpenetration and intersection in different industries. Fund support means that the economic growth caused by the URI can provide fund support for tourism economic development. In summary, the interaction impact of tourism development and the URI stems from each influencing paths.

In terms of the effect of tourism development on the URI. Firstly, the flow of factors lays the foundation for the URI. Tourism industry helps to accelerate the flow of factors and achieve the resources' allocation, and thus promoting the URI (Zhang, Wang, & Yang, 2023), especially for economic integration. Secondly, urban and rural learn from and exchange with each other in destination management, breaking down the barriers between urban and rural areas at the level of culture, thus promoting spatial integration (Li et al., 2019). Thirdly, the tourism development is beneficial for an increase in tax revenue, which in turn offers a material basis for the renovation of infrastructure and the enhancement of public services, and boosts the quality of education, medical and cultural resources to rural areas (Gong, Guo, Ma, & Li, 2021).

With respect to the effect of the URI on tourism development. Firstly, unified urban-rural planning optimizes the allocation and application of tourism resources, improves the spatial structure of scenic spots, concentrates development advantages, avoids blindness in development (Chen et al., 2022). Secondly, the mutual integration of different industries is beneficial for the integrated progress of tourism and agriculture, culture, education, recreation and other industries, the promotion of innovation in tourism products and business models, the cultivation of new tourism consumption hotspots, and thus promoting the expansion of the tourism industry chain (Dan, 2019; Fang, Cheng, Su, & Bao, 2021). Thirdly, with the socio-economic integration, there is greater support for tourism development from urban and rural residents (Lee, 2013). Especially, the URI can boost economic development, and thus providing fund support for tourism enterprises. At presents, the fund support plays in a crucial role in the recovery of tourism economy.
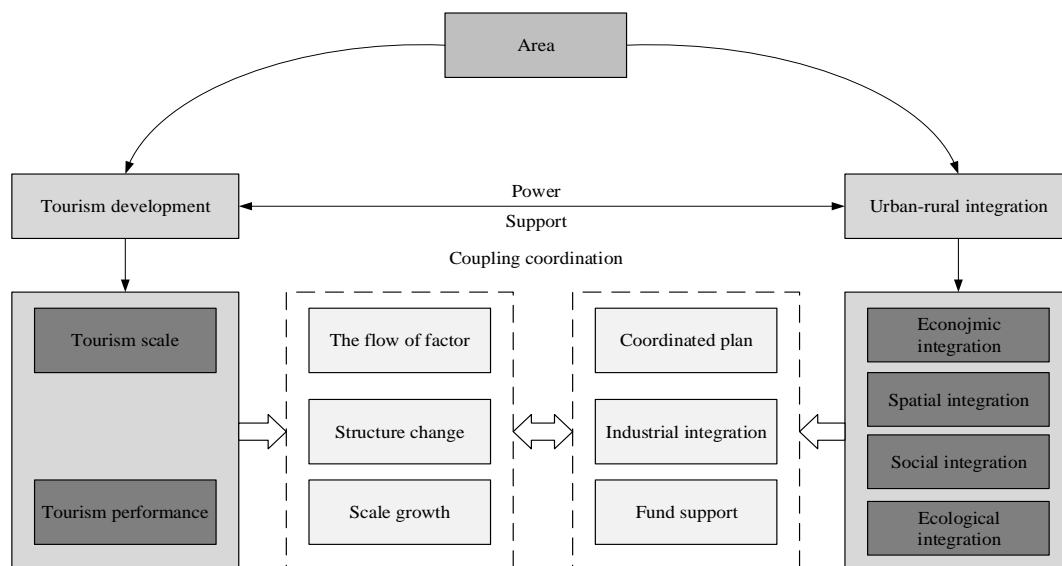

Fig. 1. The coupling coordination mechanism.

3. METHODOLOGY AND MATERIALS

3.1. Sample and data

The western Hunan Province, China mainly contains four cities, namely, Shaoyang, Zhangjiajie, Huaihua and Xiangxi (**Fig. 2**), which is an ethnic minority concentration area and underdeveloped area in Hunan Province. There are 41 attractions of 4A level and above in sample area, such as Wulingyuan Scenic and Historic Interest Area (World Natural Heritage) and Fenghuang Ancient City. Furthermore, tourism development is a crucial driving force enhancing the well-being of residents, accelerating economic development, and boosting the URI (Kai; Wang, Tan, & Gan, 2023). However, tourism industry was hit hard by the COVID-19, tourism revenues declined in 2020. In addition, the urban-rural income gap widened.
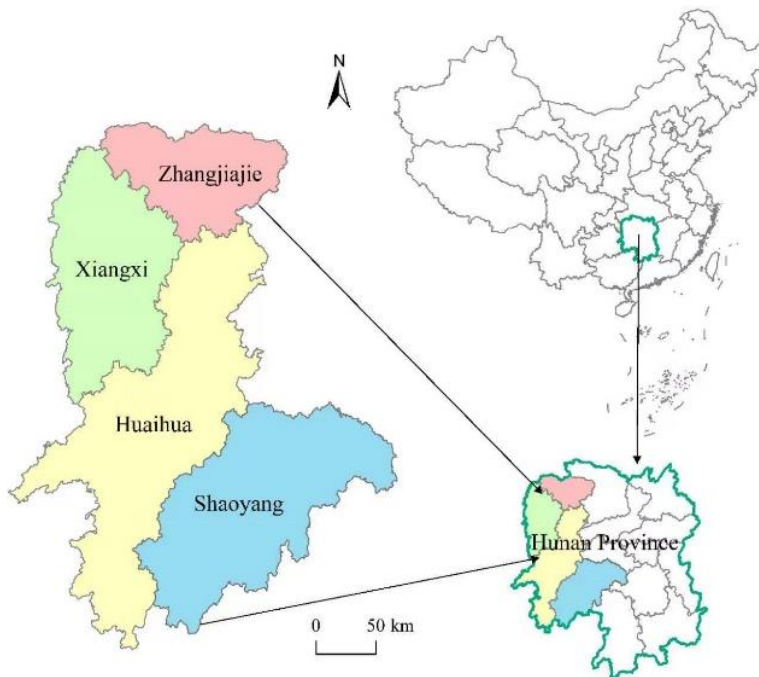
Fig. 2. The evolution trend of tourism development in western Hunan Province.

