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*Retraction*

# Retracted: Measurement of Entropy Evaluation Method and Matter-Element Analysis Model

**Mobile Information Systems**

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This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

## References

[1] D. Liu, "Measurement of Entropy Evaluation Method and Matter-Element Analysis Model," *Mobile Information Systems*, vol. 2022, Article ID 8569381, 9 pages, 2022.

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*Research Article*

# Measurement of Entropy Evaluation Method and Matter-Element Analysis Model

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Tourism carrying capacity means the intensity of tourism activities that can be accommodated by urban tourism. In this study, urban tourism carrying capacity is analyzed from five aspects, namely, tourism resources, tourism security, economic base, social environment and ecological capacity. Harbin City's tourism carrying capacity is measured based on an entropy evaluation method and a matter-element analysis model. In this paper, the five aspects are subdivided, and the entropy method and matter-element analysis model are used to calculate the tourism carrying capacity of Harbin. The calculation results show that from 2010 to 2021, the tourism carrying capacity of Harbin is on the rise. From these indicators, it can be seen that ecological capacity and social environment are the best for tourism carrying capacity development. In terms of tourism resources and tourism security, the preliminary construction effect is obvious, and the tourism carrying capacity increases significantly, but after 2016-2017, there is a significant downward trend. The economic level is growing significantly, and the effect is obvious. It can be seen that the index of economic foundation has been steadily improving and will be at the highest value in five measures in 2021.

## 1. Introduction

"Tourism carrying capacity" refers to the capacity at which tourism resources can be supported in a virtuous circle. It describes the relationship between tourism resources and activities in a region. To ensure the sustainable development of tourism resources and reasonable resource guarantees for tourists, the tourism carrying capacity of an area should be measured [1, 2]. The carrying capacity of tourism resources has been extensively studied in the academic field, and most studies have based their research on certain scenic areas or ecological parks. However, few studies focus on the carrying capacity in urban tourism. Regarding the carrying capacity measurement, the state-space method has been used by Xu et al. [3] to estimate the tourism carrying capacity of the Blue Economic Zone in Shandong Peninsula. Likewise, Li et al. [4] employ the state-space method to measure the carrying capacity of linear cultural heritage. Adopting frequency statistics and the VERP index selection method, Tang et al. [5] have established a carrying capacity evaluation index system for the Yarlung Zangbo Gorge Nature Reserve to estimate its tourism carrying capacity. Xu [6] compared the efficiencies of different methods of measuring the carrying capacity. The methods include a Cannikin Law-based method, a weighted evaluation method, a weighted comprehensive index method, and a state-space method. The results indicate that the Cannikin Law-based method is the most suitable method to measure Jiuzhaigou Valley's tourism carrying capacity. As for the eco-footprint model for sightseeing places, Wang [7] has constructed an ecological carrying capacity model to estimate the tourism carrying capacity in a scenic area used as a case study. Yang et al. [8] combined the entropy evaluation and fuzzy comprehensive evaluation methods to calculate the tourism carrying capacity of Guangxi Province. Zhu [9] used an analytic hierarchy process and the weighted comprehensive evaluation method to measure the eco-tourism carrying capacity of the Heishan Mountain-Stone Forest tourist attraction. Using the DPSIRM concept, Tian et al. [10] have selected a systematic evaluation method to evaluate the tourism carrying capacity

of the Han River Ecological Economic Belt in Hubei Province over the past ten years. Tang et al. [11] conducted a spatial analysis of GIS data and used map making and other techniques to estimate the variation of the tourism carrying capacity of the scenic area.

Currently, Harbin is vigorously developing winter tourism, and the tourism industry has become its main GDP growth index. In the past 10 years, Harbin's tourism has maintained a sequential growth rate of 19% (see Figure 1), but research on the level of Harbin's tourism carrying capacity has been little, which highlights the necessity of this study. There are few studies on urban tourism carrying capacity, and Harbin is in urgent need of scientific measurement of its tourism carrying capacity. Therefore, this study has strong and practical significance. With a unique research perspective and a typical research area, this paper has made an innovation in this regard.

