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High Temperatures and Tourism: Findings from China

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Abstract: Climate change and its fluctuations exert significant impacts on the tourism industry, particularly through the influence of high temperatures as typical meteorological and climatic factors on tourists' travel intentions, spatial behavior preferences, and destination choices. This study employs China as a case study to investigate the effects of high-temperature weather on tourism and tourist travel. By analyzing news reports, conducting observations, and examining statistics, an exploratory analysis of tourism in China under high-temperature scenarios reveals several noteworthy findings. Firstly, tourists seeking relief from the summer heat exhibit a preference for short-distance trips and destinations rich in natural resources. Secondly, heat-escape tourism products have gradually transformed over time, evolving from mountain heat escapes in the 1980s to waterfront vacations in the 1990s, artificial water leisure in the 2000s, and ultimately culminating in the development of heat-escape cities in the 2010s. Additionally, this study examines interregional disparities in summer tourism climate amenity across China using the Holiday Climate Index (HCI), the Tourism Climate Index (TCI), and daily data from 775 weather stations. It also provides a summary of the spatiotemporal evolution from 1961 to 2020 within the context of climate change, revealing intriguing findings. Moreover, a case study of Shanghai Disneyland demonstrates the greater significance of the holiday system compared to temperature constraints. This study aims to examine the interaction between high temperatures and China's tourism in the context of climate change, providing a scientific foundation for government agencies and tourism enterprises to develop effective policies and plans.

Keywords: heat-escape tourism; climate change; climate amenity; Holiday Climate Index (HCI); Tourism Climate Index (TCI); Shanghai Disneyland

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1. Introduction

Since the advent of the Second Industrial Revolution, global warming has emerged as an incontrovertible reality [1–3]. As per the sixth assessment report by the Intergovernmental Panel on Climate Change (IPCC), the global average near-surface temperature has risen by approximately 0.99 °C from 1850–1900 to 2001–2020, and it is expected that the cumulative increase will reach 1.5–2 °C by the end of the 21st century [2]. Concurrently with global warming, there has been a discernible escalation in extreme weather and climatic events such as elevated temperatures, droughts, and hurricanes. The National Aeronautics and Space Administration (NASA) has confirmed July 2023 as hottest month on record ever since 1880. Heat has become pervasive worldwide since summer commenced. Europe, Asia, America, and Africa are suffering from rare high-temperature heat waves, and even the northern part of northern Europe in the Arctic Circle has witnessed uncharacteristically

high-temperature weather exceeding 30 °C. China is no exception to this trend as numerous regions have experienced prolonged spells of scorching weather during summer [4,5]. It is anticipated that these exceptionally high temperatures will persist globally over the next four years [2,6].

Since the 1980s, climate change has emerged as a prominent and influential topic impacting the sustainable development of tourism [7,8]. It has had a significant impact on tourism destinations [9,10], tourist motivation [11,12], and seasonal tourism demand [9,13]. The frequent occurrence of extreme high-temperature weather disasters worldwide [2,9] has greatly affected the tourism industry due to its strong dependence and inherent sensitivity to climate change, particularly temperature (e.g., climate environment affects the layout of tourism facilities and climate differences cause seasonal tourism flows), which will have a greater influence [14,15]. Therefore, exploring and understanding the relationship between tourism and high-temperature weather are of great significance in promoting tourism. Global warming has had a wide-ranging and far-reaching impact on tourism, and academic attention in this area continues to rise. Scholars usually analyze the impact of climate change on tourism in terms of resources and facilities [16,17], tourism behavior and tourism flow [13,15], the tourism industry and economy [18,19], and the impacts are pros and cons. Some scholars argue the positive impacts of global warming in various aspects. Global warming may enhance the ecological tourism landscape in certain regions [20], thereby fostering an upsurge in outdoor recreational activities such as sunbathing [21]. It may also extend the summer alpine tourism season [22], optimize and adjust the structure of the tourism industry, and facilitate in launching new tourism projects (such as Arctic cruise tourism) [23]. However, other scholars believe that global warming has brought great disadvantages [7,17], resulting in the reduction and degradation of ecological landscapes such as glaciers and firns [9], beaches and coastal resources [14,24]. This may further lead to declines in tourist visits [21,25], increased costs when visiting scenic spots, and shrinking revenues for the tourism industry [9].

