Study On Site Selection of Service Facilities For Tourist Highway Campsites: A Case Study of Songhua Lake Area in Jilin Province

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Abstract. The rapid rise of campsites tourism mode leads to the increasingly obvious problem of site selection for existing tourist highway campsites. According to the characteristics of service facilities of China's tourist highway campsites, this paper adopt the centre-of-gravity method and AHP method to carry out site selection planning. This paper first define the concept of service facilities of tourist highway campsites and summarize the influencing factors and principles of site selection of tourist highway campsites. Then, a simple and effective method combining the centre-of-gravity method and AHP method for site selection of tourist highway campsites is proposed. The primary site selection of campsites is based on the centre-of-gravity method. Finally, taking the Songhua Lake area of Jilin province as an example. This paper calculates the site selection of tourist highway campsites, further validates the feasibility of the site selection method, and provides theoretical support and reference method for the site selection of tourist highway campsites in the future.

1. Introduction
With the rapid development of economy and the continuous improvement of residents' income level, the traditional group following tourism has been unable to meet the current tourism needs of users. With the popularity of private cars, the number of self-driving tourists has increased year by year, which has stimulated the rapid development of campsite tourism, a new type of outdoor leisure tourism, and the emergence of tourism highway campsites. In order to stimulate local economy, support emerging industries, standardize industry market and construction standards, a series of encouraging policies have been issued from the state to the local. The way of campsite tourism has been gradually accepted by the public since it was little known. According to the data in the report on market competition pattern and future development trend of China RV campsite industry in 2018-2024, there are 1273 campsite in 2017, 825 of which have been built and 448 are under construction. According to the planning and statistics of campsite in various provinces and cities, the number of self-driving campsite will exceed 4000 in 2020, and such a large number of campsite construction plans will face a common problem, that is, the location of campsites.

The development of camping culture and outdoor campsite in Europe and America has been very mature, and the research on campsite location has been very perfect. A systematic and complete standard and specification have been formed in the planning and construction of campsite[1], and factors such as
safety and environmental protection are paid great attention to, and many research fields are widely involved. American campsites are mostly located in sunny and warm areas with large population, close to tourist attractions, such as Florida, Arizona and California. In contrast to the current situation in China, the domestic research is still in the initial stage, not forming a systematic and wide-ranging academic research, mostly from the overall perspective, to elaborate the current situation of the development of campsite tourism in China, point out the problems and give counter measures[2–4]. The construction of the existing campsite pursues economic benefits. When introducing the way of campsite tourism, we always use the method of foreign campsite location for reference, which is not suitable for the domestic situation. There is no exact basis and standard for site selection, and the factors considered in site selection are not comprehensive enough. Only qualitative or quantitative analysis can be used to consider unilateral or partial factors for site selection, which can not reasonably solve the problem of site selection.

The purpose of this paper is to explore the ways and methods of campsite location. Firstly, the concept of Tourism Road Campsite is defined and its influencing factors are analysed. Secondly, the focus method and analytic hierarchy process are combined to establish the method of Tourism Road Campsite location. Finally, the case study of the location of Tourism Road campsite around Songhua Lake in Jilin Province is carried out.

2. Concept summary

2.1. Concept of Tourist Road Campsite

According to the understanding of the tourist road campsite in this paper and referring to the relevant literature[5–6], it is defined as follows: taking self-driving tourists as the main body, relying on a certain range of beautiful environment areas along the existing tourist road (divided into waterfront type, forest type, grassland type scenic spot, cultural landscape or natural landscape, etc.), it can provide tourists with accommodation, catering, entertainment, leisure and vacation places with special theme activities.

2.2. Analysis on the factors influencing the location of Tourist Road Campsite

The four conditions of environment, transportation, location and land area should be met in the tourist campsite. Beautiful environment, convenient transportation, superior location conditions and sufficient project land are the necessary conditions for the achievements of the tourist campsite. However, in the specific campsite location, different types of campsites have different emphases on the selection of these conditions. The main factors to be considered in the process of campsite location are four aspects, namely, traffic factors, natural factors, market factors and social factors[7].

2.2.1. Traffic factors. The location of the tourist road campsite is greatly affected by the traffic factors. The campsite is mainly built around the construction of the tourist road, mainly for the service of tourists passing through the tourist road. It is necessary to fully consider the route planning before and after the tourists arrive at the scenic spot through the tourist road for location selection. The convenient and developed transportation of the campsite location is not only conducive to the campsite's own operation, but also to the development of surrounding tourist attractions.