The tourism development of Harbin is estimated and forewarned by the tourism carrying capacity. It can effectively coordinate the development of various tourism elements in Harbin and effectively promote its improvement, boosting the regional economy, which implies the practical significance of this study. The greatest theoretical value of this paper is that it defines the tourism carrying capacity of tourist cities and verifies it based on hypothesis and research, which facilitates the promotion and application of the tourism carrying capacity concept.

In this paper, the index system of the tourism carrying capacity of the snow city has been scientifically developed by referring to the index system development methods of various literatures. The entropy method is used to confirm the weight of relevant indicators, based on which the tourism carrying capacity of Harbin is calculated and analyzed with the matter-element model. The basic data are processed by the entropy method, and the carrying capacity is further analyzed with the matter-element model based on the results.

## 2. Overview of the Research Object

As the provincial capital of Heilongjiang Province, Harbin (45° N) serves as a political, economic, and cultural center of Northeast China. It is also known as a famous historic and cultural city. Endowed with the temperate continental climate, Harbin usually features a long frost period and heavy snowfall. Therefore, it is an important ski resort destination in China. Moreover, as Harbin is geographically close to Russia, tourists heading for Russia often start their journey here. As the foreign travel industry flourishes, Harbin becomes a critical distribution center of Chinese tourists to Russia. Its unique natural environment can be attributed to Harbin's geographical location. Over the years, Harbin has transformed itself into a well-known destination wherein people can stay cool in summer and enjoy snow in winter. Thanks to its unique geographic location and resources, tourism in Harbin has grown rapidly in recent years. As indicated by data from the statistical yearbook of Harbin, the growth rate of its tourist industry remains at 18.9% for the past ten years. Currently, Harbin has 79 Grade-A tourist attractions, including 34 4A-class scenic areas, making up 43% of the total. There are 363 travel agencies and 60 star-grade hotels in Harbin with 58% of the population engaged in the tertiary industry. Therefore, Harbin is equipped with sufficient tourism resources as well as supporting facilities and personnel.

## 3. Index System Development

The measurement of its tourism carrying capacity and the timely adjustment of tourism development planning are both extremely critical to the city's tourist industry. This paper has developed an index system by combining the tourism carrying capacity evaluation indexes presented by Zheng [12] and Luo et al. [13] with the characteristics of Harbin, as shown in Table 1. In addition to tourism resources that play an important role in supporting urban tourism, the social system, economic development, and eco-environment of the scenic spots are also essential factors in ensuring sustainability. For this reason, the eco-environment, the economic environment, the resource environment, and the social environment are incorporated into the proposed primary index system for evaluating the urban tourism carrying capacity of Harbin.

Tourism carrying capacity is calculated to consider comprehensive factors involved in tourism, public services, and economic base, such as health care which has a lot of content; on the basis of summarizing previous reference research, this study of Harbin city tourism carrying capacity is from five aspects to measure: tourism resources, tourism security, economic base, social environment, and ecological capacity [14]. The tourism resources mainly measure tourism-related commercial facilities and urban public infrastructure. Tourism security mainly measures the supply capacity of basic tourism services of cities. Economic basis mainly measures tourism-related industries and local economic conditions. The economic basis mainly depends on the urban tourism industry structure and industrial potential to calculate the urban tourism carrying capacity. The social environment is mainly from the economic capacity and consumption capacity of urban residents to calculate the urban tourism carrying capacity [15]. Ecological capacity mainly measures the city's garbage disposal capacity and green ecological degree and considers the sustainable development capacity of the city and the recovery capacity of tourism damage to the environment (Table 1).

Data used in this study are mainly derived from the *Harbin Statistical Yearbook*. In the dimension of the resource environment, the following data have been collected from the Harbin Statistical Bulletin of National Economy and Social Development: (1) the number of travel agencies, (2) the number of four-star or above hotels, and (3) the number of star-rated hotels. These data are direct indicators of the completeness of resources supporting urban tourism. The popularity of tourism resources is an important index representing the quality of these resources. Higher quality tourism resources also tend to have stronger service ability and greater carrying capacity. Meanwhile, the scale of tourism resources measures the number of Grade A scenic areas of Harbin in the corresponding year, and more such attractions mean that more tourists can be accommodated. Finally, the