China owns the world's largest heat-escape tourism market.The number of domestic tourist trips in the summer of 2023 exceeded 1.8 billion, generating a tourism revenue of USD 168.52 billion, according to the latest data from the China Tourism Academy. Global warming has a positive or negative impact on tourism, and the rapid increases in air temperature this century result in more frequent and intensified heat waves that can pose dangerous conditions for most summer tourism throughout China [26,27]. As a typical meteorological and climatic factor, high temperature affects tourists' willingness to travel and spatial behavior, as well as changes in the product structure and supply of the tourism industry. In the relevant literature to date, there are some studies that have documented the impact of climate change on summer resources and facilities, summer tourism behavior, and tourism flow [22,28,29]. However, there is almost no study evaluating its future change and associated impact over China's summer tourism, and the current research still lacks rigorous academic exploration. The identification of the interaction between high temperatures and tourism in the Chinese context is beneficial for optimizing destination layouts and aiding tourists in making travel plans. Unveiling changes in climate comfort for tourism can contribute to more informed adaptation decisions within the tourism sector.

Therefore, this study examines the impact and implications of high-temperature weather on China's tourism industry and tourist travel by analyzing news reports, typical observations, and statistics. It also conducts an exploratory analysis of heat-escape tourism in China from three different perspectives. This study comprises five sections. Section 2 explores the market demand for heat-escape tourism from a consumer-oriented standpoint, while analyzing the developmental path of China's heat-escape tourism offerings from a supplier viewpoint. Section 3 provides an analysis encompassing six decades on the historical pattern and trend of summer climate resources for tourism in China. Section 4 studies the elasticity of supply and demand markets from the perspective of tourists, followed by the conclusions and discussion.

2. Heat-Escape Market Demand and Supply

2.1. Market Demand Characteristics

The development of heat-escape tourism has been adopted as a national strategy, with the State Council of the People's Republic of China emphasizing the need to develop heat-escape tourism products and promote the establishment of multiple heat-escape vacation destinations in its guidance for comprehensive tourism development (State Council of the People's Republic of China, 2018). Considering tourists' interest in exploring meteorological and climatic factors, this study investigates how high temperatures influence their travel willingness and spatial behavior.

2.1.1. Tourism Willingness

Recently, there has been a surge in people's willingness to travel, and summer tourism to escape the heat has become increasingly popular [30]. A comparison of the 2023 China Summer Tourism Development Report and 2018 China Heat-Escape Tourism Big Data Report found that the overall willingness of residents to travel in the third quarter increased from 80% in 2018 to 94.6% in 2023, with a high willingness to travel and a further increase in demand in the heat-escape tourism market. Baidu index big data platform shows that the search popularity with summer tourism as the key word is rising this year.

2.1.2. Travel Groups

The three primary market segments for heat-escape tourism, comprising the elderly, students and educators, as well as urban residents from high-temperature cities, collectively account for approximately 300 million individuals who possess a significant potential effective demand for heat-escape tourism (National Summer Tourism Development Report, 2023). Due to the institutional arrangement of winter and summer vacations and the natural, seasonal rhythms, students and teachers become the main force of heat-escape tourism. With the change in the concept of the elderly and the strong national social security system, the number of the elderly who have money and time and are willing to travel is increasing. What's more, summer brings a high incidence of cardiovascular and cerebrovascular diseases in the elderly, and heat escape is especially important for them [31,32]. Residents in traditional high-temperature areas also have a strong demand for heat escape, with a potential market size of more than 100 million people.

