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Landscape planning and design of an ecological characteristic town and its impact on tourism

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Abstract: In order to improve the tourism economy of rural areas, the local landscape needs to be planned to realise sustainable development. This paper analysed the landscape planning of an ecological characteristic town by taking Wenglangxi Village, Longchuantang Yao Nationality Town, Hongjiang City, Hunan Province, as a case. The landscape planning scheme of the ecological characteristic town for Wenglangxi Village was given after introducing the local profile and planning principles, and the changes in tourism in Wenglangxi Village in three years before and after the landscape planning were measured using the coupling coordination model. The results showed that the coupling coordination between tourism and ecology in Wenglangxi Village decreased year by year before the landscape planning and increased year by year after the landscape planning.

Keywords: ecological characteristic town; landscape planning; tourism; coupling coordination.

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1 Introduction

During tourism development, in addition to having sufficient tourism resources, there is also a need to increase the attractiveness of the promotional features. A characteristic town is an attractive tourism landscape planning project. Unlike a traditional town or park (Li and Fan, 2022), a characteristic town combines scenic spots, parks, and residential areas in an organic way. In a characteristic town, there is a good environment for local residents to live in and a landscape environment to attract tourists, and the landscape of the town highlights the local cultural characteristics and promotes the development of other related industries (Bai, 2021).

Figure 1 Basic principles of landscape planning for an ecological characteristic town

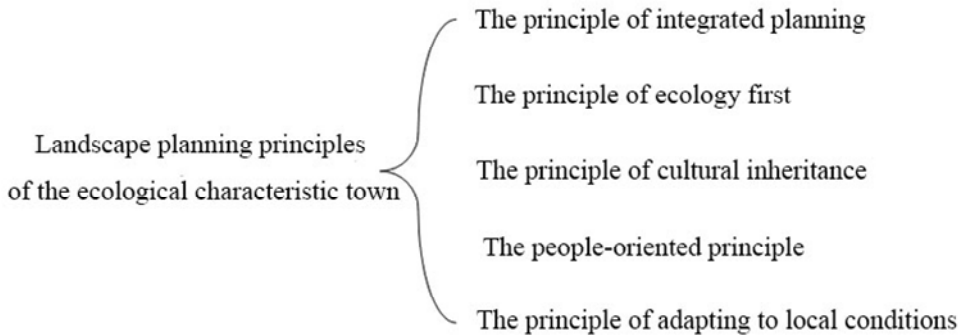


Figure 1 shows the basic principles required for the landscape planning of the ecological characteristic town.

- 1 The principle of integrated planning (Carta et al., 2022): the construction and adjustment of the landscape in Wenglangxi Village considered the local culture, industry, and economic elements and harmonised the landscape of the village and the spatial environment from the overall perspective (Yu et al., 2021).
- 2 The principle of ecology first: too much emphasis on economic benefits during tourism development will destroy the ecological environment and eventually drag down the economic development. Following the concept of ‘green mountains and clear water are equal to mountains of gold and silver’ (Li and Hou, 2021), the landscape planning of Wenglangxi Village emphasised ecology so that everyone can feel the benefits of a high-quality ecological environment and tourists can receive the service of getting close. Wenglangxi Village is an agricultural characteristic town, so its planning focuses on rural ecology (Li and Xu, 2021).
- 3 The principle of cultural inheritance: Wenglangxi village has a rich cultural heritage, among which the Yao stockade is an architectural type with historical characteristics (Wang, 2021). In the landscape planning of the local area, buildings such as the Yao stockade were retained to reflect the regional culture. In addition, there are more than 4.67 square kilometres of bamboo forests in the local mountains and forests, i.e., the bamboo resources are abundant, so bamboo is often used as a building material, for example, the bamboo fence is a special product of the local area. Bamboo fences replaced fences made of iron, plastic, and other materials to achieve the purpose of

protecting the environment and highlighting nature to tourists. At the same time, bamboo plaited articles made of *Phyllostachys heterocycla* (Carr.) Mitford cv. *Pubescens*, a rich local bamboo resource, were sold as local cultural and creative products.

