Proceedings of the 2nd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/70/20231672

Research on the Quality Development of Qingdao Tourism Based on GIS

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Abstract: With the transformation and upgrading of industrial structure and the increasing development of service industry, tourism is becoming more and more important for the proportion of regional economic development. In recent years, Qingdao tourism develops rapidly, while promoting regional development, tourism chaos appears. For the high quality development of Qingdao tourism, it is very important to think about the existing problems and solve the problems encountered in the development of tourism. This paper will make a gray correlation analysis on various factors affecting the development of Qingdao tourism: resource advantage, infrastructure and market demand, analyze the impact of different factors on the development of Qingdao tourism, and draw a conclusion: The grey correlation degree of the total number of domestic tourists, air and railway passenger volume ranks the top three, indicating that these three factors play an important role in Qingdao's tourism development. The correlation degree between star-rated hotels and tourism development is the least, indicating that their impact on tourism development is not as great as expected. At the same time, combined with climate, policy and other factors, this paper puts forward suggestions for Qingdao's tourism development.

Keywords: GIS, tourism, Qingdao, grey correlation analysis

1. Introduction

1.1. Study the regional background

Qingdao is located in the southeast of Shandong Peninsula, along the northern coast of the Yellow Sea, with a boundary of 35°35 '-37°09' north latitude and 119°30 '-121°00' east longitude. According to the Qingdao Statistical Yearbook, the proportion of the tertiary industry in the city's gross domestic product has risen, and by 2021 it has exceeded half, far surpassing the primary and secondary industries. At the same time, the tourism revenue of Qingdao increased from 68.139 billion yuan in 2011 to 141.1 billion yuan in 2021, accounting for 16.66% of the city's GDP from 10.29% in 2011. Due to the impact of the epidemic, the tourism industry will enter a trough from 2020 to 2022 and will not be considered for the time being. It can be seen that tourism plays an increasingly important role in Qingdao's economic development.

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1.2. Research objectives

With the relaxation and end of the epidemic policy, the tourist population in Qingdao increased sharply in the peak season. In summer, Qingdao is affected by the climate and the concentration of people, resulting in a series of problems: heavy rain in summer, serious waterlogged roads; Hotels and hostels are in short supply, and "sky-high" accommodation affects tourist experience; Problems such as poor sanitary conditions for Internet celebrities. At the same time, Qingdao has the advantages of rapid development of urban public transportation, a large number and diversified types of scenic spots, and significant urban characteristics, which greatly promote the high-quality development of Qingdao tourism. This paper will summarize a variety of indicators, analyze their impact on the development of Qingdao tourism, and put forward suggestions on the problems faced by Qingdao tourism.

1.3. Research Methods

The relevant data of factors affecting the development of Qingdao tourism were collected, and the SPSS analysis platform was used for grey correlation analysis. Grey correlation analysis is a statistical multi-factor analysis method proposed by Professor Deng Julong, which quantitatively analyzes the trend in the dynamic matching process of geometric correlation of the relevant statistical data of the system time series, and calculates the grey correlation degree between the original sequence and each original sequence to determine the correlation degree between different factor [1].The correlation coefficient represents the correlation degree value of the corresponding dimension of the sub-sequence and the parent sequence. The correlation coefficient indicates the strength of the correlation between various factors, and the strength degree order of influencing factors is determined by comparing the size ordering.

2. Index analysis

2.1. Analysis of GDP and tourism revenue

According to Qingdao 2022 Statistical Yearbook, as shown in the figure, Qingdao's GDP increases year by year and will reach 1,413.646 billion yuan by 2021, indicating that the city's economic development is in a good state. In the past ten years, the proportion of tourism revenue in the national GDP has gradually increased and reached a peak in 2019, accounting for 16.66%; It decreased in 2020 due to the impact of the epidemic, and still showed an upward trend after the epidemic was alleviated.