The data were received from the Hunan Statistical Yearbook (2011~2021), Shaoyang Statistical Yearbook (2011~2021), Zhangjiajie Statistical Yearbook (2011~2021), Huaihua Statistical Yearbook (2011~2021) and Xiangxi Statistical Yearbook (2011~2021). Quite a few data, such as consumption level, were obtained from the statistical bulletin (2010~2020) of various cities.

3.2. Study design with measures of variables

In this study, with reference to Gan et al. (2021) and Tang (2015), tourism development in western Hunan Province was comprehensively evaluated in tourism scale and performance (**Table 1**). specifically, tourism scale and tourism performance are an organically integrated system, with industry scale being the effectiveness of tourism development in terms of "quantity"; industry performance being the economic output of tourism development.

Referring to Luo et al. (2022) and Sun and Yang (2022), this study comprehensively evaluated the degree of the URI from four aspects, namely, economic integration, spatial integration, social integration, and ecological integration (**Table 1**). First, spatial integration lays the foundation for the flow of production factors. Second, economic integration is the use of urban areas to lead rural areas, promoting agriculture with industry and driving countryside's achievement. Third, ecological integration is the process of collaboratively promoting the comprehensive management of the urban-rural eco-environment.

Table 1.

The evaluation indexes of tourism development and the URI.

Object	Dimension	Indicator (Influence)	Unit	Weight
Tourism development	Tourism scale	Number of 4A and 5A attractions (+)	Number	0.045
		Number of travel agencies (+)	Number	0.051
		Number of star-rated hotel (+)	Number	0.031
		The total of tourists (+)	Million person-times	0.045
		Number of domestic tourists (+)	Million person-times	0.045
		Number of inbound tourists (+)	Person-times	0.084
	Tourism performance	Per capita spending of domestic tourists (+)	RMB Yuan	0.056
		The density of tourism economy (+)	Yuan/km^2	0.063
		Percentage of total tourism income in GDP (+)	%	0.056
		Percentage of total tourism income in the tertiary industry (+)	%	0.048
		Total of tourism income (+)	100 million Yuan	0.047
		Domestic tourism income (+)	100 million Yuan	0.202
		Inbound tourism income (+)	USD 10000	0.226
The URI	Economic integration	Per capita of GDP (+)	RMB Yuan	0.050
		Ratio of agricultural to non-agricultural industries (-)	%	0.032
		Consumption ratio between urban and rural (-)	%	0.057
		Income ratio between urban and rural (-)	%	0.045
	Spatial integration	Urbanization rate (+)	%	0.045
		Proportion of built-up area (+)	%	0.081
		Per capita highway mileage (+)	km	0.058
		Per capita road area (+)	m^2	0.067
		The number of mobile internet users (+)	Number	0.109
	Social integration	Per capita domestic water consumption (+)	t	0.082
		The rate of gas penetration (+)	%	0.030
		The rate of television coverage (+)	%	0.042
		The number of mobile phone users (+)	Number	0.070
		The number of collection books per 1000 persons (+)	Number	0.043
	Ecological integration	The rate of sewage treatment (+)	%	0.031
		Per capita park green space (+)	m^2	0.081
		Green coverage of built-up areas (+)	%	0.032
		Carbon emission intensity (-)	t/Yuan	0.044

3.3. Data analysis procedure

(1) The modified coefficient of variation method. So as to represent the evolution pattern of different periods, this study improves the coefficient of variation method by adding a time variable, which makes the corresponding results more reasonable. The relevant equation referred to Yin, Tang, Liu, and Dai (2023).

(2) The modified coupling coordination degree model. The results from traditional coupling coordination degree model (CCDM) is unbalanced, resulting in the coupling degree being concentrated around 1, which simplifies the CCDM assuming the same coefficients of the sub-systems, reduces the validity of the model (Wang, Kong, Zhi, & Dai, 2021).

$$C = \sqrt{\left[1 - \sqrt{\left(M_2 - M_1\right)^2}\right] \times \frac{M_1}{M_2}} \qquad (1)$$

$$T = \alpha M_1 + \beta M_2, D = \sqrt{C \times T} \qquad (2)$$

where

C is coupling degree

M_1 and M_2 are the level of tourism development

URI, respectively, T is the comprehensive index of two systems D is the CCD.

Combing with the situation in western Hunan Province, this study illustrates that the importance of two systems is equivalent (Luo et al., 2022). Consequently, α and β are 0.5, respectively.

(3) Relative development degree. Because the CCDM cannot reveal the gap between tourism development and the URI, this study used the relative development degree to measure the synergistic evolution state between tourism development and the URI.

$$E = M_1/M_2 \qquad (3)$$

where

E is relative development degree.

When E is in the interval $[1.2, +\infty)$, it means that tourism development is ahead and the URI is lagging behind. When E is in the interval $(0.8, 1.2)$, it represents that tourism development and the URI are in synchronous development. Referring to the research from Shao and Leng (2022), this study divided 8 primary types.

The eight primary types are severely uncoordinated ($0<D\leq0.2$), moderately uncoordinated ($0.2<D\leq0.3$), slightly uncoordinated ($0.3<D\leq0.4$), nearly uncoordinated ($0.4<D\leq0.5$), barely coordinated ($0.5<D\leq0.6$), primary coordinated ($0.6<D\leq0.7$), moderately coordinated ($0.7<D\leq0.8$), and superiorly coordinated ($0.8<D\leq1$). Each primary type has three sub-types, namely, Tourism development lags the URI ($0<M_1/M_2\leq0.8$), Synchronous development ($0.8<M_1/M_2<1.2$), and the URI lags tourism development ($M_1/M_2\geq1.2$).