- 4 The people-oriented principle: the planning of the characteristic town is not to separate the residential area, the economic development zone, and the tourist area, but to combine them (Xu et al., 2022), which means that the whole characteristic town is a place for local residents to live, although it is a tourist attraction for tourists to visit and sells local characteristic products to the outside world. Therefore, the planning paid attention to people oriented. In detail, the design made efficient use of land resources and maintained the harmony between people and nature under the premise of securing a livable environment for local residents.
- 5 The principle of adapting to local conditions: when planning for Wenglangxi Village, the tourism resources that the local area had were considered, the character of the local landscape was fully made use of, and blindly increasing popular elements of other tourist attractions was avoided.

This paper utilised the planning principles of ecological characteristic town to perform landscape planning and design of Wenglangxi Village, so as to improve the local tourism economic development. In addition, this paper used the coupling coordination model to study the impact of the ecological characteristic town planning principles on the local tourism industry.

2 Related works

Some studies related to landscape planning are reviewed below. Albert et al. (2015) combined environmental system assessment and valuation indicators with the widely used driving forces, pressures, states, impacts, and responses model as a systematic framework for landscape planning. They validated the system in a case study of planning problems in the community of Maldorf along the Steinhuder Meer Lake, Northern Germany. Tortora et al. (2015) analysed land use change in rural southern Italy by comparing historical cartographic support from different periods with modern maps to assess morphological and vegetation changes in agroforestry complex lands. They found that the agricultural and forestry lands were affected by the deep transformation. Lin et al. (2020) proposed an improved, targeted landscape ecology-based ecological planning approach that emphasises the important role of characteristic source-bank landscapes and their structure in the sustainable management of river quality in mountainous areas. The study showed that optimising the main conflicting landscapes closely related to river quality changes through a landscape ecology approach was feasible to help manage river quality more effectively.

3 Case study

3.1 Overview of the analysis object

This paper analyses Wenglangxi village, which is located in the mid-east region of Longchuantang Yao Nationality Town, Hongjiang City, Hunan Province, and adjacent to Luoxi Yao Nationality Town, Dongkou County in the southeast. In terms of geographical height, its average elevation is 755.8 m. The total mountain forest area of the whole village is 10.13 square kilometres, with a forest coverage rate of 99%. In terms of tourism resources, Wenglangxi Village has deep cultural deposits, and the Yao stockade has unique scenery, the most representative of which is concentrated around the village and on top of laccolites. In addition, Wenglangxi Village also has attractions such as the Rock Eagle Cave Scenic Area, Yulong Lake, Laoshanjie Grassland, and the Fengshen Stockade Ancient Temple. The aerial view of some areas of Wenglangxi Village is shown in Figure 2.

Figure 2 Aerial view of part of Wenglangxi Village (see online version for colours)