2.2.2. Natural factors. In the process of campsite site selection, we need to rely on beautiful natural scenery, emphasize the superiority of location conditions, the availability of natural resources and the quality of ecological environment. Natural factors are an important factor to attract tourists. Good natural resources can bring high-quality camping experience to tourists.

2.2.3. Market factors. Whether the source market is reliable or not is an important factor in the development of self-driving tourism campsite. The market is not only from the attraction of the campsite itself, but also influenced by the population of surrounding scenic spots and cities.
2.2.4. Social factors. The construction and development of tourist road campsite are closely related to local policies, land use conditions and other social factors. The land cost and operation cost determine the long-term development of the campsite to a large extent, and the security guarantee is the escort for the construction and operation of the campsite.

2.3. Principles of location selection of Tourist Road Campsite
The setting of tourist road campsite should make full use of existing resources, meet the needs of different users, and maximize social and economic benefits[8]. On the premise of fully considering all the influencing factors, this paper summarizes the site selection of the tourist road campsite, and summarizes the principles of site selection as follows:

- The number and composition of service groups should be considered. The distance between the site and the surrounding scenic area and the degree of correlation are the primary factors to be considered in the site selection. The number of tourists attracted by the scenic area is an important reference for the site selection of the campsite.
- Cooperation with the tourism road network should be considered. Taking the accessibility of the tourist road to the campsite into full consideration, the distance between the entrance and exit of the tourist road and the campsite is regarded as a major evaluation standard for the site selection of the campsite.
- Adapt to natural resources and environment. The site selection shall not violate the principle of environmental protection. When the area with beautiful natural conditions and close to the scenic spot is selected, its impact on the natural environment shall be evaluated to avoid environmental damage after the completion of the campsite.
- Rating settings. According to the surrounding development potential, terrain and other factors, the campsite level should be selected, and the local development policy should be fully combined to determine the construction level of the campsite before the site selection planning, so as to avoid the situation that the scale is inconsistent with the demand.

3. Method design
At present, there are three methods for the location of Tourist Road Campsite: qualitative, quantitative and the combination of qualitative and quantitative. Qualitative analysis methods mainly include expert scoring method, fuzzy comprehensive evaluation method[9], etc. these methods are simple and easy to operate and understand, but the subjectivity is strong, the lack of data is easy to lead to large fluctuations in results. The quantitative analysis methods mainly include the centre-of-gravity method[10], genetic algorithm[11], etc. these methods transform the location problem into a mathematical model, and the results are more accurate, but generally need accurate data, and the calculation process is complex, requiring multiple iterations, and the final results may also violate the objective facts. Analytic hierarchy process[12] can simply combine quantitative and qualitative analysis. There are also some site selection methods that combine quantitative and qualitative methods[13-14]. The analysis is relatively comprehensive, but still lack of accuracy.

In order to avoid the defects of qualitative and quantitative analysis, further solve the problems encountered in campsite location, and comprehensively consider various factors affecting the campsite location, first use the centre-of-gravity method to calculate the appropriate location coordinate point and list the available addresses near the centre-of-gravity point as the alternatives; then use the AHP method to make decisions on the alternatives, which can be combined with the AHP method Combined with more reference factors, on the premise that the location accuracy of gravity method is not high, multiple factors are considered to further improve the accuracy. By combining the centre-of-gravity method and AHP method, a simple and easy to understand method with high accuracy is proposed.

3.1. Preliminary site selection of campsite based on gravity method
Gravity method is a commonly used location method. It abstracts the location problem into a mathematical expression, and finds the optimal scheme by solving the mathematical model. Each factor
is regarded as a variable, its importance is regarded as the weight of the object, and the centre-of-gravity of the object system is regarded as the best setting point of the campsite location. The method of determining the centre-of-gravity of the object is used to determine the location of the tourist road campsite.