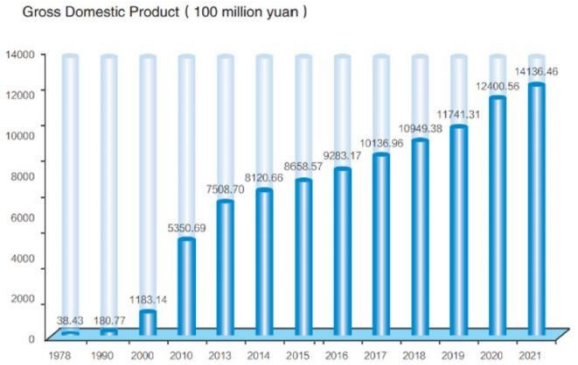

Figure 1: Gross domestic product

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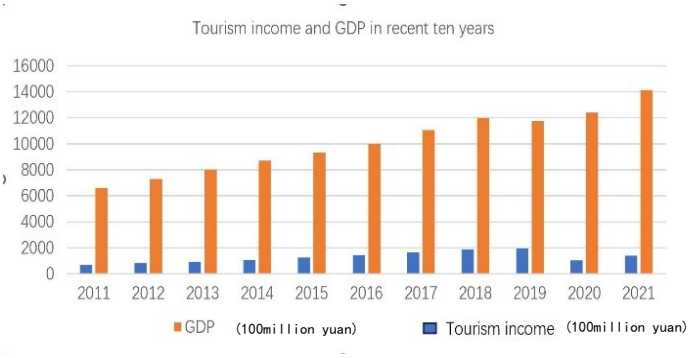

Figure 2: Tourism income and GDP in recent ten years

2.2. Analysis of industrial structure

As can be seen from the figure, the proportion of output value of the tertiary industry in Qingdao's GDP increased significantly from 26.1% in 1978 to 60.8% in 2021, gradually surpassing the secondary industry and occupying the main position.

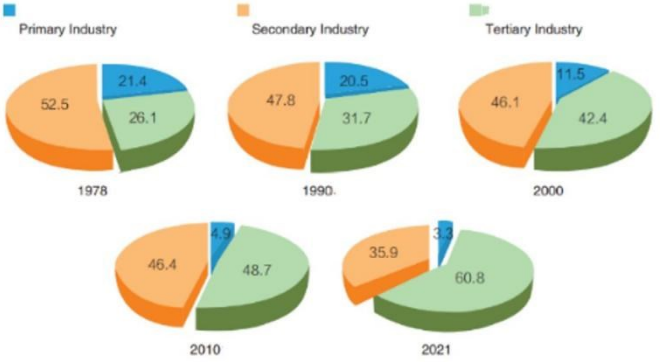

Figure 3: The change of industrial structure in Qingdao

2.3. Analysis of tourism population

In the past 20 years, the number of domestic tourists in Qingdao has steadily increased, from 12.85 million in 2000 to 111.33 million in 2019, and at the same time exceeded 100 million in 2019. The number of inbound tourists increased from 237,500 in 2000 to 1,702,600 in 2019, and exceeded 1.5 million in 2018, showing a steady growth.

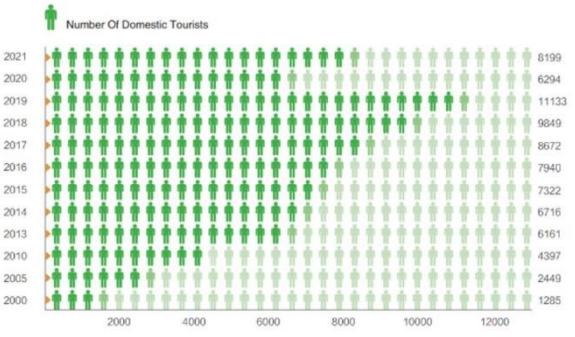

Figure 4: Number of domestic tourists

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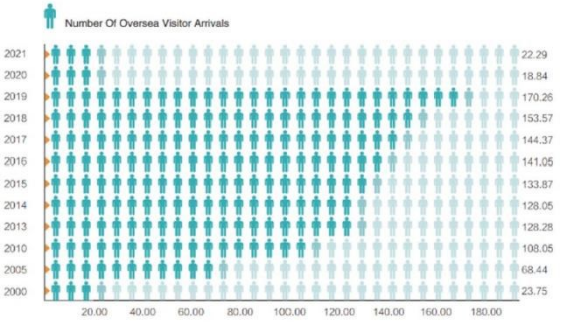