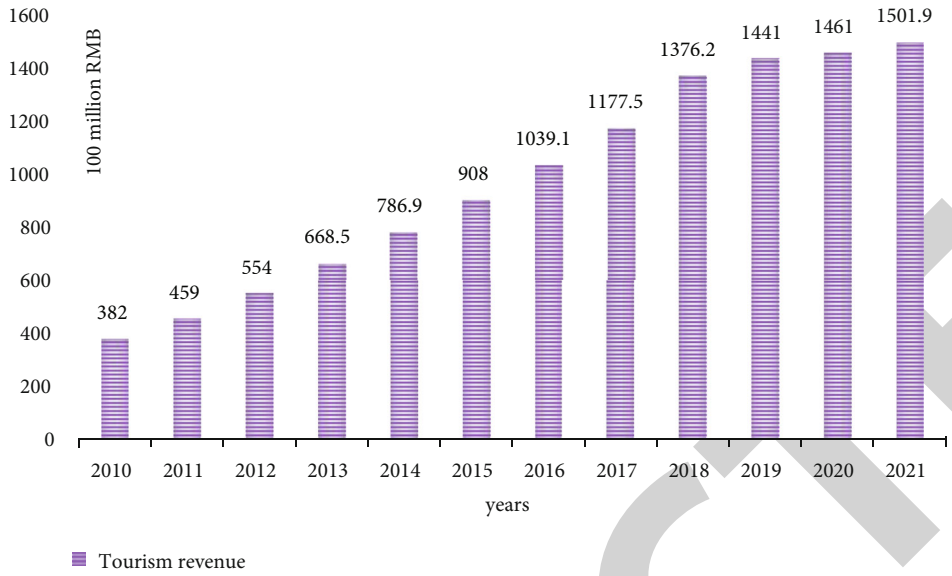


Figure 1: Tourism revenue variations in Harbin from 2010 to 2021(in RMB 100 million).

Table 1: The index system.

| Elements layer | Index layer |
|---|---|
| Ecological capacity | Municipal domestic sewage treatment rate (%) |
| | Hazard-free treatment rate of domestic sewage (%) |
| | Industrial waste treatment rate (%) |
| | Green area per capita ($m^2$) |
| Economic base | Foreign exchange earnings from tourism (USD 10 thousand) |
| | Total tourism revenues (RMB 100 million) |
| | Percentage of total tourism revenues in the annual total output value (%) |
| | Percentage of total tourism revenues in the added value of the tertiary industry (%) |
| | Per capita disposable income (RMB) |
| | Per capita gross regional product (RMB) |
| Tourism resources | Number of travel agencies |
| | Number of four-star hotels or above |
| | Number of star-rated hotels |
| | Grade of tourism resources |
| | Scale of tourism resources |
| | Popularity of tourism resources |
| Travel security | The number of hospital beds available to ten thousand people |
| | Percentage of people in the tertiary industry (%) |
| | Added value of the tertiary industry |
| | Total passenger traffic |
| | Road traffic coverage |
| Social environment | Expenditure of residents on tourism products (RMB) |
| | Disposable income of urban residents (RMB) |
| | Engel's coefficient of urban residents |
| | Floating population |

grade of tourism resources is rated based on the number of 4A-class scenic spots. Eight secondary indexes in the social environment dimension are also proposed based on data derived from the *Harbin Statistical Yearbook*, which are used to evaluate the responses of the sightseeing attractions to tourist demands.

## 4. Empirical Analysis of Harbin's Tourism Carrying Capacity

*4.1. Data Sources.* The research data are primarily collected from the *Harbin Statistical Yearbook*, the *Statistical Yearbook of Heilongjiang Province*, the official website of the Harbin Tourism Bureau, the *Yearbook of China Tourism Statistics*, and various online public databases. Hotels rated four stars and above as well as the star-rated hotels described above are selected according to a list of *Starred Hotels in Harbin* annually issued by the local government [14]. Based on the online statistics, the rating of tourism resources and scale of tourism resources are represented by the number of scenic areas rated 4A-class and above and the number of A-class scenic areas in China, respectively. The popularity degree of tourism resources is obtained based on the mean value of ratings of ranking of tourism cities in different tourism apps. In this paper, the empirical data of Harbin from 2007 to 2018 are selected, and all data used in this paper are valid.