In the densely distributed area of scenic spots, the traffic of tourist roads is more convenient. Therefore, the primary factor to be considered in the preliminary location of tourist road campsite is still the actual passenger flow of surrounding scenic spots, that is, the number of service groups in the campsite. It will make the location process more concise to incorporate the accessibility of tourist roads into the optimal location steps. Through on-the-spot investigation, the passenger flow Qi of each scenic spot is obtained as the weight reference for site selection. The first step of the gravity method is to establish the coordinate system on the distribution map of scenic spots and determine the coordinates of reference points, as shown in Figure 1. According to the coordinate system, write out the coordinates \((x_i, y_i)\) of each scenic spot entrance.

The model calculation formula of gravity method is as follows:

\[
X_0 = \frac{\sum_{i=1}^{n} m_i x_i}{\sum_{i=1}^{n} m_i} \tag{1}
\]

\[
Y_0 = \frac{\sum_{i=1}^{n} m_i y_i}{\sum_{i=1}^{n} m_i} \tag{2}
\]

In the formula, the initial location coordinates are \((X_0, Y_0)\), the coordinates of each scenic spot are \((x_i, y_i)\), and \(m_i\) is the importance index of each scenic spot after quantitative reduction.

After using the centre-of-gravity method for preliminary location, a preliminary location coordinate point is obtained. Due to the influence of practical factors and large errors, it is necessary to find several suitable alternative coordinate points around the centre-of-gravity coordinate point, specifically select the alternative point method as the centre-of-gravity point, and select three coordinate points with good traffic conditions that allow the construction of campsite as three alternative plans. Next, we need to use AHP method to select the optimal location of the alternative coordinate points.

3.2. Optimal site selection of campsite based on AHP method

AHP, that is, analytic hierarchy process, is a method that decomposes the influencing factors of final decision-making into target level, criterion level and scheme level, and then further analyses them. This method is a hierarchical weight decision analysis method proposed by Professor Saaty, an American operational research scientist.

3.2.1. Building the model of analytic hierarchy process. AHP method needs to build the hierarchical structure of the index system, determine the weight of each evaluation index, and define the hierarchical structure chart as shown in Figure 1 according to the influencing factors of the location selection of the tourist road campsite in Chapter 1.
3.2.2. Building a comparison judgment matrix. The judgment matrix starts from the criterion level, compares two indexes and gives numerical judgment. Using the 1-9 scale method proposed by Saaty, the judgment matrix is written as $P=(a_{ij})_{n \times n}$. Where $a_{ij}$ is the scale of the relative importance of criterion $P_i$ to $P_j$ relative to the total objective $O$. The scale method is shown in Table 1:

Table 1. Relative importance scale method.

| Scale | Meaning                                      |
|-------|----------------------------------------------|
| 1     | Two comparison elements are equally important|
| 3     | One of the two comparison elements is slightly more important than the other |
| 5     | One of the two comparison elements is obviously more important than the other |
| 7     | One of the two comparison elements is intensely more important than the other |
| 9     | One of the two comparison elements is extremely more important than the other |
| 2/4/6/8 | The compromise value between the above adjacent evaluation values |
| Reciprocal | Inverse comparison of two comparison elements, $a_{ij}=1/a_{ji}$, $a_{ii}=1$ |

After being scored by experts, each judgment matrix is determined as follows: The judgment matrix of the first level index is:
The judgment matrix of the secondary indicators is as follows:

\[
P = \begin{bmatrix}
    1 & 2 & 5 & 8 \\
    1/2 & 1 & 2 & 4 \\
    1/5 & 1/2 & 1 & 3 \\
    1/8 & 1/4 & 1/3 & 1 \\
\end{bmatrix}
\]

\[
A = \begin{bmatrix}
    1 & 5 & 3 \\
    1/5 & 1 & 1/3 \\
    1/3 & 3 & 1 \\
\end{bmatrix}
\]

\[
B = \begin{bmatrix}
    1 & 2 & 3 & 5 & 8 \\
    1/2 & 1 & 2 & 3 & 6 \\
    1/3 & 1/2 & 1 & 2 & 5 \\
    1/5 & 1/3 & 1/2 & 1 & 2 \\
    1/8 & 1/6 & 1/5 & 1/2 & 1 \\
\end{bmatrix}
\]

\[
C = \begin{bmatrix}
    1 & 4 \\
    1/4 & 1 \\
\end{bmatrix}
\]

\[
D = \begin{bmatrix}
    1 & 3 \\
    1/3 & 1 \\
\end{bmatrix}
\]

3.2.3. Calculate the weight of each standard and factor. When calculating the weight of each factor according to a certain standard, because the evaluation of each element of the judgment matrix is obtained by the decision-maker through two comparisons according to the mutual importance of each element, it often violates the logical consistency. Because of the complexity of objective things and the preference and diversity of people’s understanding of things, the value of judgment matrix will produce some errors, so it is necessary to carry out consistency test and give the consistency standard. The maximum eigenvalues and corresponding eigenvectors are calculated for each matrix, and then the consistency index \( I_c \), random consistency index \( I_R \) and consistency ratio \( I_{CR} \) are used for consistency test.