2.1.3. Short-Range Orientation for Travel Groups

The short-range orientation of travel groups refers to when tourists' demand for heat-escape tourism is met by tourism products in nearby regions. The cities most favored for heat-escape tourism tend to focus on first-tier cities and second-and third-tier high-temperature cities. In addition, consumers in high-temperature cities create an obvious demand for heat-escape travel. Chongqing, Chengdu, and Hangzhou are the main sources of heat-escape tourists. However, some large provinces have rich heat-escape tourism resources, such as Heilongjiang, which is rich in forest, wetland, and lake resources. Yunnan, which has a spring-like temperature year-round, and Shandong, which has more developed coastal resources. Their main tourists are from within and around the province, mainly traveling short and medium distances, with a short-range orientation.

2.1.4. Resource Orientation for Travel Groups

Pleasant climate in China illustrates a geographical pattern, and most regions in Northwest and Northeast China, as well as North and Southwest China, have favorable heat-escape climate conditions. Tourists also tend to choose these regions as heat-escape destinations. Even in the traditional high-temperature areas, such as the middle and lower reaches of the Yangtze River, there are abundant heat-escape climate resources, such as Lushan Mountain in Jiangxi, Mogan Mountain in Zhejiang, and Tiantangzhai in Anhui. The three core destination regions support the main market for heat-escape tourism in

China: the wetland and forest resources in Northeast China, the coastal resources around the Bohai Sea, and the small town and lake resources in Yunnan.

2.2. The Evolution of Heat-Escape Tourism Supply

Summer resorts are always an important motivation for summer travel. Essentially, escaping the summer heat is the result of human beings adapting to the natural environment at all times. From the Lishan Palace, a place to escape the heat and enjoy some coolness in summer, to the construction of Chengde Mountain Resort and the Summer Palace in Beijing during the Qing Dynasty, summer vacation was enjoyed by emperors, royalty, and nobles of all dynasties, and it has become the main type of vacation for the upper class. People of all classes would stay in the mountain temple to survive the scorching heat. In modern times, foreign missionaries and entrepreneurs built villas on Lushan Mountain, created the Kikungshan resort, etc., each attempting to escape the heat, introducing to China the culture of leisure and vacation found in other regions and developed countries, and creating a heat-escape vacation in both the business community and in society to a certain extent [33]. With the continuous increase in national income, under the cloud of global warming, summer resorts have become an important motivation for summer travel, and heat-escape tourism products are constantly changing with and seeking new development opportunities.

2.2.1. Traditional Heat Escapes

An ancient saying goes, "Escape the cold in winter and the heat in summer". There were two traditional ways to escape the heat: (a) Heat-escape gardens. Ancient gardens can be regarded as a prototype of tourist resorts, as they were often used as places for ancient emperors to escape the heat and deal with government affairs in summer. Chengde Mountain Resort is the largest surviving ancient imperial palace in China, a classical royal garden where the emperors of the Qing Dynasty escaped heat. During the intense heat of summer, the wealthy chose to build villas in the mountains with lush forests for temporary residence. In addition, private gardens, such as those in the south of the Yangtze River, were often places for feasting with one's friends. (b) Heat escapes in the mountain temples. The construction of villas is costly and laborious, and heat-escapers also chose to sojourn in mountain temples, particularly during the Tang Dynasty. On Qixia Mountain in Nanjing and Putuo Mountain in Hangzhou, visitors could take advantage of the shade of the tower to cool off, or climb to the top of the tower to bathe in the breeze.

2.2.2. Modern Heat Escapes

The modern Chinese tourism industry began with the development of summer resorts by Westerners, and the prosperity of Chinese tourist areas in modern China originated from Western people's heat-escaping vacations [33,34]. There are two main types of summer resorts in modern China, mountain and seaside, mainly distributed in the middle and lower reaches of the Yangtze River and in North China [35]. The northern plains of China are hot and dry in summer, so summer recuperation is mostly located at the seashore, in Beidaihe, Qingdao, Yantai, and Weihaiwei. Southern China is sweltering, so most summer retreats are in the mountains, such as the middle and lower reaches of the Yangtze River, including Lushan Mountain, Mogan Mountain, and Kikungshan.

