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Ecological Approach for the Evaluation of Structure and Sustainability in the Tourism Industry

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Abstract: Badaling is the main tourism area in Beijing. The development of tourism has generated considerable economic benefit in this region, but the tourism industry also brought considerable environmental pressure. To obtain a targeted upgrade plan for metropolitan tourism industry, static and dynamic analysis methods were used to quantitatively estimate the structure of the tourism industry in this region. In addition, the ecological footprint and ecosystem capacity models were used to evaluate the sustainable development of tourism. The results show that: (1) The structure of tourism in Badaling is better than that of Beijing, but the growth rate of tourism earnings is slower than the average value in Beijing. Overall, the region lacks competitiveness and the tourism industry in the area is in dire need of an upgrade; (2) the total ecological footprint due to tourism in the Badaling region is 381,098.28 hm^2, and the ecosystem capacity is 4509.61 hm^2. It is in an obvious ecological deficit, and the development of the tourism industry is unsustainable. To relieve the pressure on the ecology in the Badaling region, we propose four policy suggestions: (1) develop disadvantaged sectors and enhance tourism industry competitiveness, (2) boost tourist transportation revenues relying on the Winter Olympic Games, (3) grow cultural and creative products and expand sales channels, and (4) strengthen inter-regional cooperation and alleviate local ecological pressure.

Keywords: tourism industry structure; ecological footprint; ecosystem capacity; sustainable development; Badaling region

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1. Introduction

The tourism industry is mostly associated with attractive places that are worth visiting, sights to be seen, and sources of entertainment [1]. It is an economic activity with greater potential impacts on sustainable development outcomes [2]. The development of the tourism industry in the Badaling region, Beijing has brought considerable economic benefits, along with considerable environmental pressure. In 1987, the report "Our Common Future" defined sustainable development as "the development that meets present needs without compromising the ability of future generations to meet their own needs" [3]. Sustainable development has been a topic of great concern by academia since it was put forward. It is not limited to environmental protection, but emphasizes the coordinated development of economy, society, and the environment. In April 1995, the "World Conference on Sustainable Tourism" backed by the United Nations Educational, Scientific and Cultural Organization (UNESCO), United Nations Environment Programme (UNEP), and World Tourism Organization (UNWTO) was held. The "Charter for Sustainable Tourism" adopted clearly states that "the essence of sustainable tourism is one that is integrated with natural, cultural and human environments" [4].

It is effectively protecting the resources and environment on which tourism quantitatively analyzes the degree of sustainable development. Many scholars have applied the ecological footprint theory to tourism to explore the sustainability of tourist regions [5–8]. Ecological footprint is a framework to measure how much nature we have and how much nature we use. It is one of the most relevant and widely used methods used in assessing

sustainable development [9–12]. The ecological footprint concept was formally proposed by the Canadian ecological economist William Rees in 1992, and its theory and methodology were refined in 1996 with the assistance of Mathis Wackernagel [13,14]. It quantitatively represents the state of sustainable development in a region by measuring and comparing the profits and losses. Its purpose is to help monitor the progress of sustainable development and implement sustainable development management [15–20]. It has been widely used to evaluate the sustainability of tourism, transportation, projects, products, and industries. Its development provides important references for strengthening ecological and environmental protection [21–25].

It is necessary to push to improve and seek green development of the tourism industry [2,8,15,17,26–31]. Previous studies focused on the aspects of industrial organization structure, market structure, and optimization [19,32–38]. In evaluating the structure of the tourism industry, the most commonly used methods are concentration ratio (CRn), location quotient (LQ), system entropy, diversity index, and shift-share method (SSM) [39–43]. Of these, the SSM is currently a generally applicable method for comparative analysis of regions relative to large-scale reference systems [44–46]. This method regards changes in regional economies as a dynamic process. The changes in the total economic volume of the region in a certain period is broken down into three components, namely, the national growth effect (NS), the industry mix effect (IM), and the regional share effect (RS). People use them to explain the reasons for regional economic development and recession. They also showed the industrial sectors with more competitive advantages and reasonable direction of the future economic development.