(4) Scissor difference model. The scissor difference model can capture the degree of difference between two trends. The angle α between the two tangents of the change curves of the two systems at a particular moment t. The smaller value, the smaller the degree of difference (Ma, Tang, & Dombrosky, 2022). The change rate of two systems can be reflected through the slope of the tangent of the change curve, namely, $\left[F'(x)\right]$ and $\left[F'(y)\right]$

$$V(x) = F^{'}(x) = dx \, / \, dt$$

$$V(y) = F^{'}(y) = dy \, / \, dt \qquad\qquad (4)$$

$$\alpha = \arctan \left| \frac{F^{'}(x) - F^{'}(y)}{1 + F^{'}(x)F^{'}(y)} \right|, \left(0 \le \alpha < 2 \, / \, \pi \right)$$

where

> $v(x)$ and $v(y)$ denote the rate of change from system x and system y, respectively
>
> $F^{'}(x)$ and $F^{'}(y)$ represent the slope of tangent from system x and system y, respectively
>
> $dx \, / \, dt$ is the derivative of the system x with respect to the independent variable t
>
> $dy \, / \, dt$ is the derivative of the system y with respect to the independent variable t
>
> α represents angle between two tangents.

(5) Grey correlation model. The grey correlation model uses system's variability elements to determine the influence force (Yuan, Yang, Tian, & Zhuang, 2020). The smaller the correlation, the smaller the influence of the system factors on the whole system.

4. RESULTS

4.1. The level of tourism development

During the sample period, the overall level of tourism development in western Hunan Province showed a fluctuating growth trend (**Fig. 3**), rising from 0.078 to 0.239, with an average annual growth rate of 20.4%. This indicates that with the multi-directional exploitation of attractions, the optimization of infrastructures and market environment, tourism economic development in the western Hunan Province was gradually boosting.
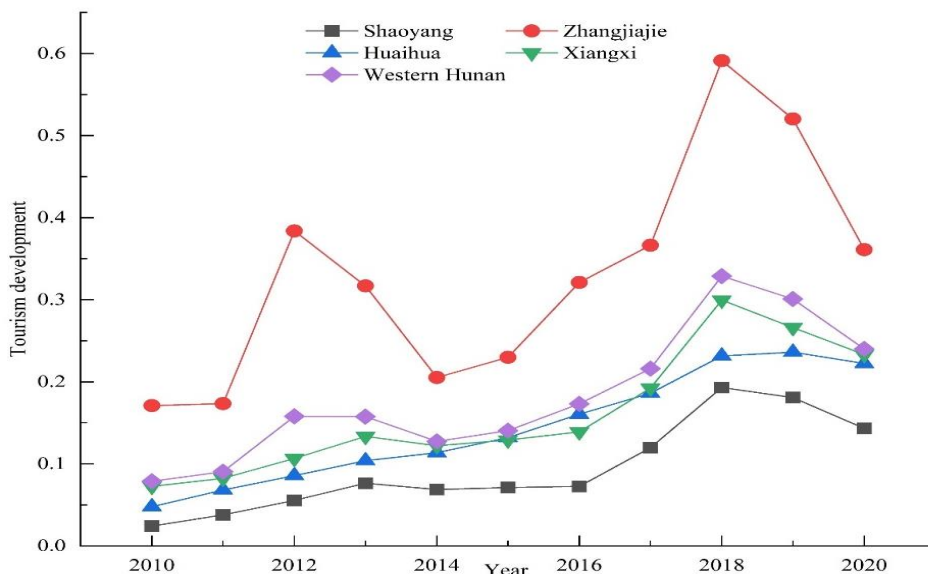

Fig. 3. The evolution trend of tourism development in western Hunan Province.

It is noteworthy that, given the distribution of the COVID-19, tourism economy in Xiangxi presented a declining trend in 2020, with a drop of 20.22% compared to 2010. This further confirms that the tourism industry is characterized by vulnerability. Regarding the spatial distribution, tourism development showed a spatial pattern of "Zhangjiajie > Xiangxi > Huaihua > Shaoyang", indicating that there was significant spatial heterogeneity in the western Hunan Province due to the differences in tourism resource endowment, tourism product innovation, and tourism market promotion.

In terms of each dimension, the average annual growth rates of tourism scale and tourism performance in the western Hunan Province were 13.5% and 35.2%, respectively. In 2020, tourism performance in each city was larger compared with tourism scale (**Table 2**), showing that the tourism industry in western Hunan Province has been steadily expanding in scale through innovation in tourism products and modes, while at the same time focusing on improving the "volume" of tourism development, effectively reducing the redundancy rate of inputs and improving the efficiency of tourism development.

Table 2.

The two dimensions of tourism development in western Hunan Province.

Area	2010		2020	
	Tourism scale	Tourism performance	Tourism scale	Tourism performance
Shaoyang	0.024	0.001	0.082	0.062
Zhangjiajie	0.113	0.058	0.157	0.204
Huaihua	0.039	0.009	0.142	0.081
Xiangxi	0.042	0.030	0.128	0.105
Western Hunan	0.054	0.025	0.127	0.113

4.2. The degree of the URI (urban-rural integration)

In the **Figure 4** we indicate that the overall level of the URI in western Hunan Province has continued to increase over the study period, from 0.213 to 0.675, with an average annual growth rate of 21.72%.
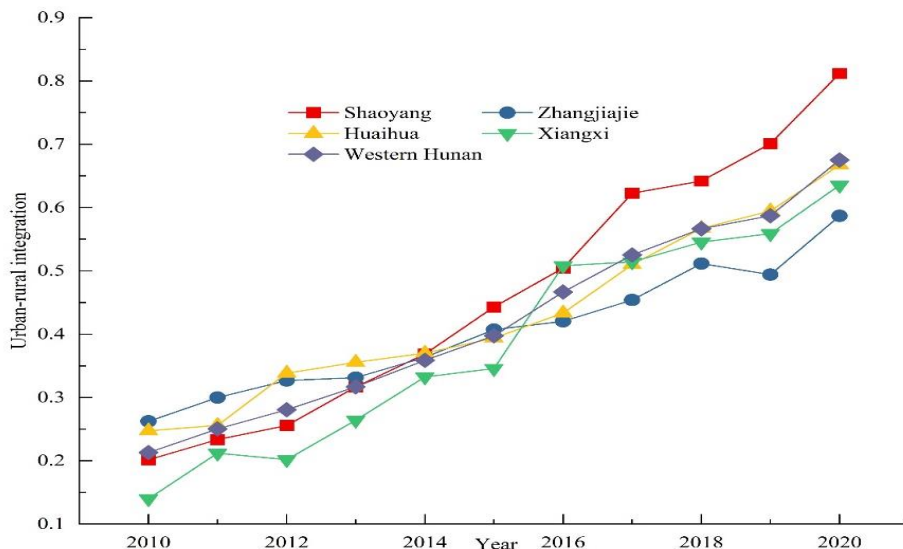

Fig. 4. The evolution trend of the URI in western Hunan Province.