2.2.3. Contemporary Heat-Escape Tourism

In recent years, heat-escape tourism has been proposed as an industry and has received considerable attention. With the rapid economic development and consumption upgrade, coupled with global warming, heat-escape tourism has become a new fashion pursuit and a rigid demand for people. In the context of the national strategy of comprehensive tourism, quality tourism, and the integration of culture and tourism, contemporary heat escapes offer a huge innovation development opportunity and development space. New types of heat-escape tourism products have become popular; in addition to mountain,

forest, and waterfront heat escapes, there are now canyon, rural, and other forms of heat escape, represented by four major sectors: the subaltitude–plateau type in the southwest, the forest–wetland type in the northeast, the coastal–beach type around the Bohai Sea, and the mountain plains–grassland type in the northwest. There seems to be an evolutionary path of "mountain–waterfront–comprehensive" in the development of heat-escape tourism (Figure 1).

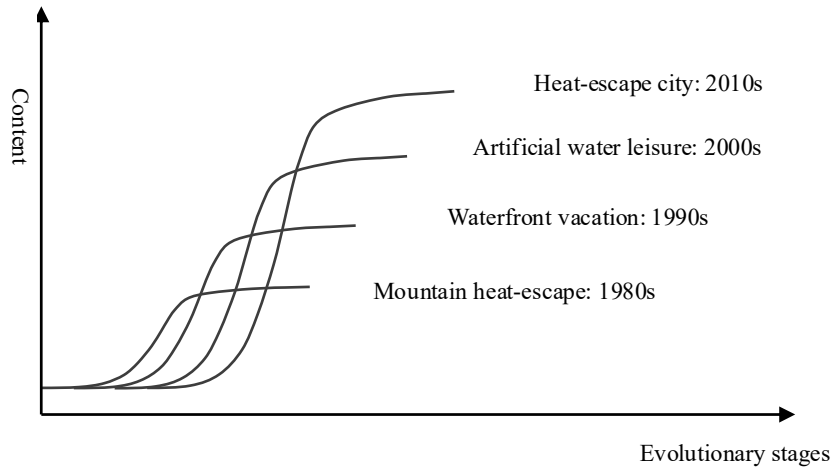

Figure 1. Evolution of Contemporary Heat Escapes in China.

(1) Mountain Heat-Escapes: 1980s

Mountain heat escapes for leisure have a long history. Originally, before the Opium Wars, their main purpose was to live in seclusion, and to visit the mountains and temples. In the 1800s until the founding of the People's Republic of China, there were famous summer resorts such as Lushan Mountain in Jiangxi province, Kikungshan in Henan province, and Mogan Mountain in Zhejiang province and traditional mountain tours, gorgeous villas and other architectural landscapes were added to expand heat-escape activities. Since the founding of the People's Republic of China, there has been the mass leisure and vacation stage, with modern urbanites pursuing rehabilitation and recuperation, fitness and leisure, and sightseeing. Mountain heat escapes developed vigorously after the Reform and Opening Up, and began to decline after the 1990s.

(2) Waterfront Vacations: 1990s

Waterfront tourism destinations are relatively traditional heat-escape resorts, relying on the water environment, including seashores, lakes, rivers, and islands. In the Late Qing Dynasty and Republican China, Western culture spread to China, and seashore resorts began to emerge, such as the Beidaihe Beach Resort in Hebei province. Waterfront tourism has gone through three stages of growth: medical treatment and health recuperation; entertainment and amusement; and complete vacations. From 1992 to 1995, the State Council of the People's Republic of China approved the establishment of twelve national tourist resorts in China. Tourist resorts have become an important concept in the development of the Chinese tourism industry since the 1990s. This is a turning point for the comprehensive development of Chinese tourism products from sightseeing only to a combination of sightseeing and vacation products. Waterfront vacations have ushered in an era of great development.