The specific steps are as follows:

- Calculate the maximum eigenvector, MATLAB is used to calculate the maximum eigenvectors of the above five matrices for the next step.
- Calculate consistency index \( I_c \).  
  \[
  I_c = \frac{\lambda_{max} - n}{n - 1}
  \]  
  (3)

  Where \( n \) is the order of the matrix. If the calculated \( I_c \) is less than or equal to 0.1, it can be considered that the consistency of the judgment matrix meets the requirements, otherwise the comparison between the two matrices needs to be carried out again.
- Check the table to determine the corresponding average random consistency index \( I_R \).

| Dimension | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-----------|---|---|---|---|---|---|---|
| \( I_R \) | 0.58 | 0.9 | 1.12 | 1.24 | 1.32 | 1.41 | 1.45 |
- Calculate consistency ratio \( I_{CR} \).  
  \[
  I_{CR} = \frac{I_c}{I_R}
  \]  
  (4)

According to the above steps, each judgment matrix is processed and tested for consistency:

- For the location target judgment matrix \( P \), the maximum eigenvalue \( \lambda_{max} = 4.0247 \) is calculated by MATLAB, and the corresponding normalized eigenvector \( \omega = [0.538 \ 0.253 \ 0.130 \ 0.079]^{T} \), \( I_c = 0.0082 \), \( I_{CR} = 0.0091 < 0.1 \), which passes the consistency test.
• For traffic factor judgment matrix A, the maximum eigenvalue $\lambda_{max} = 3.0385$ is calculated by MATLAB, and the corresponding normalized eigenvector $\omega = [0.637, 0.105, 0.258]^T$, $I_c = 0.0193$, $I_{CR} = 0.033 < 0.1$, which passes the consistency test.

• For natural factor judgment matrix B, the maximum eigenvalue $\lambda_{max} = 5.0464$ is calculated by MATLAB, and the corresponding normalized eigenvector $\omega = [0.443, 0.264, 0.165, 0.085, 0.043]^T$, $I_c = 0.0116$, $I_{CR} = 0.01 < 0.1$, which passes the consistency test.

• For market and social factors, there is no need for consistency test. After normalizing the vectors, we get $\omega = [0.8, 0.2]^T$ and $\omega = [0.75, 0.25]^T$ respectively.

3.2.4. Overall arrangement of scheme level. To determine the relative importance of the factors of a certain level to the overall goal of the highest level is the overall arrangement of the levels, which is carried out from the highest level to the lowest level. The sorting results are shown in the Table:

| P | A   | B   | C   | D   | W   | Sorting |
|---|-----|-----|-----|-----|-----|---------|
|   | 0.538| 0.253| 0.130| 0.079|     |         |
| A1| 0.637|     |     |     | 0.3427| 1       |
| A2| 0.105|     |     |     | 0.0565| 7       |
| A3| 0.258|     |     |     | 0.1388| 2       |
| B1|     | 0.443|     |     | 0.1121| 3       |
| B2|     | 0.264|     |     | 0.0668| 5       |
| B3|     | 0.165|     |     | 0.0417| 8       |
| B4|     | 0.085|     |     | 0.0215| 10      |
| B5|     | 0.043|     |     | 0.0109| 12      |
| C1|     |     | 0.8 |     | 0.1040| 4       |
| C2|     |     | 0.2 |     | 0.0260| 9       |
| D1|     |     |     | 0.75 | 0.0593| 6       |
| D2|     |     |     | 0.25 | 0.0198| 11      |

It can be seen from the results in the table that, on the premise of meeting the requirements of surrounding scenic spots, the three most critical factors in the location selection of service facilities in the tourist road campsite are: external traffic, traffic service and the area of construction land. The most optimal location scheme can be selected by applying the above evaluation system.