To obtain a targeted upgrade plan for metropolitan tourism industry in China, this paper selected the Badaling region, which is the main tourism area in Beijing, to analyze tourism industrial structure from statics and dynamics. In addition, we calculated the sustainable development of tourism industry from the ecological footprint perspective. This research provides references for the optimization of the tourism industry structure in the local area and a method for other cities facing industry structure impartment issues.

2. Study Area

The total area of the Badaling region of Beijing is 59.91 km^2, of which Badaling forest farm accounts for 49% (Figure 1). Its vegetation resources are abundant. There are 549 species of plants and the forest greening rate is over 95%. The region is located in Badaling—Heituo Mountain—Yunmeng Mountain Diversity Center. The Badaling region is rich in tourism resources and has many famous tourist attractions, including the Badaling Great Wall, which is rated as a 5A-level scenic spot.

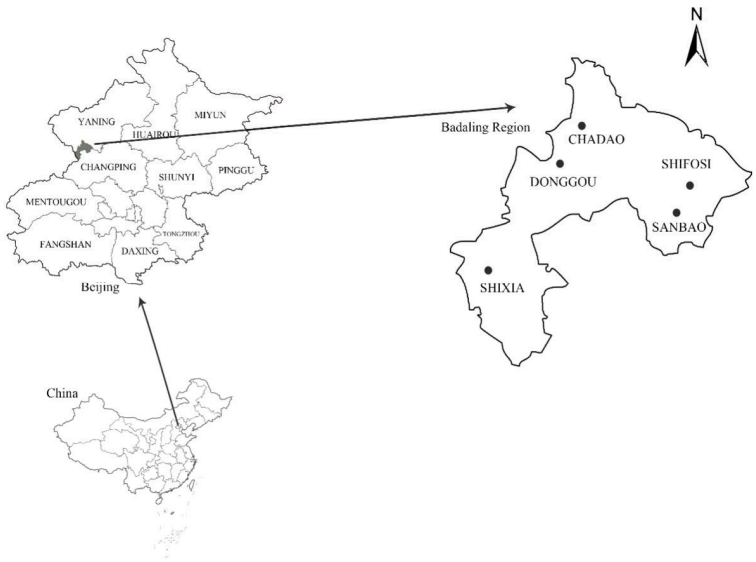

Figure 1. The geographic location of the Badaling region in China.

3. Materials and Methods

3.1. Tourism Industry Structural Model

The study analyzes the tourism industry structure in the Badaling region with the SSM model [47–49]. The competitiveness deviatoric component P reflects the strengths and weaknesses of the tourism in the Badaling region relative to the tourism sector in Beijing: When $P > 0$, it indicates structural superiority in tourism industry in the Badaling region, which is conducive to the growth of the tourism industry in Beijing, and when $P < 0$, it indicates inferior sectoral structure in the tourism industry in the Badaling region, which limits the growth of the tourism industry in Beijing. The structural deviatoric component D reflects the stronger competitiveness of the tourism in the Badaling region: When $D > 0$, it indicates that the income competitiveness of the tourism in the Badaling region is stronger than the competitiveness of the corresponding tourism sector in Beijing, and when $D < 0$, it indicates that the competitiveness of the tourism in the Badaling region is competitively weaker than the corresponding tourism sectors in Beijing. The incremental earnings G refers to the total earnings increase of the tourism in the Badaling region; the advantage component PD reflects the total growth advantage of the tourism in the Badaling region.