This reason for the finding is that a series of strategies such as "Targeted Poverty Alleviation" and "Rural Revitalization", which have strongly promoted rapid rural development, and boosted the level of the URI. The growth rates of the URI in each city are, at descending order, Xiangxi > Shaoyang > Huaihua > Zhangjiajie. At the end of the study period, Shaoyang ranked first with regard to the URI instead of Zhangjiajie. The possible reason for this is that Shaoyang has a relatively strong economy and more funds are invested in rural economic and social construction, which has greatly improved infrastructure and public service, thus boosting the URI (**Fig. 4**).

On the subject of specific aspect (**Table 3**), the level of spatial integration as well as social integration was higher in western Hunan Province, reflecting that the removal of spatial barriers to the URI, and the accelerated circulating of social resource among urban area and rural area, as evidenced by the improving transport infrastructure, which has created the basic conditions for the URI. What is noteworthy is that the level of ecological integration was relatively low.

Table 3.

The sub-systems of the URI.

Area	2010				2020			
	Economy	Space	Society	Ecology	Economy	Space	Society	Ecology
Shaoyang	0.024	0.064	0.054	0.060	0.156	0.262	0.250	0.144
Zhangjiajie	0.053	0.093	0.082	0.035	0.149	0.183	0.163	0.093
Huaihua	0.040	0.068	0.106	0.034	0.122	0.208	0.231	0.106
Xiangxi	0.023	0.046	0.038	0.033	0.130	0.211	0.195	0.099
Western Hunan	0.035	0.068	0.070	0.040	0.139	0.216	0.210	0.111

4.3. The coupling coordination relationship

(1) The coupling coordination degree. As shown in Figure 5, the CCD of tourism development and the URI in the western Hunan Province presented a fluctuating growth trend from 2010 to 2020, with an average annual increase of 6.91%. The CCD of tourism development and the URI in Shaoyang, Huaihua, Zhangjiajie and Xiangxi remained consistent with the region as a whole. For example, the CCD of each city grew to varying degrees during the study period. In terms of growth trend, the relatively larger increases in Huaihua (81.59%) and Shaoyang (80.4%) indicate that these cities greater emphasis on the exploitation of tourism resource, the innovation of tourism product, and thus spurring tourism development and boosting the CCD. It is worth noting that the tourism economic slowdown in 2020, which results from the restrictions on trip caused by the COVID-19, led to a significant decline in the CCD among two systems.

In terms of municipal differences, Zhangjiajie had the highest CCD of tourism development and the URI, which resulted from that the level of tourism economy is highest in western Hunan Province. This promoted urban-rural economic development, improved urban-rural public services and raised rural residents' income. Accordingly, the URI promoted tourism development by improving the environment and securing the supply of production factors in reverse (**Fig. 5**).

(2) The types of coupling coordination. In starting year, the relationship between tourism development and the URI in the western Hunan Province was mainly uncoordinated, with Shaoyang being severely uncoordinated (**Table 4**). In 2015, although the relationship among tourism development and the URI was yet predominantly uncoordinated, the degree of incoordination had slowed down, with Huaihua and Xiangxi moving from moderately uncoordinated to slightly uncoordinated and Shaoyang moving from severely uncoordinated to moderately uncoordinated. In 2020, the CCD of two systems in western Hunan Province will be further optimized, with Zhangjiajie moving from being nearly uncoordinated in 2015 to barely coordinated in 2020. The other three cities have all improved their coupling coordination status to varying degrees.
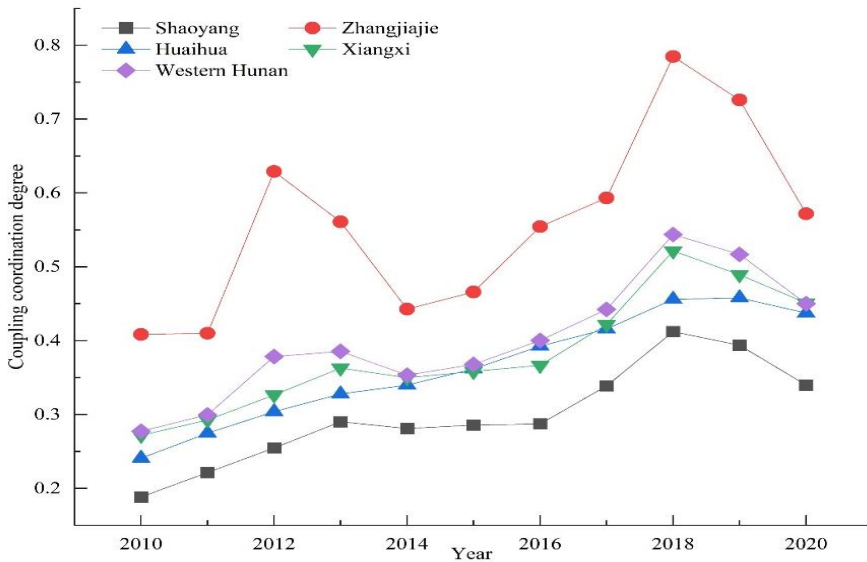
Fig. 5. The evolution trend of coupling coordination degree.