(3) Artificial Water Leisure: 2000s

Water cultural activities in China can be divided into four stages. First came the swimming pool. The second stage began with the wading pool or the swimming pool/wading pool combination. Then, in the mid-1980s, China began to build some small water playgrounds, including waves, circulation pools, and slides. At this stage, there were few

different types of amusement facilities, they had a small investment scale, and simple planning and design—the prototype of the water park. From the late 1980s to the early 1990s, China began to build medium-sized water parks. In this third stage, the area and investment scale increased significantly, the amusement park projects became more expensive and lucrative, scale and design were emphasized, and environmental art design was integrated. In addition, the water park moved from outdoors to indoors. The fourth stage is large and massive water parks from the early 1990s to 2000. The water park is no longer a single entity, but part of the urban landscape, with amusements, attractions, and environmental art, organically integrated into the modern, massive theme park.

(4) Heat-Escape Cities: 2010s

China has formed the world's largest heat-escape tourism market, with tourists crowding out major domestic heat-escape destinations—especially tourism resort cities with good weather conditions and low temperatures. In the past, domestic tourism was dominated by the "scenic spot tourism" model. With the advent of the national tourism era, it is imperative to transform scenic spot tourism into comprehensive tourism.

3. Mapping Summer Tourism Climate Resources in China

3.1. Data Sources and Methods

3.1.1. Data Sources

The 1961 to 2020 meteorological observation data required for the analysis (daily temperature, daily maximum/minimum temperatures, daily humidity, daily precipitation, daily sunshine, daily wind speed) were obtained from the China National Meteorological Information Center (http://data.cma.cn/, accessed on 1 September 2023.) for 775 National Reference Climatological Stations (NRCS) and National Basic Meteorological Observing Stations (NBMOS). These data were analyzed for understanding the key patterns of temperature change in China following its recent history, capturing the key characteristics including average and maximum temperature, as well as its changing trend.

According to the seasonal definition in the Northern Hemisphere, the summer encompasses the period from the summer solstice, commencing on 21 June, to the autumnal equinox, concluding on 22 September. The summer is widely acknowledged as one of the hottest seasons of the year, characterized by elevated temperatures and extended daylight hours. Consequently, this research article has chosen the summer as the designated period of focus.

3.1.2. Calculating Methods

Mieczkowski (1985) first proposed the specialized "Tourism Climate Index" (TCI), which incorporates climate variables related to thermal comfort, physical factors, and aesthetics in a comprehensive model for evaluating the comfort of tourism climates [36]. It is used to assess the suitability of specific climates for general tourism activities such as sightseeing and shopping. TCI is currently the most widely used comprehensive index for evaluating tourism climate [37–39]. Based on a literature review, Scott et al. (2016) adjusted the weighting and threshold criteria for the meteorological elements in TCI and developed the Holiday Climate Index (HCI) to more accurately assess the climatic suitability of leisure tourism destinations [39,40]. Each of the daily climate variables is rated on an optimal ranging from 0 to 10, based on the thresholds set out by Mieczkowski et al. (1985) [36] and Scott et al. (2016) [40]. The TCI and the HCI takes the following expression:

$$TCI = 4CID + CIA + 2P + 2S + W \quad (1)$$

$$HCI = 4TC + 2A + 3P + W \quad (2)$$

Thermal comfort is represented by CID and CIA, which are combinations of temperature and humidity. Among them, CID is derived from the combination of daily maximum temperature and daily minimum relative humidity, representing the Daytime Comfort In-

dex. CIA is derived from the combination of daily average temperature and daily average relative humidity, representing the Daily Comfort Index. P represents the precipitation. S represents the number of hours of sunshine. W represents the wind speed. TC represents thermal comfort, measured by the Effective Temperature (ET, °C), which is calculated by combining relative humidity and daily maximum temperature.