*4.2. Index Weight Determination Based on the Entropy Evaluation Method.* As an important method used to measure uncertainties, the entropy evaluation method has been widely applied for the past few years in calculating index weight with cross-section data [15, 16]. This method features an obvious negative correlation between the information amount of an index and indeterminacy/entropy. In this paper, the entropy evaluation method is used to calculate the dispersion degrees of Harbin's tourism carrying capacity. The lower the information amount of this index is, the greater the influence of this index on evaluation results will be. In other words, a lower information amount of tourism carrying capacity corresponds to a higher index weight. Then, horizontal and longitudinal comparative analyses of the raw data are conducted to determine the corresponding weights. The detailed procedure is elaborated as follows:

(1) A total of 25 indexes are selected from the data between 2007 and 2018 and then used to evaluate Harbin's tourism carrying capacity. Here, $\alpha_{ij}$ represents the value of the $j^{\text{th}}$ index in year $i$ of Harbin. The following decision matrix $Z$ is obtained:

$$Z = \begin{bmatrix} \alpha_{11} & \alpha_{12} & \cdots & \alpha_{1m} \\ \alpha_{21} & \alpha_{22} & \cdots & \alpha_{ij} \\ \vdots & \vdots & \ddots & \vdots \\ \alpha_{n1} & \alpha_{n2} & \cdots & \alpha_{nm} \end{bmatrix}, \quad (1)$$

where $i = 1, 2, \cdots, m$; $j = 1, 2, \cdots, n$; $m$ stands for the number of indexes; and $n$ represents the number of years

(2) The total contribution $B_j$ of each scheme can be obtained:

$$B_j = -K \sum_{i-j}^{m} P_{ij} LN\left(P_{ij}\right), \quad (2)$$

where $P_{ij} = \alpha_{ij} / \sum_{i-j}^{m} \alpha_{ij}$ refers to the contribution degree of the $i^{\text{th}}$ scheme among $j$ attributes and $K = 1/\ln(n)$

(3) Redundancy $C_j$ of the entropy can be expressed as follows:

$$C_j = 1 - B_j \quad (3)$$

(4) Weight $W_j$ of each index is obtained by the following equation:

$$W_j = \frac{C_j}{\sum_{j=1}^{n} C_j}. \quad (4)$$

This paper calculates the tourism carrying capacity of Harbin from five aspects: tourism resources, tourism security, economic basis, social environment, and ecological capacity (Table 2). The results show the following: (1) From the comparison of factors, it can be seen that tourism resources (0.2272) and economic basis (0.2429) have a large weight, indicating that Harbin has rich tourism resources, which is consistent with the situation taken into consideration when choosing the study area in this paper. Harbin can be regarded as a typical tourist city in China. At the same time, Harbin is a provincial capital city with a good economic foundation, so it has certain advantages in providing tourism resources. Ecological capacity (0.1639) at the criterion level has the lowest weight, indicating that Harbin has certain deficiencies in ecological environment construction. The tourism security with the weight in the middle level (0.2012) shows that the overall tourism security capacity of Harbin is fair and has a moderate influence on the tourism carrying capacity. (2) Comparative analysis of indicators shows that the industrial waste treatment rate (0.0624) has the highest weight. It can be seen that Harbin, as a heavy industrial base in China, has outstanding ability in garbage recycling and sustainable development and has certain processing capacity even in the face of high-intensity industrial waste treatment tasks. The second is the Engel coefficient of urban residents (0.0505), indicating that Harbin residents have a high quality of life and can develop long-term and medium-term tourism reception projects. The third place is the proportion of total calculated income in the annual GDP (0.0459). The tourism industry has a positive impact on the tourism carrying capacity of Harbin.