In terms of sub-type of the coupling coordination relationship, Shaoyang, Huaihua and Xiangxi was always "tourism development lags behind the URI". This indicates that the URI in these regions has accelerated; however, tourism development has not been promoted simultaneously. Zhangjiajie has improved tourism economy as well as the URI in the same frequency for some years. As a famous tourist city, Zhangjiajie's tourism image is well known both at home and abroad. Also, the expansion of the tourism market has accelerated urbanization, improving the public services in both urban, thus raising the level of the URI.

Table 4.

Types regarding coupling coordination relationship among tourism development and the URI.

Year	Shaoyang	Zhangjiajie	Huaihua	Xiangxi	Western Hunan
2010	I1	IV1	II1	II1	II1
2011	II1	IV1	II1	II1	III1
2012	II1	VI2	III1	III1	III1
2013	II1	V2	III1	III1	III1
2014	II1	IV1	III1	III1	III1
2015	II1	IV1	III1	III1	III1
2016	II1	V1	III1	III1	IV1
2017	III1	V2	IV1	IV1	IV1
2018	IV1	VII2	IV1	V1	V1
2019	III1	VII2	IV1	IV1	V1
2020	III1	V1	IV1	IV1	IV1
Average	III1	V2	III1	III1	IV1

Note: I, II, III, IV, V, VI, and VII represent severely uncoordinated, moderately uncoordinated, slightly uncoordinated, nearly uncoordinated, barely coordinated, primary coordinated, and moderately coordinated, respectively. 1, 2, and 3 mirror that tourism development lags urban-rural integration, synchronous development, and urban-rural integration lags tourism development.

4.4. Analysis of scissors difference

The composites indexes of tourism development and the URI were curve-fitted against time to obtain two well-fitted curves respectively. Meanwhile, the tangent equations of these two curves represent the evolution rate of tourism development and the URI, respectively, namely, $F'(x)$ and $F'(y)$. The fitted curves for the two systems are as follows

$$F(x) = 0.00004x^6\text{-}0.0014x^5 + 0.099x^4\text{-}0.137x^3 + 0.462x^2\text{-}0.665x + 0.401(R^2 = 0.976)$$
$$F(y) = 0.00002x^6\text{-}0.0006x^5 + 0.004x^4\text{-}0.043x^3 + 0.128x^2\text{-}0.139x + 0.261(R^2 = 0.999)$$

The slopes of two fitting curves regarding tourism development and the URI are as follows

$$F'(x) = 0.00024x^5\text{-}0.007x^4 + 0.079x^3\text{-}0.413x^2 + 0.925x\text{-}0.665$$
$$F'(y) = 0.00012x^5\text{-}0.003x^4 + 0.029x^3\text{-}0.131x^2 + 0.257x\text{-}0.139$$

Figure 6 shows that the evolution rate of tourism development in western Hunan Province increased from -0.08 in 2010 to 1.608 in 2020, and the evolution rate of the URI increased from 0.013 in 2010 to 1.561 in 2020, indicating that the change rate of two systems presented significant fluctuation. From 2010 to 2014, the evolution rate of two systems was relatively stable, while from 2015 to 2020, the change rate of two systems showed strong volatility. This shows that, although tourism development and the URI exhibited an overall trend of growth, the development trend is tortuous.
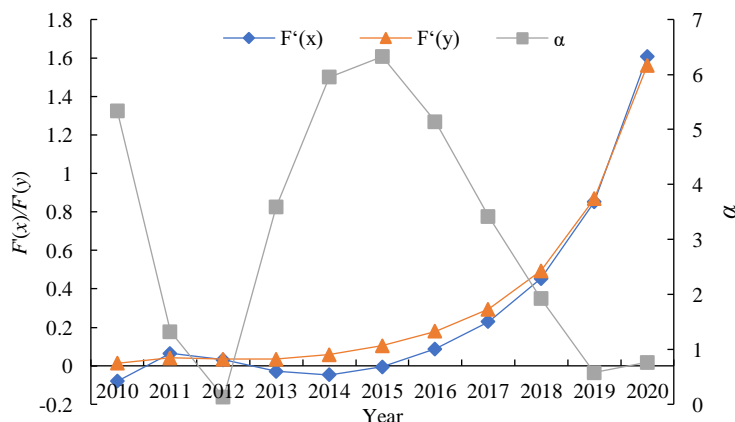
Fig. 6. Evolution rate and scissors differences of tourism development and the URI in western Hunan Province.

In the study period, the scissors difference among two systems in western Hunan Province showed a trend of fluctuation and decline. According to the value of scissors difference, the fluctuation cycle was divided into three stages, namely, 2010~2012, 2013~2015 and 2016~2020. From 2010 to 2012, the scissors difference decreased significantly, from 5.334 in 2010 to 0.128 in 2012, indicating that the positive externalities of coupling coordination were significantly enhanced. From 2013 to 2015, the scissors difference increased significantly, from 3.586 in 2013 to 6.325 in 2015, showing that the positive externalities of coupling coordination were not significant, which was consistent with the imbalance between tourism development and the URI in western Hunan Province at this stage. From 2016 to 2020, the scissors difference decreased significantly, from 5.140 in 2016 to 0.762 in 2020, which shows that under the strong promotion of the tourism poverty alleviation, the effect of coupling

coordination regarding tourism development and the URI was fully released, and tourism development and the URI in this stage jumped from low imbalance to near imbalance. It is worth noting that in 2020, the difference of scissors increased slightly, which may be related to the backward development of tourism caused by the COVID-19.

The above results show that the evolution trend of the scissors difference of two systems in western Hunan Province was highly consistent with the CCD in the three stages. Although the scissors difference among two systems exhibited a shrinking evolutionary trend on the whole, and the feed-effect of the synergistic improvement of the two systems showed an increasing fluctuation trend, the evolution rate of tourism development and the URI was not synchronized. Especially, under the impact of the COVID-19, the level of tourism economy declined greatly. Also, tourism development lagged behind the URI worsens. Consequently, tourism development and the URI were downgraded from barely coordinated to on the verge of imbalance (**Fig. 6**).

4.5. Analysis of influencing factors

To promote the CCD of tourism development and the URI in western Hunan Province, this study analyzed factors influencing the states of coupling coordination in different stages (2010~2012, 2013~2015 and 2016~2020). Various dimensions of tourism development and the URI were taken as influencing factors, this study adopted the grey correlation model to clarify key influencing factors (**Table 5**).