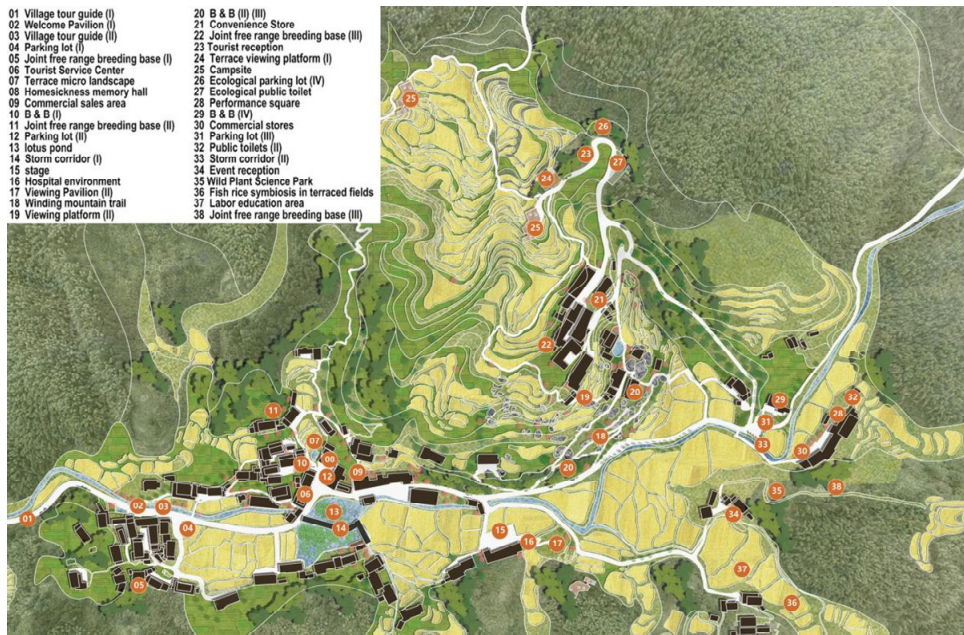


3.2 Planning scheme

The planned scheme for Wenglangxi Village based on the above landscape planning principles is shown in Figure 3. It was seen from Figure 3 that there were a large number of terraced field landscapes in Wenglangxi Village, i.e., the terraced field was the characteristic of the local area. It was also noticed that the buildings and related tourism facilities were planned without damaging the original terraced fields.

In the planning scheme in Figure 3, a tour guide map was provided at the village entrance to offer visitors opinions on the tour route. The construction of buildings and related tourism facilities was almost around the terraced fields, which not only used the terraced fields as the background of local buildings but also provided visitors who were in the buildings with a place to view the scenery at a short distance.

Figure 3 A landscape planning scheme of the ecological characteristic town for Wenglangxi Village (see online version for colours)



The planning also provided visitors with parking lots, viewing pavilions (platforms), camping platforms, service centres, and guesthouses. These facilities were not concentrated in one place but scattered in different parts of the village, which made the village less crowded and enabled visitors to find the appropriate place at any time and place during their visit.

Table 1 Indicators for the comprehensive evaluation of the tourism industry and ecological environment

<i>Subsystem</i>	<i>Evaluation indicator</i>
A comprehensive evaluation of the tourism industry	Tourism industry income
	The proportion of total tourism industry income in GDP
	Number of hotels
	Number of travel agencies
A comprehensive evaluation of the ecological environment	Number of people employed in accommodation and catering
	Garbage disposal rate
	Garbage disposal capacity
	Forest area
	Number of days with good air quality

Places such as the Nostalgia Memory Hall and the commercial sales area sold local specialties to visitors and promoted local culture. In addition to the above locations for tourists, there were also areas such as the joint scatter-feed base, the wild plant research and science park, and the fish-paddy terraced field in Wenglangxi Village, which not

only served as landscapes for tourists to enjoy but also were valuable to the local residents.

3.3 Tourism influence analysis method based on the coupling coordination model

In this paper, the planning principle of ecological characteristic town is applied to rural landscape planning (Hernández, 2021). In order to analyse the impact of the planning principle of ecological characteristic town on local tourism, in addition to measuring the intuitive number of tourists and tourism income, it can also be assessed through the coupling coordination model. When landscape planning is used to promote local tourism in the countryside (Lin, 2021), the development of tourism will also have an impact on the local ecology. The coupling coordination model can analyse the degree of coordination between the local tourism industry and the ecological environment, and the more coordinated they are, the more sustainable the tourism industry can be. The basic steps are to use the analytic hierarchy process (AHP) method to construct evaluation indicators, as shown in Table 1, use the entropy-weight method (Ji et al., 2021) to determine the weight of the indicators, calculate the comprehensive evaluation of the tourism industry and the ecological environment, and use the coupling coordination model to calculate the degree of coupling between the them and the degree of coupling coordination. The relevant formula for the coupling coordination model of the dual system in this paper is:

$$\begin{cases} C = \frac{2\sqrt{u_1u_2}}{u_1 + u_2} \\ T = \alpha \cdot u_1 + \beta \cdot u_2 \\ D = \sqrt{CT} \end{cases} \quad (1)$$