The analysis shows that the economic environment and social environment are the two primary indexes that affect the carrying capacity of Harbin. Firstly, Harbin has a good economic foundation and tourism carrying foundation as

Table 2: Calculated results of index weights.

| Element layer | Weight | Index layer | Weights |
|---|---|---|---|
| Ecological capacity | 0.1639 | Municipal domestic sewage treatment rate (%) | 0.0365 |
| | | Hazard-free treatment rate of domestic sewage (%) | 0.0322 |
| | | Industrial waste treatment rate (%) | 0.0624 |
| | | Green area per capita ($m^2$) | 0.0328 |
| Economic base | 0.2429 | Foreign exchange earnings from tourism (USD 10 thousand) | 0.0377 |
| | | Total tourism revenues (RMB 100 million) | 0.0426 |
| | | Percentage of total tourism revenues in the annual total output value (%) | 0.0459 |
| | | Percentage of total tourism revenues in the added value of the tertiary industry (%) | 0.0418 |
| | | Per capita disposable income (RMB) | 0.0383 |
| | | Per capita gross regional product (RMB) | 0.0366 |
| Tourism resources | 0.2272 | Number of travel agencies | 0.0394 |
| | | Number of four-star hotels or above | 0.0351 |
| | | Number of star-rated hotels | 0.0337 |
| | | Grade of tourism resources | 0.0442 |
| | | Scale of tourism resources | 0.0387 |
| | | Popularity of tourism resources | 0.0361 |
| Travel security | 0.2012 | The number of hospital beds available to ten thousand people | 0.0399 |
| | | Percentage of people in the tertiary industry (%) | 0.0337 |
| | | Added value of the tertiary industry | 0.0393 |
| | | Total passenger traffic | 0.0504 |
| | | Road traffic coverage | 0.0379 |
| Social environment | 0.1648 | Expenditure of residents on tourism products (RMB) | 0.0381 |
| | | Disposable income of urban residents (RMB) | 0.0398 |
| | | Engel's coefficient of urban residents | 0.0505 |
| | | Floating population | 0.0364 |

being the capital city of Heilongjiang Province, so it can explain why the weight index occupies a high proportion [17–19]. Secondly, the fundamental influence to develop tourism is the guidance of human factors while the social environment is the representation of human factors. Whether a city can attract tourists also depends on the local social environment.

*4.3. Measurement of Harbin's Tourism Carrying Capacity Based on the Matter-Element Analysis Model.* The match-element model is a multifactor evaluation method established by Chinese scholar Professor Cai Wen in the early 1980s to solve complex incompatible problems, which can study the extensibility of things and objectively reflect their comprehensive level. The calculation process of the matter-element model is as follows:

(1) The basic element, also matter element, is represented by the name $N$, the feature $F$, and the volume $V$ of the study object. Considering that characteristic indexes of an event have more than one dimension in most cases, $n$ is adopted to represent a special number; in this case, the matter element is referred to as an $n$-dimensional matter-element:

$$P_i = \begin{vmatrix} P & F_1 & X_1 \\ & F_1 & X_1 \\ & \vdots & \vdots \\ & F_1 & X_1 \end{vmatrix} \quad (5)$$

(2) According to the compositions of a matter-element system, the following matter-element analysis model is obtained:

$$P_f = \left(N_f, F_{fi}, V_{fi}\right) = \begin{vmatrix} N_f & F_{f1} & V_{f1} \\ & F_{f2} & V_{f2} \\ & \vdots & \vdots \\ & F_{fn} & V_{fn} \end{vmatrix}, \quad (6)$$

where $V_{fi}$ refers to the measure of $N_f$, that is, the raw data of the $i^{\text{th}}$ index in the $f^{\text{th}}$ subsystem

(3) A classical-domain matter-element matrix $P_{fi}$ is obtained as follows:

$$P_{fi} = \left(N_{fj}, F_{fj}, V_{fj}\right) = \begin{vmatrix} N_{fj} & F_{f1} & \left\langle a_{fj1}, b_{fj1} \right\rangle \\ & F_{f2} & \left\langle a_{fj2}, b_{fj2} \right\rangle \\ & \vdots & \vdots \\ & F_{fn} & \left\langle a_{fjn}, b_{fjn} \right\rangle \end{vmatrix}, \quad (7)$$

where $j = 1, 2, 3 \cdots, n$, $N_{fj}$ represents the $j^{\text{th}}$ order of evaluation for the $f^{\text{th}}$ subsystem, and $F_{f1}$ is the classical domain