3.2. Ecological Footprint of the Tourism Industry

The sustainable development of the tourism industry is evaluated using the ecological footprint model with the following formula [50–52]:

$$TEF = N \times tef = N \sum A_i = N \sum \left(q_j \frac{c_i}{p_i} \right) \quad (1)$$

In the formula, TEF represents the tourism ecological footprint, N represents the number of tourists, tef represents the tourism ecological footprint per capita (hm^2/cap), i is the type of consumer product, A_i represents the area of ecologically productive land per capita that is converted from the i-th type of consumer product (hm^2/person), and c_i represents the per capita consumption of the i-th consumer product (hm^2/person), p_i represents the average productive capacity of the i-th consumer product (kg/hm^2). J is the type of ecological productive land, and q_j represents the equilibrium factor of the i-th type of the land area. In the calculation, the component method is used to divide the tourism activities into six categories: transportation, lodging, foodservice, shopping, sightseeing, and entertainment. The ecological footprint of each tourism activity is calculated separately and added to obtain the total ecological footprint of the tourism industry [15,29].

3.3. Ecological Capacity of the Tourism Industry

Tourism ecological capacity (TEC) refers to the area of ecologically productive land that can provide support for a region's gross national product. The basic formula for TEC is [53–55]:

$$TEC = \sum_{(j = 1, 2, 3, \ldots 6)} q_j \times r_j \times a_j \quad (2)$$

TEC represents the total ecological capacity of tourism, q_j is the equivalence factor, r_j is the yield factor, and a_j is the existing area of the type-j ecologically productive land for tourism. In addition, 12% of the biodiversity and protected area should be factored out when calculating the ecological capacity.

3.4. Sustainable Development of the Tourism Industry

The sustainable status of the development of the tourism industry (ecological surplus or ecological deficit) is the difference between the ecological footprint and the ecological capacity of tourism. When the ecological footprint is greater than the ecological capacity, it is an ecological deficit, indicating that the region is in a state of unsustainable development;

otherwise, it is an ecological surplus, indicating that the region is in a state of sustainable development. The formula is as follows [56]:

$$TED = TEC - TEF \quad (3)$$

In the formula, *TED* represents the ecological deficit or surplus, *TEC* is the ecological capacity, *TEF* is the total ecological footprint of the tourism industry; when $TED > 0$, it is an ecological surplus; when $TED < 0$, it is an ecological deficit.

3.5. Date Set

All the agriculture and industry data come from the Beijing Statistical Yearbook 2017 (beijing.gov.cn) (accessed on 24 November 2021) which is available in 2018. All the tourism data came from Tourism Year Book of Beijing-2017 (cnki.net) (accessed on 24 November 2021). Although all the industry, agriculture, and commercial data in 2020 were updated and available, the tourism data updating for Yanqing (the county Badaling area belongs to) stopped in 2017 because of construction for Winter Olympics 2022 in Beijing.

4. Results

4.1. Tourism Industry Structure in the Badaling Region

4.1.1. Static Tourism Industrial Structure

As we can see from Table 1, the relative growth rate is constantly less than 1. The growth rate from 2015 to 2016 reached 98.45%, which is almost the same as Beijing. The structure effect index fluctuates within a small range of 1, among which the structure effect index from 2013 to 2014 was greater than 1, and the total structural deviation component of the tourism earnings during the year was very large in the Badaling region. The structure effect index from 2015 to 2016 was greater than 1. The competitive effect index is always less than 1.

Table 1. Relative growth rate, structure effect index, and competitive effect index of tourism earnings of the Badaling region.

	2012–2013	2013–2014	2014–2015	2015–2016
Relative growth rate (%)	88.47	92.27	93.29	98.45
Structure effect index	0.98	1.04	0.99	1.03
Competitive effect index	0.90	0.88	0.94	0.96

The relative growth rate indicates that the growth rate of tourism earnings in the Badaling region has always been slower than that of Beijing, but it has an obvious trend of accelerating year by year. The structure effect index of the remaining two years was less than 1, indicating that in these two years, the sectors with slow income growth in the tourism industry accounted for a large proportion in the Badaling region. As a result, the overall tourism industry structure was poor, and the economic structure did not contribute to the economic growth. Although the competitive effect index and the total competitiveness deviation component showed a trend of increasing year by year, the competitiveness was still at a disadvantage compared with the overall tourism industry in Beijing and the level of the tourism industry needs to be improved. The following is an analysis of the six income sectors of the tourism industry in the Badaling region.