Table 5
Grey correlation analysis of influencing factors and coupling coordination degree in different stages.

System	Tourism development		The URI			
Dimension — Period	Tourism scale	Tourism performance	Economic integration	Spatial integration	Social integration	Ecological integration
2010~2012	0.903	0.870	0.867	0.933	0.919	0.894
Rank	3	5	6	1	2	4
2013~2015	0.844	0.808	0.845	0.880	0.868	0.837
Rank	3	6	4	1	2	5
2016~2020	0.765	0.753	0.753	0.850	0.803	0.739
Rank	3	5	5	1	2	4

Spatial integration, social integration and tourism scale always exert a crucial effect on the coupling coordination relationship between two systems. First, spatial integration was the basis and direct form of the URI. The compression of spatial distance can boost tourism economic development through the scale effect. The effect of "integration of industry and city" produced by tourism economic development can also apparently promote the URI. Second, social integration reflected the further sharing of public services, which is beneficial for boosting the URI. The improvement of public service can also improve the service quality in tourist destinations. Therefore, social integration played a crucial role in the integration effect of two systems. Finally, the expansion of tourism scale can directly promote the tourism performance, while the prosperity of tourism economy can directly increase residents' income, improve infrastructure, optimize public services, and thus accelerating the urban rural integration. Especially, the ranking of the forces of economic integration showed an evolutionary trend of fluctuation decline. On the one hand, it shows that urban-rural residents concentrate on the equalization of public service and social welfare. On the other hand, this demonstrates that simple optimization of economic conditions is easy to lead to tourism leakage, thus narrowing the positive externalities (**Table 5**).

5. DISCUSSION

During the sample period, the level of tourism development in western Hunan Province showed a trend of fluctuating growth. However, at the end of the study period, given the impact of the COVID-19, the scale of the tourism market shrank sharply, and the level of tourism development presented a significant decline. This further illustrates the vulnerability of the tourism industry (Duro, Perez-Laborda, Turrion-Prats, & Fernández-Fernández, 2021). The overall level of the URI in western Hunan Province exhibited a trend of steady improvement. The main reasons are as follows. The implementation of such strategies as Targeted Poverty Alleviation, and Rural Revitalization has effectively boosted the socio-economic development of rural areas, narrowed the development differences, and thus promoting the URI in western Hunan Province (Kai Wang, Gan, Chen, & Voda, 2020).

The CCD of tourism development and the URI in western Hunan Province showed a fluctuating growth trend. Also, the CCD of each city also presented varying degrees of growth (Luo et al., 2022), showing that the coupling effect of tourism development and the URI was increasingly significant. To be more specific, the coupling coordination state of tourism development and the URI has experienced the evolution process of "moderately uncoordinated–slightly uncoordinated–nearly uncoordinated". Although the scissors difference between tourism development and the URI showed a shrinking evolutionary trend on the whole, and the mutual feed-effect of the synergistic improvement of the two systems presented an increasing fluctuation trend, the evolution rate of tourism development and the URI was not synchronized, and tourism development still lagged behind the URI.

Spatial integration, social integration and tourism scale have always played a key role in the coupling effect of tourism development and the URI in the western Hunan Province. However, the fluctuating downward in the ranking of the contribution of economic integration indicates that, on the one hand, residents in western Hunan Province were more concerned with the equalization of public services and social security; on the other hand, it shows that the mere optimization of economic conditions leads to tourism leakage, which, to a certain extent, tends to widen the gap between urban and rural economic development and thus discourages the URI.

The literature contributions of this study are as follows. First, this study analyzed the coupling coordination relationship between tourism development and the URI, which is conducive to enriching the literature on tourism impact and also providing a new perspective for studying the relationship between tourism development and the URI. Second, this study adopted a modified coupling coordination model to improve the validity of the CCD, so that the CCD can more reasonably reveal the measurement of coupling coordination relationship, which offers a methodological reference for studying the coupling relationship between tourism development and other systems. Third, this study follows the "Pattern-Process-Factor" research paradigm and analyses the spatiotemporal patterns of the coupling coordination relationship between tourism development and the URI. This analytical framework has good generalizability.

6. CONCLUSIONS

Taking the western Hunan Province of China as an example, this study used the modified entropy method, the modified coupling coordination degree model, the scissor difference model and the grey correlation model to examine the coupling coordination relationship between tourism development and the URI and its influencing factors. The main findings are as follows: First, the coupling and feedbacks between tourism development and the URI in the western Hunan Province have become increasingly prominent during the study period, and the coupling coordination state has evolved through a process of "moderately uncoordinated–slightly uncoordinated–nearly uncoordinated".

Second, tourism development and the URI in western Hunan Province were not evolving at the same pace, with tourism development still lagging behind the URI. Third, spatial integration, social

integration and the scale of the tourism industry have al-ways played a key role in the coupled and reciprocal feedback process of tourism development and the URI.

First, he relationship among tourism development and the URI was still uncoordinated. On the one hand, governments at all levels should make full use of the dividends of the various support policies introduced by the central government, actively promote innovation in products, thereby accelerating the degree of the URI. On the other hand, governments in the western Hunan Province should promote the urbanization of the migrant agricultural population so that residents are able to share quality infrastructure and public affluence, thereby accelerating tourism development.

Second, tourism development in the western Hunan Province has always lagged behind the URI; therefore, governments should promote the exploitation of tourism resources, the flow of tourism factors and the improvement of tourism efficiency through the urban-rural economic cooperation, infrastructure renovation and public service enhancement. Moreover, with the improvement of the URI, the relevant fund, talent, and technologies should be tossed into tourism industry.

Third, spatial integration, social integration and tourism scale have always played a key role in this coupling coordination relationship. Therefore, governments at all levels in the western Hunan Province should boost the urbanization at county in each city, and thereby enhancing the spatial integration. Furthermore, For the sake of spurring social integration, administrative barriers should be broken down and attention need be paid to the household registration system, social security system as well as optimization of public services. In addition, ecotourism should be promoted to accelerate the ecological integration among urban and rural areas.

