Site Selection and Design of RV Campgrounds within Tourist Cities

——Research on Needs Hierarchy Theory and AHP Hierarchy Theory Empowerment

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Abstract. In recent years, domestic tourism consumption has shown a trend of experience-heavy, personalized development, and the demand for high-quality tourism products continues to increase. RV travel, is widely welcomed by consumer groups pursuing in-depth leisure experience by virtue of its own flexibility, safety and privacy advantages. RV campgrounds are the supply stations for RV travel and have good development prospects. However, the influencing factors that need to be paid attention to when selecting the site of RV campgrounds in tourist cities are still unclear, and there is often a lack of a set of systematic and effective site selection factor analysis methods and site assignment methods to guide the decision-making process in practice. Combining the Needs Hierarchy Theory and AHP Hierarchy Theory Empowerment, the article proposes a comprehensive site selection method for RV campgrounds, and conducts practical application analysis to verify the feasibility of the method, which will contribute to the domestic RV economy.

Keywords: Needs Hierarchy Theory; AHP Hierarchy Theory Empowerment; RV Campgrounds; Site Selection and Design.

1. Introduction

Since 2000, China's Gross Domestic Product (GDP) has surged from US$1.2 trillion to US$18 trillion, a leap that reflects a significant increase in productivity, and caravanning has flourished alongside this growth. With the improvement of infrastructure for RV travel and the support of relevant policies, RV travel is expected to become an important part of the tourism market. Along with travelers' increasing demands for cultural content of their trips, RV campground have evolved into comprehensive places that integrate landscape, catering, lodging, and recreation.

The development of domestic RV campground can be divided into three stages. In the early stage at the end of the 20th century, Qian Xueli analyzed the problems of China's RV travel development in-depth, and discussed the difficulties in setting up RV campground as well as the focuses of construction, which provided early thoughts on the factors of the demand for and the direction of the development of RV campground[1]. The early stage of development at the beginning of the 21st century, Yu Qiuyang pointed out that the site selection of RV campground needs to comprehensively consider the local natural environment, policies and other factors[2].The mature stage after 2015, with the rapid development of RV campground in China, the research began to comprehensively analyze the various elements of RV campground, and Ding Hua used the hierarchical analysis method (AHP) and entropy coefficient method to calculate the weights of each index, and the results showed that the transportation condition factor is the priority factor for choosing campgrounds, the second consideration is the social factor, the third factor is the market, and the fourth factor includes the natural factor[3]. Yang Zihan et al. also carried out a study aimed at site selection principles, overall scale and parking facilities planning for RV campgrounds[4]. The in-depth exploration of RV campground selection issues in China responds to the actual demand for urban RV travel as a new trend in the context of rising housing prices and the rise of urban tourism.

Although there are many advanced examples in the field of RV campground design, there is a relative lack of research on the site selection stage. With the growing emergence of new tourism modes, the complexity of the tourism environment increases, which puts higher requirements on the site selection of RV campgrounds. These requirements pose significant challenges to the site selection and design phase, and there is an urgent need to update and refine the site selection factors.

2. Research Theory and Methodology

2.1 Analysis of Influencing Factors of Site Selection Based on Needs Hierarchy Theory

2.1.1 Infrastructure factors

The first level of the Needs Hierarchy Theory (Maslow's theory) is physiological needs, and the level of physiological needs is related to the planning and construction of the infrastructure around the RV campgrounds, which requires the ability of garbage disposal, material supply, and electric power supply in three aspects. Firstly, make sure the camp has adequate garbage collection points and regular garbage removal services, and consider effective disposal methods when there is a spike in garbage during the tourist season. Secondly, the material supply capacity of the RV campground is reflected in whether it can ensure the continuous, stable and economic supply of various necessary materials such as food, water, fuel, maintenance materials and so on in the operation of the camp, when selecting the site, a detailed logistics analysis should be conducted, taking into account the distance to the nearest town, warehouse, or other supply point, the time required, and the cost, as well as an assessment of potential logistical risks. Finally, during the peak tourist season, power system must have sufficient capacity to cope with peak hour demand.