4.1.2. Dynamic Tourism Industrial Structure

The share component *N* of the foodservice income, lodging earnings, transportation earnings, sightseeing earnings, and entertainment earnings in the tourism industry in the Badaling region fluctuated little and basically remained at a level slightly above 0 (Figure 2). The competitiveness deviation component *P* of the foodservice income was always greater than 0. The competitiveness deviation component *D* of the foodservice earnings fluctuated sharply. The trends of the preponderance component *PD* and the total earnings growth

G and the competitiveness deviation component *D* were basically the same (Figure 2a), indicating that foodservice earnings are greatly influenced by factors outside the earnings structure. Because the Yanqing District where the Badaling is located is in the suburbs of Beijing, the foodservice venues in the area are mainly farmhouses, and there are no large retailing malls or restaurants, the per capita foodservice expenditure is far lower than the average foodservice consumption level of tourists in Beijing.

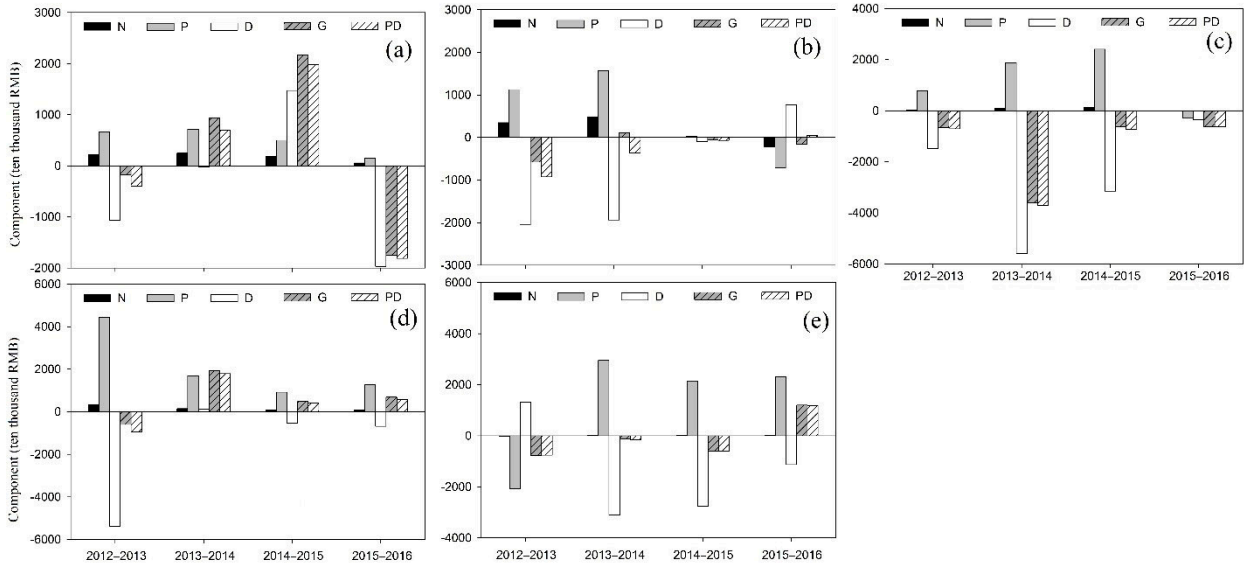

Figure 2. SSM dynamic analysis results of industries. (**a**) foodservice income, (**b**) lodging earnings, (**c**) transportation earnings, (**d**) sightseeing earnings, and (**e**) entertainment earnings.

The structural deviation component *P* of lodging earnings fluctuated significantly, of which the first three years were positive. However, the *P* dropped to a negative value in 2016. The competitiveness deviation component *D* of the lodging earnings continued to increase between 2012 and 2016, and was negative in the first three years. The structural deviation component *P* and the competitiveness deviation component *D* of the lodging earnings changed in reverse and had similar amplitudes, the trends of the preponderance component *PD* and the total earnings growth *G* were flat with no significant fluctuation (Figure 2b). Combining with the present situation in the research area, with the improvement of people's consumption level and higher requirements for lodging, in recent years, many homestays have been opened. Compared with the traditional farmhouses, homestays with fine decoration and a good environment are more favored by tourists, which has increased the competitiveness of the tourism lodging sector in the Badaling region to some extent.