3.2. Spatial Pattern

China is a region that holds significant sensitivity and influence concerning global climate change. The China Meteorological Administration (CMA) published the Blue Book on Climate Change in China 2021, which emphasizes the continuation of climate system warming and the escalating risks associated with extreme weather and climate events. Notably, extreme high temperatures have exhibited a distinctive pattern characterized by heightened intensity, increased frequency, and prolonged duration (China Meteorological Administration, 2021). In meteorology, "high-temperature days" refer to those when the daily maximum temperatures reach or exceed 35 °C. Historical data indicate that China's summer is becoming increasingly hotter, with predictions from the National Climate Center (2020) pointing towards a substantial rise in occurrences of extreme high temperature events.

The results obtained from the analysis of the Tourism Climate Index (TCI) and the Holiday Climate Index (HCI) in Figure 2a,b reveal a significant disparity in the spatial distribution of tourism climate comfortable degree during summer in China, particularly between the northern and southern regions. Generally, there is an increasing trend of tourism climate comfortable degree with higher latitudes. The average duration of the summer tourism climate comfortable period (TCCP) [41] is 37.8 days. Notably, regions such as the Xinjiang Tarim Basin, central and western areas of Inner Mongolia, and certain parts of Yunnan Province experience a summer TCCP exceeding 80 days, accounting for 85% of the season. Moreover, most northern areas offer a higher level of comfort for summer tourism compared to the national average, thus providing favorable climatic conditions for tourism development during this season. Conversely, due to the influence of subtropical high-pressure systems, the majority of southern regions experience a higher frequency of hot and rainy weather, which leads to noticeably lower TCCP compared to the national average. In summary, areas with high altitude and low latitude generally exhibit a lower level of summer tourism climate amenity.

Analysis reveals that the occurrence of annual average high-temperature days is more prevalent in the southeast region compared to the northwest (with the exception of most parts of Xinjiang). However, high-temperature days are concentrated in the middle and lower reaches of the Yangtze River as well as certain areas in the Xinjiang region (Figure 2c). The middle and lower reaches of the Yangtze River represent focal points for several typical "hot stove" cities during summer in China. Notably, the Turpan Basin in Xinjiang exhibits a significantly higher value (101.2 °F average annual high-temperature days), which can be attributed to natural factors such as elevated local temperature and intense sunshine.

3.3. Evolution Trend

Large-scale continuous high-temperature weather events have been observed in various regions of China, characterized by pronounced extremes, a significant number of consecutive days, extensive spatial coverage, prolonged duration, and elevated minimum temperatures. To examine the changing trends in national summer tourism climate resources, a comparative analysis was conducted by calculating the difference in HCI and TCI scores as well as high-temperature days between two 30-year periods: 1961 to 1990 and 1991 to 2020. This calculation facilitated an investigation into spatially interpolated disparities, offering valuable insights into the dynamic state of summer tourism climate resources nationwide (Figure 3).