Inevitably, this study also suffers from the following shortcomings. First, in order to verify the applicability of the research framework, future studies could extend the research territory to other regions across China or the world. Second, because of unavailable dataset, the comprehensive evaluation indicator system of tourism development and the URI are not comprehensive; therefore, future scholars need to optimize the two comprehensive evaluation indexes. Third, this study adopted grey correlation and revealed the different dimensions influencing the coupling coordination relationship; nevertheless, the influencing mechanism need to be investigated by the panel regression model or Geo-Detector.

REFERENCES

Bennett, K. J., Yuen, M., & Blanco-Silva, F. (2018). Geographic differences in recovery after the great recession. *Journal of Rural Studies, 59*, 111-117. doi: https://doi.org/10.1016/j.jrurstud.2018.02.008.

Buckley, R., Shekari, F., Mohammadi, Z., Azizi, F., & Ziaee, M. (2019). World Heritage Tourism Triggers Urban–Rural Reverse Migration and Social Change. *Journal of Travel Research, 59*(3), 559-572. doi:10.1177/0047287519853048.

Chen, M., Zhou, Y., Huang, X., & Ye, C. (2021). The integration of new-type urbanization and rural revitalization strategies in China: Origin, reality and future trends. *Land, 10*(2), 207. doi: https://doi.org/10.3390/land10020207.

Chen, P., Clarke, N., & Hracs, B. J. (2022). Urban-rural mobilities: The case of China's rural tourism makers. *Journal of Rural Studies, 95*, 402-411. doi:https://doi.org/10.1016/j.jrurstud.2022.09.017.

Dan, Z. (2019). On exploration of tourism resources based on urban-rural industries integration: A case study of border town Tacheng. *Modern Urban Research*(1), 111-117+136. doi: 10.3969/j.issn. 1009-6000.2019.01.

Duro, J. A., Perez-Laborda, A., Turrion-Prats, J., & Fernández-Fernández, M. (2021). Covid-19 and tourism vulnerability. *Tourism Management Perspectives, 38*, 100819. doi: https://doi.org/10.1016/j.tmp.2021.100819.

Ernawati, N. M., Torpan, A., & Voda, M. (2018). Geomedia role for mountain routes development. Mesehe and Pisoiu waterfall comparative study. *Geographia Technica*, 13(1). doi: 10.21163/GT_2018.131.05.

Fang, Y., Cheng, X., Su, X., & Bao, J. (2021). The spatial spillover effect of integration progress on tourism economy: A case study of the Yangtze River Delta urban agglomeration. *Scientia Geographica Sinica, 41*(9), 1546-1555. doi:10.13249/j.cnki.sgs.2021.09.006.

Gan, C., Voda, M., Wang, K., Chen, L., & Ye, J. (2021). Spatial network structure of the tourism economy in urban agglomeration: A social network analysis. *Journal of Hospitality and Tourism Management, 47*, 124-133. doi:https://doi.org/10.1016/j.jhtm.2021.03.009.

Gao, C., & Cheng, L. (2020). Tourism-driven rural spatial restructuring in the metropolitan fringe: An empirical observation. *Land Use Policy, 95*, 104609. doi:https://doi.org/10.1016/j.landusepol.2020.104609.

Gatti, P. (2013). Tourism, welfare and income distribution: The case of Croatia. *Tourism, 61, 53-71.* https://hrcak.srce.hr/file/149493.

Gong, Z., Guo, R., Ma, H., & Li, Z. (2021). Spatio-temporal evolution of the coupling coordination development of tourism economy-tourism public service-population urbanisation. *Statistics & Decision, 37*(9), 83-87(in Chinese). doi:10.13546/j.cnki.tjyjc.2021.09.019.

Gupta, S. K., Negru, R., & Voda, M. (2018). The Indian Himalaya's unique attributes: Hemkund Sahib and the Valley Of Flowers. *Geographia Technica, 13*(2). doi: 10.21163/GT_2018.132.05.

Kim, J. H., & Kang, K. H. (2020). The interaction effect of tourism and foreign direct investment on urban–rural income disparity in China: a comparison between autonomous regions and other provinces. *Current Issues in Tourism, 23*(1), 68-81. doi:10.1080/13683500.2019.1637826.

Lakatos, J., Magyari-Saska, Zs., Dombay, S. (2023) A GIS-based analysis for ecotourism suitability in a geological complex area of Carpathians, *Geographia Technica*, 18(1), 149-160 doi: 10.21163/GT_2023.181.11.

Lee, T. H. (2013). Influence analysis of community resident support for sustainable tourism development. *Tourism Management, 34*, 37-46. doi: https://doi.org/10.1016/j.tourman.2012.03.007.

Li, Y., Zhang, H., Zhang, D., & Abrahams, R. (2019). Mediating urban transition through rural tourism. *Annals of Tourism Research, 75*, 152-164. doi:https://doi.org/10.1016/j.annals.2019.01.001.

Liu, J., Nijkamp, P., & Lin, D. (2017). Urban-rural imbalance and Tourism-Led Growth in China. *Annals of Tourism Research, 64*, 24-36. doi:https://doi.org/10.1016/j.annals.2017.02.005.

Liu, Y., & Li, Y. (2017). Revitalize the world's countryside. *Nature, 548*(7667), 275-277. doi: https://www.nature.com/articles/548275a.

Luo, W., Chu, X., & Gao, Y. (2022). A research on the correlation between tourism industry development and urban-rural Integration: A case study of Hunan Province. *Tourism Science, 36*(4), 42-55(in Chinese). doi:10.16323/j.cnki.lykx.2022.04.001

Ma, L., Liu, S., Fang, F., Che, X., & Chen, M. (2020). Evaluation of urban-rural difference and integration based on quality of life. *Sustainable Cities and Society, 54*, 101877. doi: https://doi.org/10.1016/j.scs.2019.101877.

Ma, M., Tang, J., & Dombrosky, J. M. (2022). Coupling relationship of tourism urbanization and rural revitalization: A case study of Zhangjiajie, China. *Asia Pacific Journal of Tourism Research, 27*(7), 673-691. doi:10.1080/10941665.2022.2105158.