The competitiveness deviation component *P* of transportation earnings continued to rise in the first three years and was greater than 0. In 2016, it decreased to negative but with a small absolute value. The competitiveness deviation component *D* of the transportation earnings was always less than 0, which reached the minimum value in 2014, and continued to increase in the following two years, but remained negative in 2016. The trend of the preponderance component *PD* and the total earnings growth *G* was relatively similar to the competitiveness deviation component *D* (Figure 2c). According to the relevant data, from 2012 to 2016, the number of people riding the suburban railway S2 increased year by year, while the number of people taking buses and taxis has declined. As the fare of the suburban railway S2 is lower, the transportation earnings in the research area decreased year by year. The transportation earnings in the Badaling region were less competitive compared with the urban area which has more diverse ways for tourists to travel and higher transportation costs.

The structural deviation component *P* of sightseeing earnings was always positive. The competitiveness deviation component *D* of the sightseeing earnings increased significantly in 2014, but then slowly declined in the next two years. It only had a small positive value in 2014, while in the other years it was all negative. The trend of the preponderance component *PD* was in the same direction with the total earnings growth *G*, and it changed in the same direction with the competitiveness deviation component *D* (Figure 2d). The structural deviation component *P* of entertainment earnings was negative in 2013, and then rose to a positive value and stabilized. In contrast to the change of the structural deviation component *P*, the competitiveness deviation component *D* of the entertainment earnings was only positive in 2013, and then it decreased to a negative value and slowly increased (Figure 2e). The entertainment earnings in the Badaling region are at a competitive disadvantage compared with the overall level of the tourism entertainment earnings in Beijing.

4.2. Ecological Footprint of Tourism in the Badaling Region

4.2.1. Ecological Footprint of the Foodservice Industry

There are about 40 restaurants of various types in the research area. Based on an average area of 300 m^2, the ecological footprint of this part is 1.236 hm^2. According to the results of the survey in Badaling, the average travel days by tourists in Badaling is 1.97 days. As shown in Table 2, the ecological footprint of the foodservice industry in the Badaling region is 378,819.81 hm^2, with the ecological footprint from grain being the highest, at 164,372.83 hm^2; the ecological footprint of fruits is a close second at 141,962.05 hm^2; the ecological footprint of vegetables is the lowest, and significantly lower than that of grain, fruits, and edible vegetable oils, at 11,995.15 hm^2.

Table 2. Ecologically productive land foodservice industry footprint.

Food	Annual Consumption Per Capita (kg)	Average Productivity (kg/hm^2)	Total Consumption (kg)	Foodservice Footprint (hm^2)
Grain	51.10	21.87	3,490,130.00	164,372.83
Vegetables	62.05	363.91	4,238,015.00	11,995.15
Fruits	29.20	14.47	1,994,360.00	141,962.05
Edible Vegetable oils	7.30	8.49	498,590.00	60,488.54
Total				378,818.57

A suburb of Beijing, Yanqing is positioned as an ecological conservation area in Beijing. The development of Yanqing District must fully consider the needs of ecological construction and thus, transformation and upgrading of agriculture in this area is one of the key programs for the government. A large amount of rural labor force has been transferred from the prime industry to the secondary and tertiary industries. By 2018, the regional GDP of Yanqing District reached 15.18 billion yuan which in 2005 was 4.02 billion yuan. The primary industry increased from 560 million yuan in 2005 to 768 million yuan in 2018, reaching a peak of 1.1 billion yuan in 2013, but gradually stabilized at about 700 million yuan after focusing on the development of rural cooperatives and modern agricultural farms. Stabilizing the development of primary industry is the need of Beijing's back garden and ecological conservation area; and Yanqing reserved vegetable production and decreased other agriculture such as grain and fruit production. Native residents prefer high quality and better flavor fruits from south China and fresh vegetables locally grown. That is the reason for the lower average productivity of grains and fruits than vegetables.