4. Example analysis

4.1. Brief introduction of leisure tourism complex in Songhua Lake and other places of Jilin City

It is pointed out in the instruction of Jilin province's tourism development master plan (2013-2030) that the principle of "ecology as the core" should be practiced, the symbiotic development of tourism and ecological environment protection should be promoted, the belt and three areas should be planned, and the Songhua River Tourism Belt should be taken as the development axis to drive the development of the East and West wings. Focus on the construction of leisure tourism complex in Songhua Lake, Qingshan and other places in Jilin City, and build the tourism highway axis layout into a high-quality tourism area. Taking the scenic area around Songhua Lake as an example, the site selection, grid coordinate system and key scenic areas are constructed.

4.2. Case location and evaluation

4.2.1. Determination of alternative site selection by gravity method. According to the grid coordinate system, the coordinates of scenic spots around Songhua Lake are written out one by one: Longtan
Mountain Heritage Park A(4,43), Zhuque Mountain National Forest Park B(18,18), Songhua Lake National Scenic Spot C(20,3), Jiaohe Hongye Valley D(93,6). According to the passenger flow of each scenic spot obtained from the survey, the importance index is determined and substituted into the gravity center formula for calculation. The coordinates of the gravity center are P(28.5, 13.6) marked in the figure. In consideration of terrain, traffic and other factors, three alternative coordinate points are selected and recorded as X, Y and Z points.

Figure 2. Preliminary location plan.

4.2.2. Optimal site selection of campsite based on AHP method. According to the evaluation index, each alternative address is scored with five grades of "very good, good, general, poor, and very poor". The score is [10, 8, 6, 4, 2], and the score can be interpolated between them.

- Grade of secondary evaluation index:
  Evaluation matrix $A = \begin{bmatrix} 9 & 7 & 7 \\ 6 & 7 & 8 \\ 1 & 6 & 7 \end{bmatrix}$, the weight of traffic factor evaluation index is calculated as $\omega_{21} = [0.637 \ 0.105 \ 0.258]^T$, and the evaluation vector $R_1 = [8.169 \ 6.742 \ 7.105]$. 

  Evaluation matrix $B = \begin{bmatrix} 8 & 9 & 8 \\ 6 & 8 & 7 \\ 7 & 7 & 9 \end{bmatrix}$, the weight of natural factor evaluation index is calculated as $\omega_{22} = [0.443 \ 0.165 \ 0.085 \ 0.043]^T$, and evaluation vector $R_2 = [7.456 \ 8.315 \ 7.527]$. 

  Evaluation matrix $C = \begin{bmatrix} 6 & 8 & 7 \\ 7 & 7 & 7 \end{bmatrix}$, the weight of market factor evaluation index is calculated as $\omega_{23} = [0.8 \ 0.2]^T$, and the evaluation vector $R_3 = [6.200 \ 7.800 \ 7.000]$. 

  Evaluation matrix $D = \begin{bmatrix} 7 & 8 & 6 \\ 7 & 7 & 8 \end{bmatrix}$, the weight of social factor evaluation index is calculated as $\omega_{24} = [0.75 \ 0.25]^T$, and the evaluation vector $R_4 = [7.000 \ 7.750 \ 6.500]$. 

- First level evaluation index:
  From the results of the second level evaluation indexes, we can get the first level evaluation matrix 
  $P = \begin{bmatrix} 8.169 & 6.742 & 7.105 \\ 7.456 & 8.315 & 7.527 \\ 6.200 & 7.800 & 7.000 \\ 7.000 & 7.800 & 7.000 \end{bmatrix}$, and the weight of the first level indexes is $\omega_1 = [0.538 \ 0.253 \ 0.130 \ 0.079]^T$, and the evaluation vector $R = [7.6403 \ 7.3611 \ 7.1898]$. 

  According to the calculation results of the first level evaluation index, among the three alternative schemes, scheme X has the highest score, which is the most suitable site for the tourist road campsite.
After investigation, it is found that the campsite has been built at point X: "Be Able to Live in Wild Luxury Campsite", which further confirms the feasibility of the site selection method.