(4) A nodal-domain matter-element matrix below is obtained for the $f^{\text{th}}$ subsystem:

$$P_{fi} = \begin{vmatrix} N_{fr} & F_{f1} & V_{r1} \\ & F_{f2} & V_{r2} \\ & \vdots & \vdots \\ & F_{fn} & V_{rn} \end{vmatrix} = \begin{vmatrix} N_{fr} & F_{f1} & \left\langle a_{fr1}, b_{fr1} \right\rangle \\ & F_{f2} & \left\langle a_{fr2}, b_{fr2} \right\rangle \\ & \vdots & \vdots \\ & F_{fn} & \left\langle a_{frn}, b_{frn} \right\rangle \end{vmatrix}, \quad (8)$$

where $P_{fi}$ stands for the nodal-domain matter element, $V_{rn}$ represents a quantity value range of the corresponding feature values, and $r$ refers to the overall grade of the $f^{\text{th}}$ subsystem of the study object.

At present, there is a clear distinction between the early-warning states of the horizontal interval of carrying capacity, as shown in Table 3 [20]. The result of matter-element analysis represents the bearing capacity. As can be observed from this table, a carrying capacity value below 0.4 means poor tourism carrying capacity, that between 0.4 and 0.6 refers to a general state of carrying capacity, and that above 0.6 corresponds to a superior carrying capacity. According to the above calculation process of matter-element model, this paper calculates the tourism carrying capacity of the research area, and the calculation results are shown in Figure 2. It can be seen that the matter-element analysis results of the study area have been rising from 2010 to 2021, and the level of tourism carrying capacity has changed from extremely poor to good. According to the statistical change data of indicators, the total income of tourism keeps growing at an average annual rate of about 30%, and the investment in infrastructure is also increasing year by year, which are the main factors to improve the carrying capacity of tourism. However, from 2010 to 2015, the annual increment of tourist reception was about 5 million, but the change of tourist volume was not obvious, indicating that there is a certain coordination problem between tourism development and infrastructure construction. From 2016 to 2020, the growth of tourism carrying capacity slowed down significantly, and the change between 2019 and 2020 was not obvious, indicating that the development of tourism has encountered a bottleneck. From 2020 to 2021, the tourism carrying capacity increased suddenly and significantly, but there was no significant change in the measurement index data, indicating that the factors influencing the tourism carrying capacity have changed.

Table 3: Carrying capacity prediction levels.

| Matter-element analysis interval | Carrying capacity level |
|---|---|
| [0.00, 0.20] | Inferior |
| [0.20, 0.40] | Low |
| [0.40, 0.60] | Normal |
| [0.60, 0.80] | High |
| [0.80, 1.00] | Superior |

Overall, although the tourism carrying capacity curve of Harbin fluctuates obviously, it can be seen that the overall trend is improving. In order to explain the problems found in the above analysis and further analyze the tourism carrying capacity of Harbin, this paper conducts an in-depth study on the matter-element analysis results of tourism resources, tourism security, economic basis, social environment, and ecological capacity. The results are shown in Figure 3 and Table 4.

(1) *Tourism Resources*. However, thanks to the reform of national tourism management policy, tourism resources in Harbin showed a rapid upward trend from 2010 to 2017. However, the national scenic spot evaluation and construction policy was revised in 2017, resulting in an obvious downward trend from 2017 to 2018. Subsequently, in 2021, the tourism carrying capacity of Harbin City will fall back to the level of 2015, which shows that the tourism attraction and exploitation capacity of Harbin City have problems, leading to the decline of tourism carrying capacity.

(2) *Tourism Security*. (1) After a significant increase in 2012-2013, the curve maintained a steady upward trend. This shows that the construction of tourism security in Harbin has been in a stable state. With the development of tourism industry, the number of tertiary industry employees, passenger transport capacity, and emergency handling capacity have been significantly improved and can maintain a stable state.