4.2.2. Ecological Footprint of the Lodging Industry

The calculations of the ecological footprint of tourist lodging mainly include the built-up area occupied by providing lodging for tourists and the fossil energy land occupied by the energy consumed by various services provided to tourists. In this study, lodging facilities were divided into two categories, farmhouses and hotels. The bed area of farmhouses

and hotels were calculated as 10 m^2 and 15 m^2, respectively, and the ecological footprint of tourist lodging in the Badaling region is 2.20 hm^2.

4.2.3. Ecological Footprint of Transportation

The built-up area occupied by tourist transportation facilities refers to the area of various types of transportation facilities occupied by tourists, excluding the area occupied by non-tourists. The transportation facilities in the Badaling region mainly include railway stations, bus stations, highways, railways, parking lots, and cableway stations in scenic spots. In the area, there is one railway station, namely, the Badaling Railway Station, which covers an area of about 2000 m^2. There are 75 bus stations, each at 20 m^2. The highways in the Badaling town are about 88.32 km, and the width is calculated according to the average of 12 m in the Yanqing District. The railways in the Badaling town are about 5 km in length and 1.5 m in width. There are about 90 parking lots in the research area, each at 1 hm^2; and the entrances to the Badaling cableway stations are negligible. The tourist occupancy rate is calculated at 76.1%. The sum of the ecological footprint of tourism and background transportation is 147.56 hm^2.

4.2.4. Ecological Footprint of the Sightseeing Industry

This mainly refers to the arable land, grassland, waters, forest land, and built-up area corresponding to the tourist trails, roads, and viewing spaces in various scenic spots. The results show that the total ecological footprint of the sightseeing industry is 2127.47 hm^2. The sightseeing area and ecological footprint of each scenic spot are shown in the Table 3.

Table 3. Tourism sightseeing industry footprint.

Scenic Spot	Sightseeing Area (hm^2)	Land Type	Ecological Footprint (hm^2)
Badaling Great Wall	119.00	Built-up area	122.57
Badaling Water Pass Great Wall	2.50	Built-up area	2.58
Badaling Ancient Great Wall Natural Scenic Area	1.40	Built-up area	1.44
Badaling Wildlife World	400.00	Forest land	240.00
Badaling National Forest Park	2934.80	Forest land	1760.88
Total			2127.47

4.2.5. Ecological Footprint of the Entertainment Industry

The ecological footprint of the entertainment industry mainly considers the total built-up area and energy consumed by providing recreational facilities for tourists, including built-up area, grassland, waters, forest land, and fossil fuel land. The floor area of the large casino of all the full-week cinemas and the Great Wall Museum in the Badaling region are about 0.8 hm^2 and 0.4 hm^2, respectively. The ecological footprint of entertainment can be calculated at 1.236 hm^2.

4.3. Tourism Ecological Capacity in the Badaling Region

The Tourism Ecological Capacity (TEC) of the Badaling region is 4509.61 hm^2. As shown in Table 4, the ecological carrying capacity of the forest land is the highest, which is 2307.76 hm^2; the ecological carrying capacity of the built-up area is followed closely by 2030.22 hm^2; and the ecological carrying capacity of the arable land is the lowest and significantly lower than the forest land and built-up area, at 786.58 hm^2. The total ecological carrying capacity of the above three types of land use is 5124.55 hm^2, minus the 614.95 hm^2 required for biodiversity protection. Finally, the ecological carrying capacity of the Badaling region is 4509.61 hm^2.

Table 4. Tourism ecological carrying capacity.

Land Type	Area (hm^2)	Equilibrium Factor	Yield Factor	Ecological Carrying Capacity (hm^2)
Forest land	4226.67	0.6	0.91	2307.76
Arable land	460.04	1.03	1.66	786.58
Built-up area	1187.40	1.03	1.66	2030.22
Sub-total	5874.11	—	—	5124.55
Biodiversity protection (12%)				614.95
Total				4509.61

The total ecological footprint from tourism in the area of the Badaling region is 381,098.28 hm^2 (Table 5), the ecological carrying capacity is 4509.61 hm^2, the per capita tourist ecological footprint is 0.03438 hm^2, the per capita ecological carrying capacity is 0.00041 hm^2, and the per capita ecological deficit is 0.03397 hm^2.