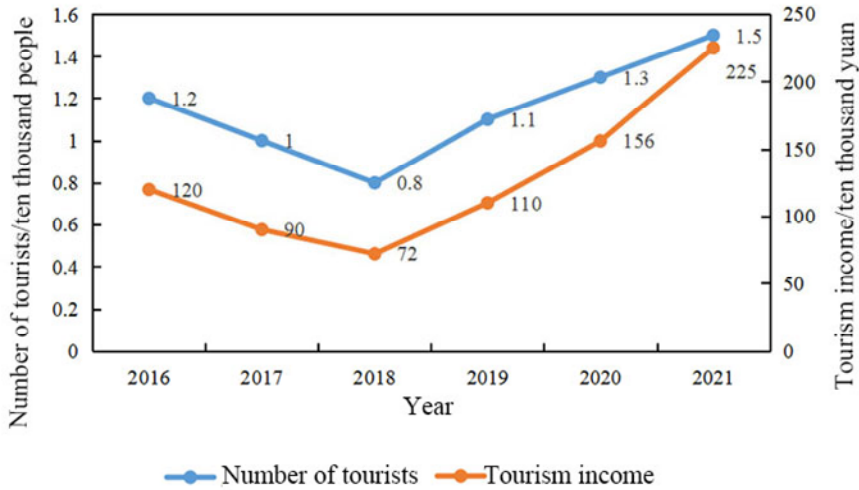
where u_1 and u_2 are the respective comprehensive evaluation of tourism and ecology, C is the coupling degree (Lin et al., 2020), T indicates the comprehensive coordination index (Gong et al., 2021), D is the coupling coordination degree of the three subsystems, and α and β are the corresponding undetermined coefficients (Hasanov et al., 2021).

When analysing the impact of local tourism using the above methodology, the required data were obtained from the *Hunan Provincial Statistical Yearbook* and the *Hunan Provincial National Economic and Social Development Statistical Bulletin* from 2016 to 2021.

3.4 Tourism impact before and after the town landscape planning

In addition to introducing the landscape planning of the ecological town of Wenglangxi Village, this paper also studied the impact of landscape planning on the local tourism industry. The impact of landscape planning on tourism is most intuitively reflected in the number of local tourists and tourism income. Figure 4 shows the changes in the number of tourists and tourism income of Wenglangxi Village in the three years before and after the landscape planning. It was clearly seen from Figure 4 that the number of tourists and local tourism income decreased year by year in the three years before the landscape planning and increased year by year in the three years after the landscape planning.

Figure 4 Changes in the number of tourists and income of Wenglangxi Village in the three years before and after the landscape planning (see online version for colours)



Although the changes in tourism number and tourism income intuitively reflected the influence of landscape planning on local tourism, these two items alone were not enough to analyse the influence of landscape planning on local tourism in depth. In addition, Wenglangxi Village adopted the ecological characteristic town mode for landscape planning, so the impact of tourism development on the local ecological environment also needs to be considered. Therefore, this paper also adopted a coupling coordination model to analyse the degree of coupling coordination between tourism and the ecological environment. Table 2 shows the evaluation indicators of the tourism industry and ecological environment constructed using the AHP method before the calculation of coupling coordination, and the weights were calculated using the entropy-weight method.