(3) *Economic Foundation*. (1) The economic base mainly reflects the level of economic development of a city. The higher the level of urban development, the stronger the ability of a city to meet the needs of tourists at different levels. From the curve fluctuation, it can be seen that the economic development of Harbin city is in an upward trend and the growth rate is obvious from 2010 to 2021. The matter-element analysis result is obvious in the city's economic development, and the trend of tourism

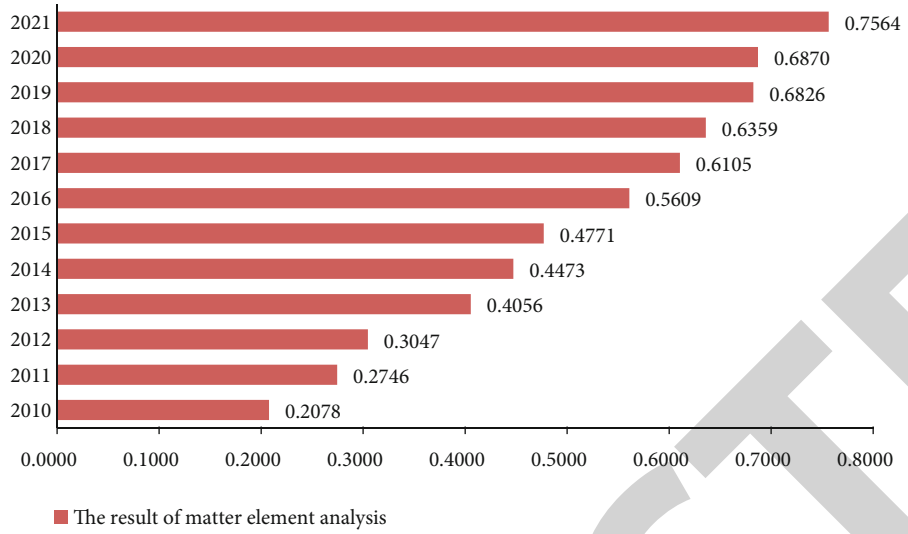


Figure 2: Calculated results of the matter-element analysis.

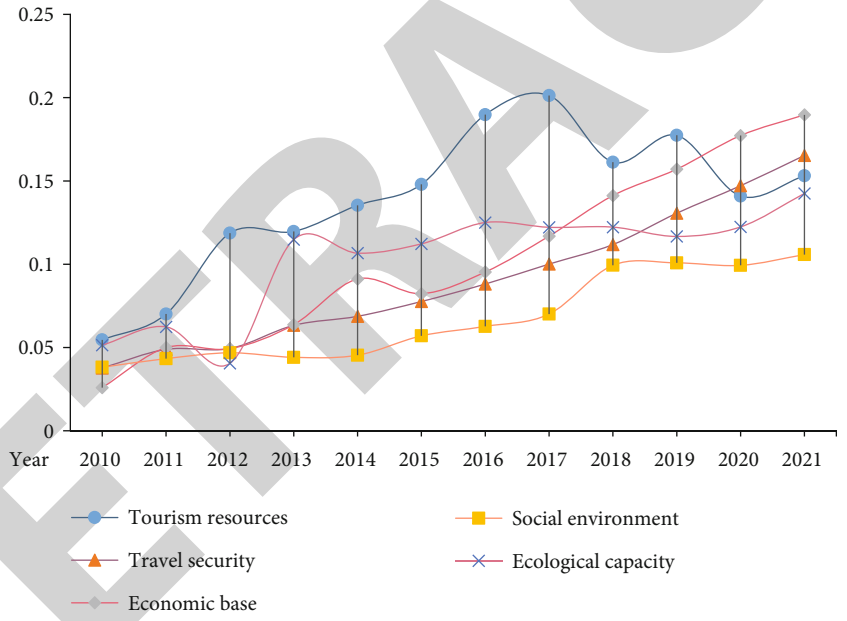


Figure 3: A curve chart for the matter-element analysis results from the different dimensions of Harbin's tourism sector.

Table 4: Matter-element analysis results for different dimensions of Harbin's tourism sector from 2010 to 2021.