2.1.2 Security factors

When physiological needs are satisfied, people begin to pursue their own safety attributes, safety needs. Safety needs include both natural environment safety and security safety. Natural environment safety means that the natural environment of the site selection location should be stable and non-toxic and harmless to ensure that RV owners can enjoy a safe and healthy environment both inside and outside the campgrounds. When selecting a site, it is necessary to investigate and assess the local flora and fauna to maximize the protection of wildlife and flora, and at the same time to exclude natural insecurities, and to take appropriate protective measures, such as installing protective fences and warning signs, and in addition, it is necessary to Conduct air quality tests and stay away from major sources of pollution such as industrial areas and busy traffic arteries to ensure the air quality in the camp. In terms of public security and safety, due to the large mobility and complex composition of RV campgrounds, the potential contradictions between the camps and the surrounding residents are easy to be highlighted, so it is necessary to understand the local government policies and folk customs when selecting the site, so as to screen out the RV campgrounds that the government attaches importance to and have good folk customs.

2.1.3 Environmental factors

Social demand is the third layer of Maslow's theory, when there is enough security in the campground, RV owners will socialize and sightsee around the campgrounds. The environment is the scene carrier of sightseeing and socializing, and different landscape environments will have different impacts on RV owners' socializing, which needs to be considered from the natural landscape and humanistic landscape of the selected location. Natural landscape involves terrain, vegetation, water and other natural elements, while man-made landscape includes buildings, roads, decorations and other products of human activities. The planning and construction of camps should respect the local natural and humanistic landscape, avoid destroying the original landscape features, and strive for harmonious coexistence with the surrounding environment. When selecting a site, one should look for locations that can provide rich environmental experiences, and also consider

whether there are cultural heritage and historical attractions in the vicinity, so as to enhance the attractiveness of the campsite and the customer's satisfaction with the environment.

2.1.4 Economic and demographic quality factors

The fourth level of Maslow's theory is respect needs, RV owners have different expectations of the service level and management system of RV campgrounds with different economic development and population quality. RV owners in high economic development areas will expect a high level of service and facilities, these areas need to have a more complete infrastructure and a higher standard of service management mode, RV owners will also have a higher ability to pay for the campground and psychological expectations, the campground can set relatively high fees. RV campgrounds in low economic development areas need to emphasize the natural landscape of the campgrounds, simple services and unique local experiences to help RV owners form reasonable expectations. Considering that most of the daily management and maintenance of RV campgrounds require the participation of local residents, an area with a reasonable demographic structure and high quality of population is more conducive to the long-term operation of the camps, and enhances the level of services that the RV campgrounds can provide, promotes the integration of the camps with the local society.

2.1.5 The distance factor

Although the distance factor is not directly related to Maslow's theory, it indirectly affects the degree of advantage of the above factors. First of all, the campsite's proximity to popular tourist attractions, especially close to the Netflix scenic spots, has a significant advantage in attracting tourist traffic, and this convenience not only enhances the overall experience of tourists, but also greatly increases the competitiveness and market attractiveness of the RV campgrounds. Secondly, the proximity of the camp site to main roads is directly related to the camp's accessibility and ability to attract popularity. Campsites located near major transportation routes are undoubtedly a huge plus for travelers who are looking for easy and quick access, and in addition, campsites adjacent to busy roads are able to leverage on high-traffic roadways to increase their visibility, thus attracting more passing eyes and potential customers.

2.2 Empowerment of Site Selection Influencing Factors Based on AHP Hierarchy Theory Empowerment

2.2.1 Factor assignment

The infrastructure factors, safety factors, and environmental factors are assigned using the ranking assignment method. Distance factors and economic and population quality factors are assigned using data standardized assignment.

Ranking assignment method: identify all key factors influencing site selection decisions, including those that are difficult to quantify directly; ranking the degree to which each factor influences the importance of site selection success usually requires the site selection team to evaluate based on professional experience and actual conditions; once the ranking is completed, the corresponding score can be assigned according to the position of the factors. Sites with high total scores perform better on multiple key factors and are therefore more suitable for RV campgrounds.

Standardized Assignment Formula:

$$R_i = \left(\frac{\frac{x_i}{s}}{n}\right) \times n_i = \frac{x_i n_i}{sn} \tag{1}$$

n: the number of all data item numbers in the factor;

s: the sum of all data;

x_i: the ith set of data;

n_i: the sum of the combined total scores of the single factors in the ranking assignment method.