Magyari-Saska, Zs., Dombay, S. (2016) Mixed group hikers optimal resting place location along trails. Test area at Lacu-Rosu region (Romania), *Geographia Technica*, 11(2), 69-77 doi: 10.21163/GT_2016.112.07.

Paniagua, A. (2002). Urban-rural migration, tourism entrepreneurs and rural restructuring in Spain. *Tourism Geographies, 4*(4), 349-371. doi:10.1080/14616680210158128.

Quevedo, J. M. D., Uchiyama, Y., & Kohsaka, R. (2021). Linking blue carbon ecosystems with sustainable tourism: Dichotomy of urban–rural local perspectives from the Philippines. *Regional Studies in Marine Science, 45*, 101820. doi:https://doi.org/10.1016/j.rsma.2021.101820.

Shao, J., & Leng, J. (2022). Types and spatial pattern of coupling coordination between the new-type urbanization and eco-environment in Wuling Mountainous Area of Hunan. *Economic Geography, 42*(9), 87-95. https://kns.cnki.net/kcms2/article/abstract?v=QHiZY5KKB7ZSK0oTE1v7Amtofl0_Z_WDkdsnZeKuu Aknp9fOtrMgoPY3-ChxgYvOUAhu-D7iugbPaPWGSZ3MIXX746wIOX2Iouf8nFxJB2mlq3Eu-i1QHDGDkmMvFh1M&uniplatform=NZKPT&language=gb.

Sheng, Z. (2011). Towards China's urban-rural integration: Issues and options. *International Journal of China Studies, 2*(2), 345. doi: https://scholarbank.nus.edu.sg/handle/10635/126376.

Sokhanvar, A., Çiftçioğlu, S., & Javid, E. (2018). Another look at tourism- economic development nexus. *Tourism Management Perspectives, 26*, 97-106. doi:10.1016/j.tmp.2018.03.002.

Sun, J., Ling, L., & Huang, Z. (2020). Tourism migrant workers: The internal integration from urban to rural destinations. *Annals of Tourism Research, 84*, 102972. doi:https://doi.org/10.1016/j.annals.2020.102972.

Sun, Y., & Yang, Q. (2022). Study on Spatial–Temporal Evolution Characteristics and Restrictive Factors of Urban–Rural Integration in Northeast China from 2000 to 2019. *Land, 11*(8). doi:10.3390/land11081195.

Tan, J., & Wang, K. (2024). Coordination relationship and identification of obstacle factors between harmonious and beautiful rural construction and tourism urbanization: Take Wuling Mountain Area as an example. *Journal of Natural Resources, 39*(4), 768-787(in Chinese). doi:10.31497/zrzyxb.20240402.

Tang, Z. (2015). An integrated approach to evaluating the coupling coordination between tourism and the environment. *Tourism Management, 46*, 11-19. doi:https://doi.org/10.1016/j.tourman.2014.06.001.

Voda, M., Moldovan, L., Torpan, A., & Henning, A. (2014). Using GIS for mountain wild routes assessment in order to qualify them for tourism valorisation. *Geographia Technica*, 9(1), 101-108. http://technicalgeography.org/pdf/1_2014/10_voda.pdf.

Voda, M., Kithiia, S., Jackiewicz, E., Du, Q., & Sarpe, C. A. (2019). Geosystems 'pathways to the future of Sustainability. *Scientific Reports*, 9(1), 14446. https://doi.org/10.1038/s41598-019-50937-z.

Wang, K., Gan, C., Chen, L., & Voda, M. (2020). Poor Residents՚ perceptions of the impacts of tourism on poverty alleviation: From the perspective of multidimensional poverty. *Sustainability, 12*(18), 7515. doi: https://doi.org/10.3390/su12187515.

Wang, K., Tan, J., & Gan, C. (2023). Degree of synergy of regional tourism development and urban-rural integration and influencing factors in the Western Hunan region. *Progress in Geography, 42*(8), 1468-1485 (in Chinese). doi:10.18306/dlkxjz.2023.08.003.

Wang, S., Kong, W. R., Liang, Zhi, D., & Dai, B. (2021). Research on misuses and modification of coupling coordination degree model in China. *Journal of Natural Resources, 36*(3), 793-810. doi:10.31497/zrzyxb.20210319.

Xu, J., & Cheng, L. (2019). *Research on the residents՚ support for intercity railway in rural tourism destinations: multiple regression analysis and fsQCA findings.* Paper presented at the Proceedings of 2019 International Conference on Strategic Management (ICSM 2019), Francis Academic Press, Oxfordshire.

Yang, Y., Bao, W., Wang, Y., & Liu, Y. (2021). Measurement of urban-rural integration level and its spatial differentiation in China in the new century. *Habitat International, 117*, 102420. doi: https://doi.org/10.1016/j.habitatint.2021.102420.

Yin, Q., Sui, X., Ye, B., Zhou, Y., Li, C., Zou, M., & Zhou, S. (2022). What role does land consolidation play in the multi-dimensional rural revitalization in China? A research synthesis. *Land Use Policy, 120*, 106261. doi: https://doi.org/10.1016/j.landusepol.2022.106261.

Yin, Z., Tang, Y., Liu, H., & Dai, L. (2023). Coupling coordination relationship between tourism economy-social welfare-ecological environment: Empirical analysis of Western Area, China. *Ecological Indicators, 155*, 110938. doi:https://doi.org/10.1016/j.ecolind.2023.110938.

Yuan, G., Yang, Y., Tian, G., & Zhuang, Q. (2020). Comprehensive evaluation of disassembly performance based on the ultimate cross-efficiency and extension-gray correlation degree. *Journal of Cleaner Production, 245*, 118800. doi:https://doi.org/10.1016/j.jclepro.2019.118800.

Zhang, D., Wang, Q., & Yang, Y. (2023). Cure-all or curse? A meta-regression on the effect of tourism development on poverty alleviation. *Tourism Management, 94*, 104650. doi:https://doi.org/10.1016/j.tourman.2022.104650.