| Element layer | Year | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
| Ecological capacity | 0.051 | 0.062 | 0.040 | 0.115 | 0.107 | 0.112 | 0.125 | 0.122 | 0.122 | 0.117 | 0.122 | 0.142 |
| Economic base | 0.026 | 0.050 | 0.049 | 0.064 | 0.091 | 0.082 | 0.095 | 0.117 | 0.141 | 0.157 | 0.177 | 0.190 |
| Tourism resources | 0.055 | 0.070 | 0.119 | 0.120 | 0.135 | 0.148 | 0.190 | 0.201 | 0.161 | 0.177 | 0.141 | 0.153 |
| Travel security | 0.038 | 0.049 | 0.049 | 0.063 | 0.069 | 0.078 | 0.088 | 0.100 | 0.112 | 0.131 | 0.147 | 0.165 |
| Social environment | 0.038 | 0.043 | 0.047 | 0.044 | 0.045 | 0.057 | 0.063 | 0.070 | 0.099 | 0.101 | 0.099 | 0.106 |

carrying capacity has a significant positive correlation, meaning that the higher the level of economic development in Harbin and the stronger the per capita income and consumption capacity and tourism carrying capacity, the better, the same as the statistics showing that the results, economic development, and consumption level are stable, which is good and has great help to the development of tourism carrying capacity.

This results in an insufficient carrying capacity of tourism.

(4) *Social Environment*. It mainly considers the psychological cognition of local residents on the number of tourists, tourism concept, and tourism consumption. After analysis, it is found that, similar to the economic basis, the curve is in an upward trend and the fluctuation is small. Combined with the statistical data, the number of tourists in Harbin is increasing year by year, and the degree of social environment perfection is also increasing year by year with obvious effects, indicating that Harbin is a city with high tourism acceptance and social development [21].

(5) *Ecological Capacity*. As can be seen from the curves, although the increase rate is not as obvious as other curves, it is also an upward trend, indicating that the carrying capacity of tourism ecology is improving. Combined with data analysis, it can also be seen that the recovery capacity of tourism ecology damage is also improving, but it is still at a low level.

## 5. Conclusions and Recommendations

*5.1. Conclusions.* First, the tourism carrying capacity of Harbin will be on the rise from 2010 to 2021. It can be seen from various indicators that the best development of tourism carrying capacity is ecological capacity and social environment, which is in line with the guidance of China's tourism development strategy for Heilongjiang Province that "ice and snow are also gold and silver mountains." Harbin City's investment in tourism ecology and humanistic construction has achieved remarkable results, but it is in the low-end state and has not reached the state of ecological sustainable development.

Second, in terms of tourism resources and tourism security, the preliminary construction effect is obvious, and the tourism carrying capacity increases significantly. However, after 2016-2017, there is an obvious downward trend, indicating that with the increase of the total volume of tourism industry, there is no obvious improvement in quality, and tourism diversity and demand satisfaction have not been well developed. The growth rate of infrastructure, tourism resources, and supporting facilities is relatively slow, which has been unable to meet the tourism needs of tourists in Kazakhstan, that is, the level of tourism carrying capacity. Third the economic level is growing significantly and the effect is obvious. It can be seen that the index of economic foundation has been steadily improving, and it will be at the highest value in five measures in 2021, indicating that the economic construction of Harbin has been significantly improved, thus driving the improvement of tourism carrying capacity.

Based on the above conclusion, it is necessary to measure the tourism carrying capacity to understand the current situation of tourism facilities and find solutions, providing evidence for future policy and measures. Moreover, the determination of the definition of the carrying capacity of urban tourism provides theoretical support for researchers.

*5.2. Recommendations.* Harbin is the economic and political center of Northeast China, and its nickname, Ice City, has become common sense for Chinese people. However, the lack of governance on tourism services made it lag behind other cities. To become a famous tourist city again, the government of Harbin must exert significant efforts in the following aspects.

In terms of economic development, it can be seen from the analysis results that urban economic construction is the core factor promoting the development of tourism carrying capacity and has a great influence. Combining Harbin's tourism strategy and northeast economic revitalization, we can develop diversified tourism models: combining national tourism demand and Harbin's natural geographical advantages, we can build a snow and ice featured tourism model, excavate the city culture, and combine the exotic elements to develop the historical city, combined with urban planning, construction of tourism landmarks, and the development of tourism industry.

Social construction promotes multisubject harmonious coexistence. The construction of Harbin tourism city needs to maintain the integrity of the environmental system; promote the harmonious development of man-land relationship; build an ecological and cultural system with the harmony of man-environment system as the core; promote the coordinated and sustainable development of natural, economic, and social tourism environment in the ice-snow city; and realize the coordination of man-land relationship.

## Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

## Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this paper.

## Acknowledgments

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