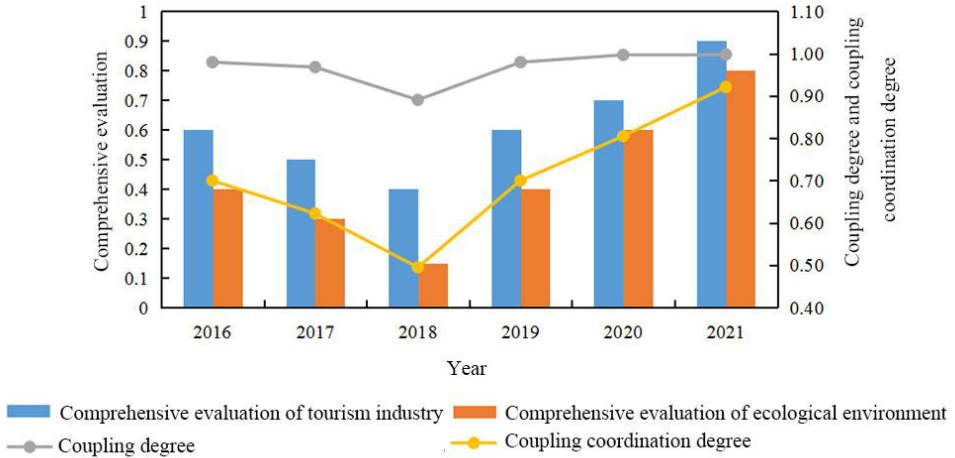
Table 2 Indicators for the comprehensive evaluation of the tourism industry and ecological environment and the corresponding weights

<i>Subsystem</i>	<i>Evaluation indicator</i>	<i>Weight</i>
A comprehensive evaluation of the tourism industry	Tourism industry income	0.19
	The proportion of total tourism industry income in GDP	0.27
	Number of hotels	0.21
	Number of travel agencies	0.12
	Number of people employed in accommodation and catering	0.21
A comprehensive evaluation of the ecological environment	Garbage disposal rate	0.30
	Garbage disposal capacity	0.15
	Forest area	0.21
	Number of days with good air quality	0.34

The comprehensive evaluations of tourism and ecology in Wenglangxi Village and the coupling coordination changes in the three years before and after the landscape planning are shown in Figure 5. It was seen from Figure 5 that the comprehensive evaluations and

coupling coordination decreased year by year in the first three years before landscape planning and increased year by year in the three years after landscape planning, the comprehensive evaluation of tourism was always better than the comprehensive evaluation of the ecological environment in the same year, and the gap between the comprehensive evaluations of tourism and the ecological environment in the same year gradually increased before planning and decreased after planning.

Figure 5 Changes in the comprehensive evaluation of tourism and ecology and the degree of coupling coordination in Wenglangxi Village in the three years before and after the landscape planning (see online version for colours)



Then, it was an analysis of the coupling coordination between tourism and the ecological environment. It was seen from Figure 5 that the coupling and coupling coordination between tourism and ecological environment gradually decreased in the three years before the landscape planning and increased in the three years after the landscape planning. Coupling coordination reflected the balance of tourism and the ecological environment in the run-in state. The trend of the coupling coordination between tourism and the ecological environment before and after the landscape planning was decreasing first and then increasing.

4 Discussion

With the continuous development of society, people’s living standards have also been rising, travel has gradually become a common choice, and the tourism industry has developed rapidly (Athukorala et al., 2021). However, the tourism industry focuses too much on economic benefits in the process of high-speed development, so the design and construction of scenic spots affect the local ecological balance (Huang et al., 2020). For the tourism industry, the ecological environment of scenic spots is also a vital tourism resource, and if the environment is destroyed because of ecological imbalance, the attractiveness of scenic spots will be declined, and the growth of economic benefits will also be slower (Péter, 2021). Therefore, the planning and design of the local tourism landscape require the coordination of economic and ecological benefits. ‘Ecological

characteristic town' is a mode of planning and designing rural tourism landscape, which highlights the local ecological and cultural characteristics in the process of tourism landscape planning, so as to enhance the attractiveness of the local tourism industry. In this paper, the landscape of Wenglangxi Village was planned using this mode, and then the coupling coordination model was used to analyse the impact of the landscape planning on the local tourism industry. The final results are shown above. The number of tourists and local tourism income decreased year by year in the three years before the landscape planning and increased year by year in the three years after the landscape planning. The coupling coordination between tourism and ecological environment gradually also decreased first and then increased.