2.2.2 Numerical empowerment of factors

According to the type of campground and the specific needs of the target group of tourists, the focus of site selection is reflected in the different demand intensity of the above five factors, so it is necessary to assign the influencing factors of different types of RV campgrounds. Empowerment method is AHP hierarchy theory empowerment method: ① establish a hierarchical structure, the decision-making problem is divided into the target layer, criterion layer and program layer, this study has only two layers of judgment, so only the target layer and criterion layer is used; ② construct a judgment matrix, in the criterion layer, according to the relative importance of the criterion of the two comparisons, and numerical value to express the relative importance of them, the filling of the judgment matrix is usually the expert's experience or the corresponding comparative analysis, the use of experts' experience or comparative analysis. or corresponding comparative analysis, using a scale such as 1 to 9 assignment method to quantify the priority; ③ Hierarchical single ranking and consistency test, using the judgment matrix to calculate the relative weights, and test the consistency of these judgments.

3. Case Application

3.1 Case Overview

Jinan Xu eye Tourist Area is located in Liwu District, Jinan , Shandong Province, only 30 minutes from Laius , 1.5 hours from Jinan , belonging to the core area within the city circle, with a total area of 587.6 square kilometers, three towns under the jurisdiction of the city, with a total of 131,000 people, it is the provincial-level tourism resort area of Shandong Province, and the key service industry park of Shandong Province, It is a provincial tourism resort area in Shandong Province, a key service industry park in Shandong Province, a permanent venue for the China International Aviation Sports Festival, and a national-level water conservancy scenic area.

The buildable land of Xueye Lake is centered on the Xueye Lake Reservoir, with the area surrounded by Xueye Town, Xixiayou Village, Shangyou Village, and Dongxiayou Village in the north; the area surrounded by Dongnuan Village, Nanshuangwang Village, Xitantou Village, and Kuangshan Village in the south; the area around the Xingjiayu Village and Xizhanli Village mainly in the west; and to the east is the construction zone formed by Beibaizuo Village and Beishuangwang Village. For the convenience of tabulation, the centers of the above four areas are designated as B1, B2, B3 and B4 respectively.

3.2 Assignment of Site Selection Factors

3.2.1 Infrastructure factors

There are 49 administrative villages distributed around Xueye Lake with certain infrastructure, but Xueye Lake and its surrounding areas are still inadequate in terms of environmental infrastructure, especially in terms of municipal infrastructure such as sewage treatment and solid waste disposal, where there are obvious gaps. Among the existing villages, the south side of Xueye Lake and the surroundings of Xueye Town have relatively superior conditions for domestic waste disposal and basic material supply, followed by the north, which has relatively better infrastructure compared to the left and right because of its proximity to the exit of the area, and the worst of all, the east, which is surrounded by a hilly terrain with a low degree of development and poor infrastructure. In terms of power supply, high-voltage power lines cross from east to west under the Xueye Lake, making the best conditions for power transmission around Xueye Village under the Xueye Lake, followed by Beishuangwang Village in the east, and the worst is the area around Xingjiayu Village in the west.

Considering the infrastructure aspects, the south side of Xueye Lake, Xueye Town and its neighboring villages and towns in the surrounding area perform more prominently in site selection, followed by the north side of Xueye Lake, where the infrastructure development is more backward

but closer to the electric power facilities, and the area from Xingjiayu Village to Beishuangwang Village, located to the west of Xueye Lake, which faces greater difficulties in electric power transmission because of the smaller size of the villages and towns and the poorer infrastructure development, thus performs the most unfavorable.

Table 1. Ranking and scoring of infrastructure factors

Factor/Name	B1	B2	B3	B4
Garbage disposal	3	4	2	1
Supply of material	3	4	2	1
Power supply	2	4	1	3
Synthesize	2.67	4	1.67	1.67

3.2.2 Security factors

Surrounded by U-shaped hills, ecological stability shows a decreasing distribution trend from high to low altitude throughout the region. Especially in the southeast direction of the U-shaped mouth, the terrain of the area is mainly valleys with relatively flat terrain and low elevation, and the main natural landscapes of the area include farmland, sandy land and other undeveloped land, which are less sensitive to the land environment and thus more suitable for development and utilization.

The planning area is covered by a large area of forest, which is mainly artificial secondary forest, with the main species of trees such as oil pine and cypress and poplar, and almost no harmful plants. The surrounding area is also rich in animal resources, including foxes, snakes, wolves and swans, which are national Class II protected animals. The west downstream area is close to the periphery of the U-shaped mouth and has fewer large animals, while Xueye Village has the lowest probability of harmful animals within its range because of the large number of villagers and their wide range of activities, and Beibaizuo Village is located at the foot of a steep mountain peak and has the highest probability of harmful animals. In addition, the lack of local sewage and solid waste disposal facilities, coupled with the burning of straw in the fields, so the air environment around the lake has been polluted, with the most serious pollution in Xixiayou Village, and the lightest in Beibaizuo Village.