Table 5. Tourism ecological footprint.

	Foodservice	Lodging	Transportation	Sightseeing	Retailing	Entertainment	Total
Ecological footprint (hm^2)	378,819.81	2.20	147.56	2127.47	0.00	1.24	381,098.28

5. Discussion

5.1. Unsustainability in Tourism Industry

Tourism has become one of the largest industries and has had a high increasing rate in recent decades [57–59]. Such high growth rate in both international and regional tourism also causes environmental issues worldwide. Natural resources can provide support and help to recycle those emissions and wastes from tourism activities while overconsumption and extractions would generate negative impacts on environmental degradation and the ecological footprint.

In regions with low development and human interference, tourism industry can promote ecological footprint. A study in 59 Belt and Road countries showed that financial development, especially from foreign direct investment, increases ecological footprint and the impact of urbanization on ecological footprint is also positive and statistically significant [60], while GDP per capita, international tourism, and ecological footprint have an inverted U-shaped relationship [59,60].

For most countries around the world, the results are just the opposite and tourism industry development conflicts with sustainability. In southeast Asian countries, studies showed from 1995 to 2016 a positive correlation between economic growth, energy consumption, and tourism with the ecological footprint, while natural resources had a negative correlation with the ecological footprint [58]. Similarly, a positive statistically significant relationship between economic growth and non-renewable energy consumption was also reported in Europe Union countries from 1994 to 2017 [15]. A study based on 35 counties' data also showed that international inbound tourists damage the ecological biodiversity by increasing carbon emissions and greenhouse gas emissions [59].

In China, the major challenge of sustainable tourism industry is ecological deficits across the whole country and the demand of calculation results was far greater than the supply. In south China, Hainan Province as an example, the per capita ecological footprint is increasing at an annual rate of 3.87%, and the per capita ecological deficit is increasing at an annual rate of 5.85%. The ecological footprints are mainly composed of cropland and forest land and the account composition is dominated by the biological and energy accounts and the consumption of total natural capital stock is growing at an average annual rate of 4.49%, from a value of 2.97 times the sustainable resource consumption of Hainan Province in 2005, increasing to a factor of 4.81 times in 2016 [57]. In middle China, Shanghai for instance, there was a tourism ecological deficit from 2008 to 2013, with a yearly average

value of 326.28 $\times$ 10^{-4} hm^2, showing that the pressure of the tourism ecosystem was high and that Shanghai tourism was in an unsustainable development state [61].

Beijing faces similar issues in sustainable tourism development. The tourism industry in the Badaling region is in an obvious ecological deficit which is mainly caused by the massive food and beverage consumption. According to our analysis, the lack of ecological carrying capacity is compensated by overconsuming natural capital stock and importing. The ecosystem is under great pressure and the development is imbalanced. Thus, to reduce the ecological footprint of tourism to match sustainable development, we need to consider the reduction of the various components of the footprint.

In order to alleviate the pressure on the ecological environment in the Badaling region, the starting point would be optimizing the structure of tourism industry [15], increasing the ecological carrying capacity, and controlling the ecological footprint to promote the sustainable tourism development [35].

5.2. Optimizing the Tourism Industry Structure

From the analysis of the tourism industry structure, the foodservice and lodging sectors in the tourism industry in the Badaling region have a low degree of professionalism and are much less low competitive than Beijing. The foodservice and lodging places in the Badaling region are mainly farmhouses. Although some high-quality homestays are emerging, the overall operating level is still low and it is not attractive to tourists. It cannot effectively meet the needs of tourists with different consumption levels. Considering the principle of protection first, large commercial districts and high-end hotels should not be built in the area. It is recommended that concerned departments strengthen communication and cooperation with the surrounding residents and provide training to the residents who open farmhouses and homestays to help them change the way they develop and improve their operation and management to better meet the needs of tourists and adapt to the needs of tourism development.