The reason for causing the above results is as follows. Wenglangxi Village developed its tourism economy with the local ecological resources, so it paid more attention to tourism development. Even if it used the ecological town mode for landscape planning, it was also aimed at the sustainable development of tourism, so the comprehensive evaluation of tourism was higher than that of the ecological environment. In the three years before landscape planning, the local ecological environment was over-exploited for the development of tourism, so the comprehensive evaluation of the ecological environment decreased year by year, widening the gap with the comprehensive evaluation of tourism, but because the ecological environment became worse, the local area became less attractive, reducing the comprehensive evaluation of tourism. In the three years after the landscape planning, the landscape planning of the ecological characteristic town mode paid more attention to the sustainable development of the ecological environment, so the evaluation of the ecological environment gradually improved and, at the same time, pulled the evaluation of tourism, narrowing the gap between them. Even though the coupling between tourism and ecological environment decreased, they were still in the run-in state. The development of tourism and ecological environment were mutually influenced. The better the ecological environment was, the more resources tourism could use, and the better the development was; the good development of tourism increased the economic income of tourism, but the consumption of ecological environment also increased. However, the consumption of ecological environment was reduced by investing tourism revenues in ecological conservation, so tourism and the ecological environment were in the run-in state and eventually reached a mutual balance. In the three years before the landscape planning, the local area only focused on the development of tourism without protecting the ecological environment, which led to decreased coordination, and after the landscape planning, the protection of the ecological environment was emphasised, so the coordination increased.

5 Conclusions

This paper analysed the landscape planning of the ecological characteristic town in Wenglangxi Village, Longchuantang Yao Nationality Town, Hongjiang City, Hunan Province. Wenglangxi Village was briefly introduced firstly; then, the principles of landscape planning of ecological characteristic town were explained, and the landscape planning scheme of the ecological characteristic town in Wenglangxi Village was given; finally, the coupling coordination model measured the tourism change in Wenglangxi Village before and after landscape planning. The following conclusions were drawn. The comprehensive evaluations of tourism and ecology of Wenglangxi village showed a

decreasing trend in the three years before the landscape planning and an increasing trend in the three years after the landscape planning. The coupling degree between tourism and ecology in Wenglangxi Village before and after the landscape planning was decreasing first and then increasing but still in a run-in state; the coupling coordination degree between tourism and ecology in the three years before the planning was decreasing in the three years before planning but increasing in the three years after planning.

The contribution of this paper is to use the planning principle of 'ecological characteristic town' to plan the rural tourism landscape, which provides an effective reference for improving the development of rural tourism. The shortcoming of this paper is that when analysing the effect of the planning principle of 'ecological characteristic town', only Wenglangxi Village is taken as the subject of analysis, i.e., the number of cases is not enough, so the direction of research in the future is to increase the number of cases that can be analysed.