The simplicity of the people and the stable security environment in the communities around Xueye Lake have led to a generally high level of tourist satisfaction with the tourism experience in and around Xueye Lake, and the local tourism industry has shown a healthy development. Overall, the region is well deployed in both maintaining the tourism environment and ensuring the safety of tourists, with no significant differences.

Table 2. Ranking and scoring of security factors

Factor/Name	B1	B2	B3	B4
Public security	4	4	4	4
Slope safety	3	4	2	1
Animal and plant safety	3	4	2	1
Air safety	1	3	4	2
Synthesize	2.75	3.75	3	2

3.2.3 Environmental factors

The landform of Xueye Lake appears as a U-shaped structure with an opening to the south. Comparatively speaking, Beibaizuo Village below the Maan Mountain is at a relatively high altitude with a wide view and a better natural landscape. Xueye Village at the opening of the U-shaped landform is a platform area surrounded by hills with the worst views.

Xixiayou Village is rich in historical and cultural resources, such as Jinyangguan, Niangniang Temple, and Luan Palace, which give Xixiayou Village a unique and quaint flavor, attracting many tourists seeking a traditional cultural experience. Xueye Village is more modernized due to its close proximity to Laicheng, where commercial high-rise buildings and a well-developed excursion market form the main artificial landscape of the area, making Xueye Village a more suitable

location for those seeking modern conveniences and urban entertainment. Located at the foot of Maan Mountain, Beishuangwang Village is surrounded by more usable wasteland and has the fewest elements of man-made attractions, but the vast wasteland provides ample space for a variety of outdoor activities and large gatherings, and has potential for development. Located at the foot of Peacock Mountain and the Little Three Gorges, Xingjiayu Village is situated near the river, with beautiful surrounding natural landscapes and distinctive artificial attractions such as fields. Through the above analysis, a relative ranking is assigned to the site selection locations around Xueye Lake.

Table 3. Ranking and scoring of environmental factors

Factor/Name	B1	B2	B3	B4
Natural andscape environment	3	1	4	2
Human landscape environment	2	4	3	1
Synthesize	2.50	2.50	3.50	1.50

3.2.4 Economic and demographic quality factors

The economic demographics around Xueye Lake widely, with some developed villages having nearly 2,000 people, while some of the more depressed villages have only 183 people; the highest total income is 24.17 million dollars, while the lowest is only 2.54 million dollars. Different economic and demographic environments create different investment and service environments.

Table 4. Number of people and income levels in the villages and towns around Xueye Lake

Village name	Total population (persons)	Total income ($ million)	Net income per capita (yuan)
Shangyou	1,874	2,417	4,500
Dongxiayou	1,217	1,405	4,501
Dongyu	1,050	1,146	4,470
Shiquan	307	254	4,543
Dongzhanli	361	498	3,684
Xixiayou	1,137	1,460	4,590
Huayu	725	855	4,531
Xizhanli	732	752	3,914
Lvzuquan	1,398	1,680	4,421
Niangniang Temple	555	662	4,477
Luoquan	183	202	3,906
Xingjiayu	2,119	2,489	4,532
Dongnuan	1,765	2,259	4,504
Xueye	1,486	1,514	4,469
Nanshuangwang	824	640	4,019
Beishuangwang	631	748	4,045
Nanbaizuo	722	779	4,114
Beibaizuo	1,306	1,152	3,969

Statistically speaking, the more populous villages are those around Xueye Village and Xixiayou Village in Xueye Lake. In terms of economic volume, Xixiayou Village is the highest and Maan Village is the smallest. In terms of combined economic volume and population factors, the conditions associated with Xixiayou Village are the best and the worst is under Maan Mountain.

Table 5. Scoring of economic and demographic quality factors

Factor/Name	B1	B2	B3	B4
Raw data on total population	1409.30	1357.70	1192	686.30
Raw data on economic aggregates	1760.60	1471	1365.30	893
Raw data on per capita income	4530.30	4328.70	4325.70	4042.70
Standardized total population ratio	1	0.96	0.83	0.47
Standardization of economic aggregates	1	0.87	0.83	0.53
Standardized per capita income	0.86	0.83	0.84	0.78
Synthesize	2.86	2.66	2.50	1.78

In general, the economically developed areas of villages and towns with high quality population are also relatively large, but in the actual survey found that the Xueye Village area is closer to Lai City, the educational resources are of higher quality, the middle school in the village is better, and the proportion of college students and senior high school students is higher, and the quality of the population as a whole is higher. Combining the above analysis, the economic and population quality factors are ranked and assigned values.