Figure 5: Number Of Oversea Visitor Arrivals

3. Research steps

3.1. Index system construction

The development of Qingdao's tourism economy is affected by many aspects. Following the principles of comprehensiveness, comparability and availability, this paper finds eight factors that can be obtained and may affect Qingdao's tourism income

Table 1: The index system of influencing factors of Qingdao tourism income [2]

First-level index	Secondary indicators
Resource advantage	X1 A Class scenic spot (place)
Infrastructure	Number of X2 travel agents (each)
	X3 star hotels (each)
	X4 Annual air passengers(10 thouand)
	X5 years of rail passengers(10 thouand)
	X6 years of road ridership(10 thouand)
Market demand	X7 Per Capita Disposable Income of urban residents(Yuan)
	X8 Total number of domestic tourists(10 thouand)
Economic benefits	Y Total tourism revenue of Qingdao(100 million yuan)

3.2. Method Model

1) Determine the eature series and the generating series. Compare the sequence as

$$[X'_1\ X'_2 \cdots\ X'_n] = \begin{bmatrix} x'_1(1) & x'_2(1) & \cdots & x'_n(1) \\ x'_1(2) & x'_2(2) & \cdots & x'_n(2) \\ \vdots & \vdots & & \\ x'_1(m) & x'_2(m) & \cdots & x'_n(m) \end{bmatrix}$$

Parent sequence is

$$X'_0 = (x'_0(1), x'_0(2), \cdots, x'_0(m))^T$$

2) Dimensionalization of indicator data. In order to truly reflect the actual situation, eliminate the impact of different indicator units and the disparity between their numerical orders of magnitude, and avoid the occurrence of unreasonable phenomena, it is necessary to carry out dimensional unified processing of indicators.

3) Calculate the correlation coefficient between each comparison sequence and the corresponding element of the reference sequence:

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$$\gamma\left(x_0(k), x_i(k)\right) = \frac{\Delta min + \rho \Delta max}{\Delta_{ik} + \rho \Delta max}$$

$$\Delta min = \min_i \min_k |x_0(k) - x_i(k)|$$

$$\Delta max = \max_i \max_k |x_0(k) - x_i(k)|$$

$$\Delta_{ik} = |x_0(k) - x_i(k)|$$

4) Calculate the weighted average of the association coefficient of each index and the corresponding element of the reference sequence respectively to reflect the association relationship between each control device object and the reference sequence, and call it the correlation degree, which is denoted as:

$$r_{0i} = \frac{1}{m}\sum_{k=1}^{m} W_k \varepsilon_i(k) (i=0,1,2,\ldots,n)$$

5) Analyze the calculation results. According to the size of grey weighted correlation degree, establish the correlation order of each evaluation object. The greater the correlation degree, the greater the importance of the evaluation object to the evaluation criteria.

3.3. Empirical Analysis

The total tourism income of Qingdao is taken as the reference and comparison item of other indicators, and the correlation degree between other indicators and the parent series is studied. In order to further study the influencing factors of Qingdao's tourism development and intuitively show the relationship between each influencing factor and the total tourism revenue, the grey correlation analysis method is used to analyze the influence degree of influencing factors on Qingdao's tourism development. On the basis of relevant studies, this paper combined with the characteristics of Qingdao's tourism development, regional development advantages, etc., based on the principles of comprehensiveness, comparability and operability, selected 9 indicators from two aspects of market demand and infrastructure to build an indicator system.

In this paper, the annual tourism revenue of Qingdao is selected as the reference sequence (parent sequence), and 8 8 impact factors affecting the tourism development of Qingdao are selected as the comparison sequence, and the data of 8 impact factors are collected in 7 moments from 2015 to 2021. In order to meet the comparability of the sequences, the gray correlation coefficients of the 8 impact factors at different times are obtained, as shown in Table 2.

Table 2: Results of correlation coefficients.