5. Conclusion and Discussion

With the improvement of residents' living standards, camping tourism has gradually become the mainstream, and the problem of the location of the tourist road campsite is urgent. In view of the current situation of the existing campsite, this paper proposes a location method which combines the centre-of-gravity method and the analytic hierarchy process, and confirms its feasibility. Compared with the existing research, this paper has some supplements in the following aspects:

- The concept of service facilities in tourist road campsite is defined, which is different from the previous concept of campsite.
- Analyse and summarize the influencing factors and specific site selection principles of the service facilities of the tourist road campsite, and further refine the concept of the tourist road campsite.
- Taking the surrounding area of Songhua Lake tourist attraction in Jilin Province as an example, the feasibility of the method proposed in this paper is further illustrated, which provides a more accurate and convenient method for the location of service facilities in the tourist highway campsite, and provides a reference case for the subsequent location.

The conclusion of this paper has some enlightenment to the location and development of the tourist road campsite. The empirical analysis of this paper shows that the evaluation system of reference traffic factor, natural factor, market factor and social factor can reasonably analyse and evaluate the tourist road campsite, and the evaluation system can be used for scheme selection when the selection of the location scheme is uncertain. Gravity method is a commonly used location method, but the location obtained by its model formula is not accurate enough, and the calculation is complex, which requires multiple iterations. Finally, it may violate the objective facts. Combined with AHP method, it can be combined with more influencing factors for comprehensive consideration to get more realistic location results and further improve the location accuracy.

There are some deficiencies in this study. First of all, the evaluation system contains many subjective factors, and the site selection scheme is affected by the change of scores. Secondly, due to subjective factors, there is a possibility of missing the optimal site selection. In the future, it is necessary to formulate more precise site selection principles. Finally, in the aspect of method selection, this method can be applied to most of the problems of Tourist Road Campsite location, and its applicability to some special cases needs further study.

Acknowledgments

The authors wish to thank the Jilin transportation science and technology project (No. 2019-1-17) for financial support. Furthermore, we are grateful for Harbin Institute of Technology.

References

[1] Bao Lei. Comparative study on the development of car campground between China and the United States[D]. Beijing Sports University,2014.

[2] Zhang Hongrui. Research on the planning and design of campgrounds in scenic spots[D]. Nanjing Forestry University,2017.

[3] Chen Cong. Research on the development of China’s RV camping tourism——taking Hainan Island as an example[D]. Central China Normal University,2013.

[4] Dai Hong, Ding Hua, Gou Qingqing, Li Xiaonan. Spatial structure characteristics and site selection optimization for self-driving camping in Shaanxi Province[J]. China Journal of Highway and Transport, 2018,31(11):205-213.

[5] Wang Huailiang. Posthouse in poetic context——Discussion of the systematic design for Yongning service area environment on Ninghuai freeway[J]. Art & Design,2007,(10):106-107.

[6] Chen Lin, Liu Yungang. The significance of roadside stations in Japan and its implications for rural revitalization of China.[J]. Urban Planning International, 2018,33(02):128-134.
[7] Liu Shuaishuai, Huang Anmin, Wang Ru, Zhong Xiaoli. Analysis of influencing factors for site selection of self-drive tourist campsites[J]. Consume Guide, 2010(04):194-195.

[8] Ding Li. Designing and modeling of urban greenway cross-section and station location[D]. Shan Dong University,2016.

[9] Shen Changhua, Shen Changhu. Application of multi-level fuzzy comprehensive evaluation in logistics center location——Take Yancheng for example[J]. Management & Technology of SME (Under the ten-day), 2012(10):189-190.

[10] Liu Meng, Sun Dongshi. Research on location selection of logistics facilities based on GIS with multiple mindsets[J]. Geospatial Information,2016,14(08):44-46+5.

[11] Wen Xiaozheng, Zhang Jing. Application of genetic algorithm in site selection of fresh food cold chain logistics distribution center[J]. Xi’an University of Posts and Telecommunications,2018,23(06):94-98+106.

[12] Wang Jia. AHP-based location evaluation of Changsha agricultural products logistic park[J]. Logistics Technology,2019,38(06):79-83.

[13] Tang Yunfeng. Location selection and layout of express intelligent cabinet in colleges and universities based on gravity method and analytic hierarchy process[J]. Shandong Science, 2019,32(03):65-72.

[14] Cao Yongfeng, Rong Hongwei, Zhang Kefang, Zhang Chaosheng. Location selection of waste transfer station based on combining gravity method and AHP model[J]. Environmental Science & Technology, 2012,35(06):118-121+129.