Table 6. Ranking and scoring of economic and demographic quality factors

Factor/Name	B1	B2	B3	B4
Economic condition	4	3	2	1
Demographic quality	3	4	2	1
Synthesize	3.50	3.50	2	1

3.2.5 The distance factor

The transportation hub of the Xueye Lake area consists mainly of the four-lane Laiming Road, which is 21 meters wide and runs north-south through Xueye Lake, greatly facilitating the flow of traffic. In addition, Zhonglin Road, which connects the eastern part of the lake, has become the main exit to the highway in the Xueye Lake area with the opening of the Jinan-Qingdao Expressway South. However, in the northeastern part of Xueye Lake, traffic circulation is weak, and villages and towns are mainly connected by dirt roads. In contrast, the southern part of the area has significantly better transportation conditions due to the connection between Laiming Road and Puxue Road.

The west side of Xueye Lake leads to the western Fanggan scenic area, the north is the main route to Jinan and Zibo, the south side of the main route to Laiwu city, the east side of the Maan Mountain scenic area of the channel, these routes are well-connected, directly connecting the major tourist attractions, which leads to Jinan and Laiwu city routes are particularly busy, especially during the barbecue season in Zibo, a large number of tourists will be from the Xueye Lake, along the Jinan-Qingdao Expressway to Zibo.

Taking into account the accessibility and proximity to tourist attractions, Dongnuan Village, Hebei Village and Henan Village on the south side of Xueye Lake are particularly well connected, as these areas are close to the main road, making it easier to travel to popular tourist attractions. The next most popular areas are Xueye Village, Shuangwang Village, and Nanquan Village, which are slightly farther away from the main roads, but still enjoy good transportation conditions, ensuring quick access to the main road network.

Table 7. Standardized assignment of distance factor

Factor/Name	B1	B2	B3	B4
Driving distance to Jinan city center	97 minutes	95 minutes	98 minutes	98 minutes
Drive to Zibo city center	105 minutes	88 minutes	87 minutes	110 minutes
Distance from main roads	1.50 kilometers	1 kilometers	0.50 kilometers	3 kilometers
To the Jinan city drive standard assignment	-0.80	-0.83	-0.80	-0.80
To Zibo city drive standard assignment	-0.89	-0.75	-0.75	-0.94
Standard assignment of distance to main roads	-0.83	-0.75	-0.27	-1.25
Synthesize	-2.52	-2.33	-1.79	-2.99

3.3 Site Selection Empowerment

3.3.1 RV campground type analysis

The type of inner-city RV campgrounds at Xueye Lake are urban recreational resorts, the main type of service is for office workers in the surrounding cities who seek to enjoy nature and life in the city circle on weekends and holidays, the main reason for the choice is the combination of the natural beauty of the area and the convenience of the city., visitors can enjoy the natural beauty of Xueye Lake, but also can easily access the city center of Jinan and Zibo and so on. So site selection should pay attention to accessibility, excellent environmental landscaping and a balance between economy and population and economy.

3.3.2 Empowerment results

According to the comprehensive consideration of infrastructure, environmental stability, geographic location, and economic and demographic factors, factors for which it is difficult to estimate data accurately are assigned using the assignment of value, and factors for which accurate data are available are standardized. This is then weighted with the results of the RV campground type analysis to get a final overall score.

Based on the final total score, it can be learned that the unopened plots located between Xueye Village and Xishuangwang Village has a significant and prominent advantage, and unopened plots are superior for RV campground construction. The location not only has a relatively well-developed village infrastructure and high demographic and economic indicators, but also enjoys a stable ecological terrain. In addition, its proximity to major roads and key tourist attractions makes transportation convenient and easy to attract tourists. In view of the above conditions, the site is undoubtedly an ideal choice for the development of RV campground, and its geographic and socio-economic advantages indicate that the RV campground project has great potential for success and development prospects here.

Table 8. Comprehensive weighting assignment

Synthesize	B1	B2	B3	B4
Infrastructure factors	0.69	1.04	0.43	0.43
Security factors	0.72	0.98	0.78	0.52
Environmental factors	0.40	0.40	0.56	0.24
Economic and demographic quality factors	0.56	0.56	0.32	0.16
The distance factor	-0.40	-0.37	-0.29	-0.48
Totals	1.96	2.60	1.81	0.87

On this basis, site selection mapping was carried out based on the topography and geomorphology of the site locations.