	X1	X2	X3	X4	X5	X6	X7	X8
2015	0.6616	0.9849	0.4047	0.8894	0.8409	0.3495	0.9073	0.9517
2016	0.7646	0.8621	0.6438	0.8891	0.8630	0.6275	0.7743	0.9888
2017	0.9725	0.6478	0.8323	0.8954	0.7487	0.9406	0.6495	0.8345
2018	0.6013	0.5415	0.5005	0.8823	0.8733	0.7257	0.5405	0.8044
2019	0.4322	0.5403	0.4401	0.8544	0.5924	0.6167	0.5576	0.9657
2020	0.4674	0.3688	0.5445	0.6808	0.5530	0.5433	0.3699	0.8139
2021	1.0000	0.5813	0.7448	0.6341	0.5415	0.6127	0.4969	0.9159

The gray correlation degree of each factor is calculated and sorted to obtain the influence degree of each factor on the total annual tourism revenue of Qingdao, as shown in Table 3.

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Table 3: Results of correlation degree.

Evaluation items	Relevance	Ranking
X8	0.896	1
X4	0.818	2
X5	0.716	3
X1	0.7	4
X2	0.647	5
X6	0.631	6
X7	0.614	7
X3	0.587	8

4. Conclusions and recommendations

The gray correlation degree of all data is greater than 0.5, indicating that the selected indicators have a high correlation degree to the tourism income of Qingdao, and its impact on the tourism development of Qingdao is significant, indicating that the selection of impact factors is scientific and reasonable.

By calculating the grey correlation degree between each influencing factor and the reference sequence of Qingdao's total tourism income, it is concluded that the order of grey correlation degree between each influencing factor is as follow [3]: total number of domestic tourists > annual air passenger volume > annual railway passenger volume > A-level scenic spots > number of travel agencies > annual highway passenger volume > per capita disposable income of urban residents > star hotels. We can see that:

(1) Market demand: the grey correlation degree of the total number of domestic tourists is 0.896, ranking first [1], indicating that the number of domestic tourists is the main contributor to Qingdao's tourism income. In order to achieve sustainable, healthy and stable development of the tourism industry, we should pay attention to meeting tourists' demand for travel itinerary, develop diversified tourism projects and increase tourism attraction. The grey correlation degree of per capita disposable income of urban residents is 0.614, indicating that the market demand of tourism is closely related to the degree of tourism development. People's life is happy, disposable income increases, travel desire increases, and demand increases. It is necessary to continuously improve the level of local economic development, which is an important way to meet the people's ever-growing needs for a better life and inject vitality into tourism development.

(2) Resource advantage: The grey correlation degree of the number of Alevel scenic spots is 0.7, ranking fourth, indicating that the number of scenic spots is also an important condition affecting the tourism income of Qingdao, indicating that resource endowment will have A positive role in promoting tourism. Qingdao is close to the mountains and the sea with numerous tourism resources, so it should make full use of the favorable coastal conditions to build a first-class coastal city, combine the unique wine culture, optimize the venue and control measures of Qingdao Beer Festival, do a good job in the publicity of the red wine museum, beer museum and other places, build a tourism brand [4], promote the development of cultural industry and the balanced development of natural landscape and cultural landscape. Make full use of Weibo, Douyin, wechat public account, TV advertisement and other platforms to publicize local tourism information, so that tourists can quickly and comprehensively understand the local tourism competitiveness, enhance the tourist willingness, and promote the industrialization and high-quality development of Qingdao's tourism industry.

(3) Infrastructure: The grey correlation degree of air passenger traffic and railway passenger traffic ranks the second and third respectively, and road passenger traffic ranks the sixth, indicating the importance of strengthening infrastructure construction and improving various modes of

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transportation for the development of tourism industry. The grey correlation degree of the number of travel agencies is 0.647, and the grey correlation degree of star hotels is 0.587, and the grey correlation degree ranks fifth and eighth. It shows that the traditional tourism formats such as the number of star-rated hotels and travel agencies have a low degree of influence on tourism development, and "non-star-rated accommodation" such as homestays and inns have become most of the choices for tourism. The public's willingness to travel independently is on the rise. Poor information can be reduced through the development of smart tourism, and the potential needs of users can be inferred by intelligent means, and appropriate tourism products can be promoted [5]. Meanwhile, the local government should reasonably supervise the tourism market, and the relevant departments should timely deal with the phenomenon of "arbitrary charges" and "dirty, messy and bad" during the tourist season. Improve the infrastructure, reduce the rainy season road water; We will do a good job in environmental conservation, create quality services for the tourism industry, and improve the quality of tourism development.

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