Tourism revenue is greatly influenced by factors outside the earnings structure and natural environmental conditions [62]. In 2022, Beijing and Zhangjiakou will jointly host the Winter Olympic Games which can not only increase the transportation earnings, but also effectively boost the overall tourism revenue in the Badaling region. To this end, relevant management personnel should seize the opportunity to properly conduct characteristic tourism activities on the premise of ensuring the controllable tourist volume.

Tourism is an industry totally dependent on tourism resources [57]. The concept of sustainable tourism development should be firmly established [58,62] and tourism activities carried out based on the principles of respecting, conforming to, and protecting nature [63]. Thus, full play should be given to the potential of tourism to protect the ecological environment and the Badaling Great Wall and gradually develop tourism activities while minimizing the pressure on the local ecological carrying capacity to ensure the sustainable use of tourism resources. Moreover, as is apparent from the calculation of the ecological footprint, the ecological footprint of foodservice in the tourism industry is much higher than that of the other five sectors, resulting in a large ecological deficit. Obviously, relying solely on local ecologically productive land to supply food is far from enough to meet the needs of residents and tourists. With the support of the local government and relevant departments, inter-regional cooperation can be strengthened, and more grain, vegetables, and fruits from other surrounding areas can be procured [64] to transform the foodservice footprint generated by tourists outward, thereby reducing the occupation of local ecologically productive land by various products required for foodservice activities [65].

Tourism development can not only highlight the commonwealth attributes and highlight the infrastructural achievements, but also increase the protection funds of the region and strengthen the driving role of the scenery [15,60]. To provide tourism opportunities in the Badaling region, a social participation mechanism should be emphasized, and volunteer service and social supervision mechanism should be highlighted [66]. The spatial bound-

aries where tourists can reach and move within the area and construct related supporting facilities should be clarified in strict accordance with the management requirements.

5.3. Limitations and the Next Step

The total ecological footprint of the tourism industry was significantly higher than the carrying capacity of the Badaling region, which resulted in an ecological deficit. However, the breakdown of the footprint was unevenly distributed which implies that a significant part of the total ecological footprint of the tourism industry is from food service. Furthermore, the ecological footprint of vegetables is much smaller than that of grains and fruits due to the very high average productivity of vegetables. The low average productivity of grains and fruits increases the value of the total ecological footprint of tourism through food service but the food service and lodging sectors in the tourism industry in the Badaling region have a low degree of professionalism and are much less competitive than Beijing. The sustainability of the tourism industry of the Badaling region can change from ecological deficit to ecological surplus and thus from unsustainable to sustainable if it is possible to reduce the ecological footprint of grains and fruits. However, the mechanism behind the change and how can we achieve such goals remains unclear. Therefore, the reasons for the higher ecological footprint of grains and fruits require more data and further analysis.

6. Conclusions

Ecological footprint and ecosystem capacity models were used to evaluate the sustainable development of tourism. We used shift-share method (SSM) to analyze the structure of the tourism industry in Badaling region. The results showed that the structure of the tourism sectors in Badaling is better than the overall situation in Beijing, but the growth rate of tourism earnings is slower than the average of Beijing. The total ecological footprint due to tourism in Badaling region is 381,098.28 hm^2, and the ecosystem capacity is 4509.61 hm^2. It is in an obvious ecological deficit and the development of the tourism industry is unsustainable [57,58,61]. The commonalities in optimizing the sustainable development of the tourism industry are the desire to seek out several essential factors comprehensively and concertedly in tourism development by looking at the overall issues to achieve long-term sustainable tourism development [15,60,62]. The tourism industry should (1) develop disadvantaged sectors and enhance tourism industry competitiveness, (2) boost tourist transportation revenues relying on the Winter Olympic Games, (3) grow cultural and creative products and expand sales channels, and (4) strengthen inter-regional cooperation and alleviate local ecological pressure.

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