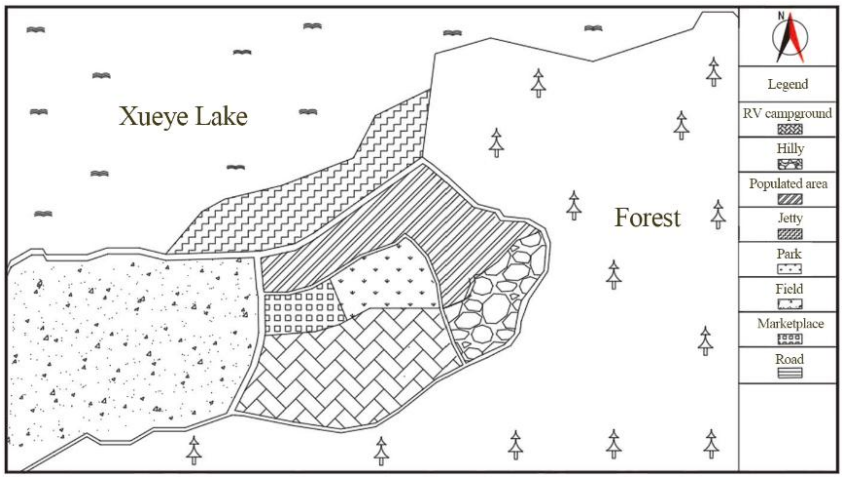

Fig. 1 RV campground general layout map in Xueye Lake

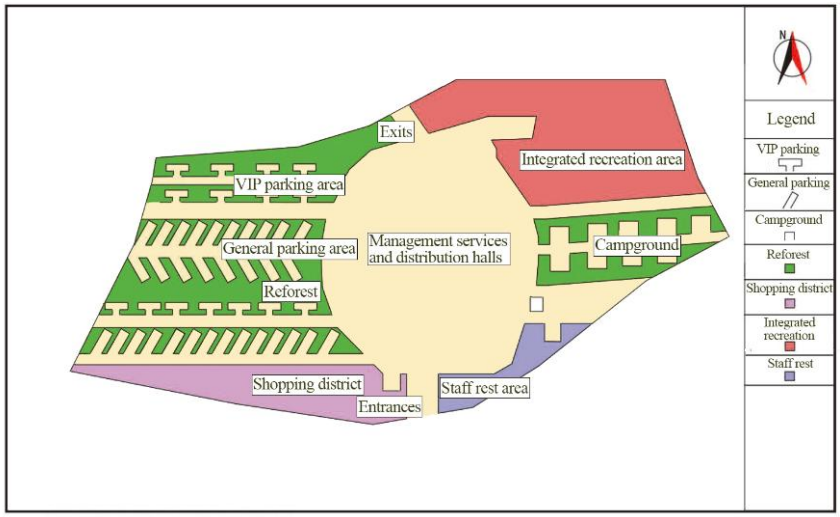

Fig. 2 RV campground planning map in Xueye Lake

4. Summary

The research combines Maslow's Theory and AHP Hierarchy Theory Empowerment to design a comprehensive inner-city RV campground selection system, which consists of two parts: the first section is an in-depth look at the physiological, safety, social, and respect needs of RV owners using Maslow's theory, based on these needs, this paper exhaustively analyzes the key factors affecting the location of RV campgrounds within cities; the second part is to carry out data processing of the selection factors, including the standardized assignment and weighting of the factors, while those factors that can be directly expressed by data are ranked and assigned. For the factors that are difficult to be directly quantified, the relative comparison method is used for ranking and assigning scores, while those factors that can be directly expressed through data are standardized. Finally, the pre-built RV campground in Jinan Xueye Lake Tourism Area is taken as an example of practical case application practice, and finally a set of Xueye Lake campsite selection and planning program is designed.

The RV campground site selection system proposed by the research, with its innovative theoretical application, effectively answers the practical problems of the RV travel industry and provides a set of scientific and systematic methodology for the site selection of RV campgrounds within the city, which ensures the reasonableness of the site selection process and the optimization of the results. In addition, the methodology used in the article stays at the level of subjective analysis, and the RV campground site selection system will be further improved in the future with the help of more advanced analytical tools and more detailed data processing methods.

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