References

- Albert, C., Galler, C., Hermes, J., Neuendorf, F., Haaren, C.V. and Lovett, A.A. (2015) 'Applying ecosystem services indicators in landscape planning and management: The ES-in-Planning framework', *Ecological Indicators*, Vol. 61, No. FEB.PT.1, pp.100–113.
- Athukorala, D., Estoque, R.C., Murayama, Y. and Matsushita, B. (2021) 'Impacts of urbanization on the Muthurajawela Marsh and Negombo Lagoon, Sri Lanka: implications for landscape planning towards a sustainable urban wetland ecosystem', *Remote Sensing*, Vol. 13, No. 2, pp.1–20.
- Bai, Y. (2021) 'Research on rural landscape planning and design based on BIM', *Journal of Physics: Conference Series*, Vol. 1992, No. 3, pp.1–5.
- Carta, M., Gisotti, M.R. and Lucchesi, F. (2022) 'Settlements and Urban Morphological Quality in Landscape Planning-Analytical Models and Regulating Tools in the Landscape Plan of Regione Toscana', *Sustainability*, Vol. 14, No. 3, pp. 1.
- Gong, Y., Yang, X.Q., Ran, C.Y., Shi, V. and Zhou, Y.F. (2021) 'Evaluation of the sustainable coupling coordination of the logistics industry and the manufacturing industry in the Yangtze river economic belt', *Sustainability*, Vol. 13, No. 9, pp.1–19.
- Hasanov, A., Ibrahimova, L. and Aliyeva, N. (2021) 'Algorithms of Nakhchivan (Azerbaijan) grasslands and their economic-geographical assessment, based on landscape planning', *Bulletin of Science and Practice*, Vol. 7, No. 6, pp.105–112.
- Hernández, G.A., Rosete, F.A., Salas, L., Alvarado, L.F., Martinez, J. and Sanchez J.F. (2021) 'Landscape planning for conservation: the case of the Flora and Fauna protection area 'Sierra de San Miguelito', San Luis Potosi, Mexico', *Diversity*, Vol. 14, No. 1, pp.1–21.
- Huang, Y., Li, C. and Zhang, L. (2020) 'Based on the characteristic of different Spaces, the pattern of plant landscape in universities', *IOP Conference Series Earth and Environmental Science*, Vol. 455, No. 1, p.12202.
- Ji, J., Wang, S., Zhou, Y., Liu, W. and Wang, L. (2021) 'Studying the coupling coordination degree between socio-economic and eco-environment of Jing-Jin-Ji urban agglomeration during 2001-2015', *IOP Conference Series: Earth and Environmental Science*, Vol. 675, No. 1, pp.1–7.
- Li, F.L. and Xu, Y.G. (2021) 'Study on plant landscape planning method based on discrete particle swarm optimisation', *International Journal of Environmental Technology and Management*, Vol. 24, Nos. 3–4, pp.184–199.
- Li, J. and Hou, T. (2021) 'Application of virtual reality technology in analysis of the three-dimensional evaluation system of rural landscape planning', *Mathematical Problems in Engineering*, Vol. 2021, No. 5, pp.1–16.

- Li, S. and Fan, Z. (2022) 'Evaluation of urban green space landscape planning scheme based on PSO-BP neural network model - ScienceDirect', *Alexandria Engineering Journal*, Vol. 61, No. 9, pp.7141–7153.
- Lin, J.F. (2021) 'Research on Peng Yigang's landscape planning and design thoughts and methods: a case study of Zhangpu XiHu Park in Fujian Province', *Landscape Studies*, Vol. 13, No. 2, pp.77–79, 82.
- Lin, L., Li, M., Chen, H., Lai, X., Zhu, H. and Wang, H. (2020) 'Integrating landscape planning and stream quality management in mountainous watersheds: a targeted ecological planning approach for the characteristic landscapes', *Ecological Indicators*, Vol. 117, p.106557.
- Liu, X.R., Lü, Y.P., Liu, Q. and Li, M. (2020) 'Measuring the land-sea coupling coordination degree of the Coastal Zone and its optimization strategy: a case study of the Coastal Zone in Xiamen', *China City Planning Review*, Vol. 29, No. 1, pp.12–23.
- Péter, C. (2021) 'Present tendencies in landscape planning and recognition of the opinion of local citizens on the example of the Tiszazug', *Landscape and Environment*, Vol. 15, No. 1, pp.1–9.
- Tortora, A., Statuto, D. and Picuno, P. (2015) 'Rural landscape planning through spatial modelling and image processing of historical maps', *Land Use Policy*, Vol. 42, pp.71–82.
- Wang, X. (2021). 'The practice teaching of regional cultural expression in rural landscape planning and design under the background of urban-rural integration', *International Journal of Electrical Engineering Education*.
- Xu, H., Yang, J., Xia, G. and Lin, T. (2022) 'Spatio-temporal differentiation of coupling coordination between ecological footprint and ecosystem service functions in the Aksu Region, Xinjiang, China', *Sustainability*, Vol. 14, No. 6, pp.1–18.
- Yu, X., Ni, C., Bi, Y. and Yuan, S. (2021) 'Application of ecological and environmental protection concept in urban landscape planning and design', *Journal of Environmental Protection and Ecology*, Vol. 22, No. 6, pp.2693–2700.