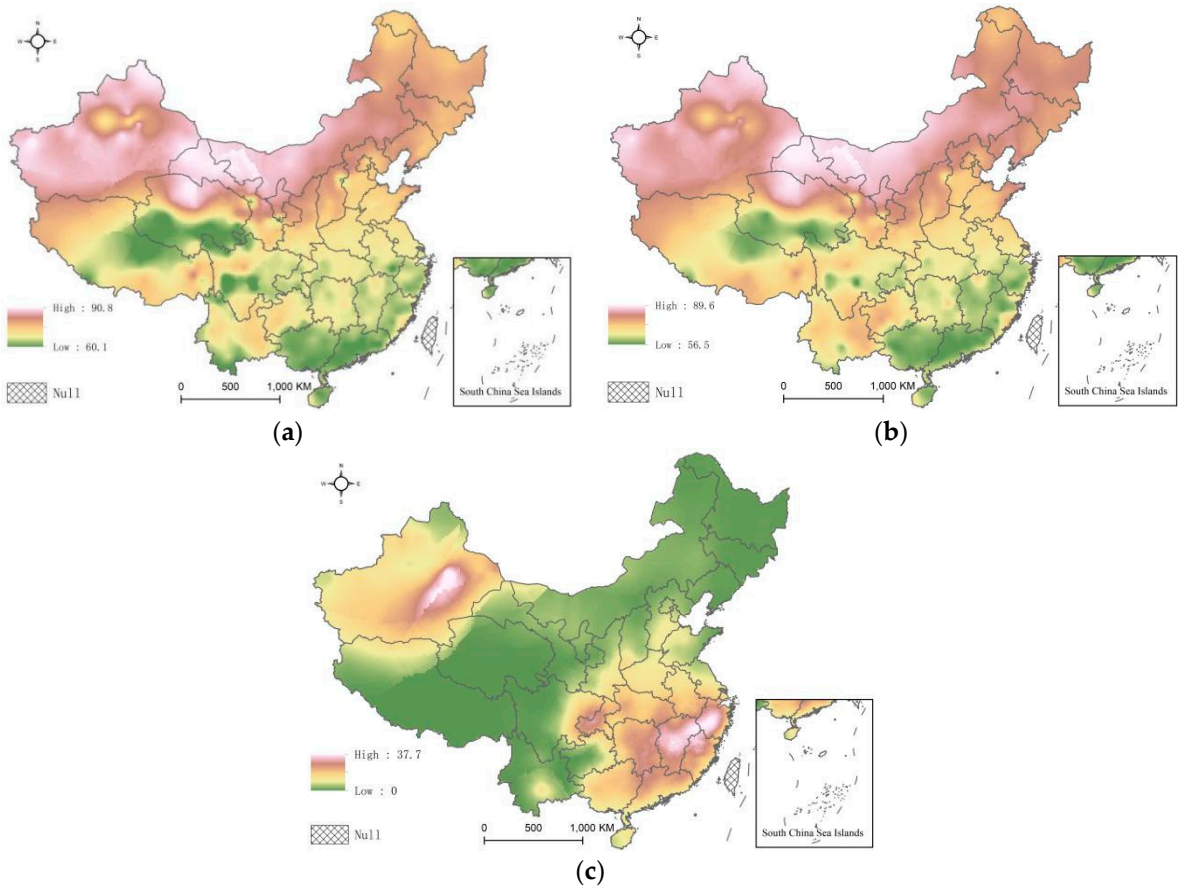

Figure 2. Spatial patterns of national annual average HCI, TCI scores and high-temperature days in China (1991–2020). (**a**) The HCI, (**b**) the TCI, and (**c**) high-temperature days.

The results depicted in Figure 3 indicate the following trends: (a) There has been a widespread decline in the overall summer tourism climate comfortable degree across China, although certain localized regions have experienced an increase. (b) Most areas exhibit a noticeable downward trend, with the southeastern region showing particularly prominent changes. The regions witnessing an increase in summer tourism climate comfortable degree are primarily concentrated in high-latitude areas of China (northern Inner Mongolia and Heilongjiang) and high-altitude locations (first-tier altitude). (c) A majority of the areas located east of the Black River-Tengchong line demonstrate a decrease, with significant declines observed in regions situated east of the "Huhuan Yong Line", including the middle and lower reaches of the Yangtze River and southeastern coastal areas. In contrast, West of the Black River-Tengchong line, areas such as the Xinjiang Tarim Basin (Taklamakan Desert) show a declining trend due to rising temperatures in desert regions and similar locales that significantly reduce summer tourism climate comfortable degree. (d) In the past six decades, China has experienced a significant increase in the average annual frequency of high-temperature days, impacting various regions across the country. This includes the Southeast coastal area, which has witnessed a surge in hot days due to its proximity to the ocean. Higher temperatures and increased humidity levels have necessitated adaptive measures among residents to cope with more frequent heatwaves and mitigate heat-related illnesses. Similarly, the arid Shaanxi–Gansu–Ningxia region has also observed notable changes in climate patterns regarding hot days. Situated in northwestern China with a continental climate characterized by aridity, this area has undergone a discernible shift towards hotter summers, resulting in an overall increase in the average annual count of hot days. Certain parts of Xinjiang and limited precipitation are experiencing an increasing

number of scorching hot days that exacerbate water scarcity issues and pose significant challenges for agriculture reliant on irrigation systems.

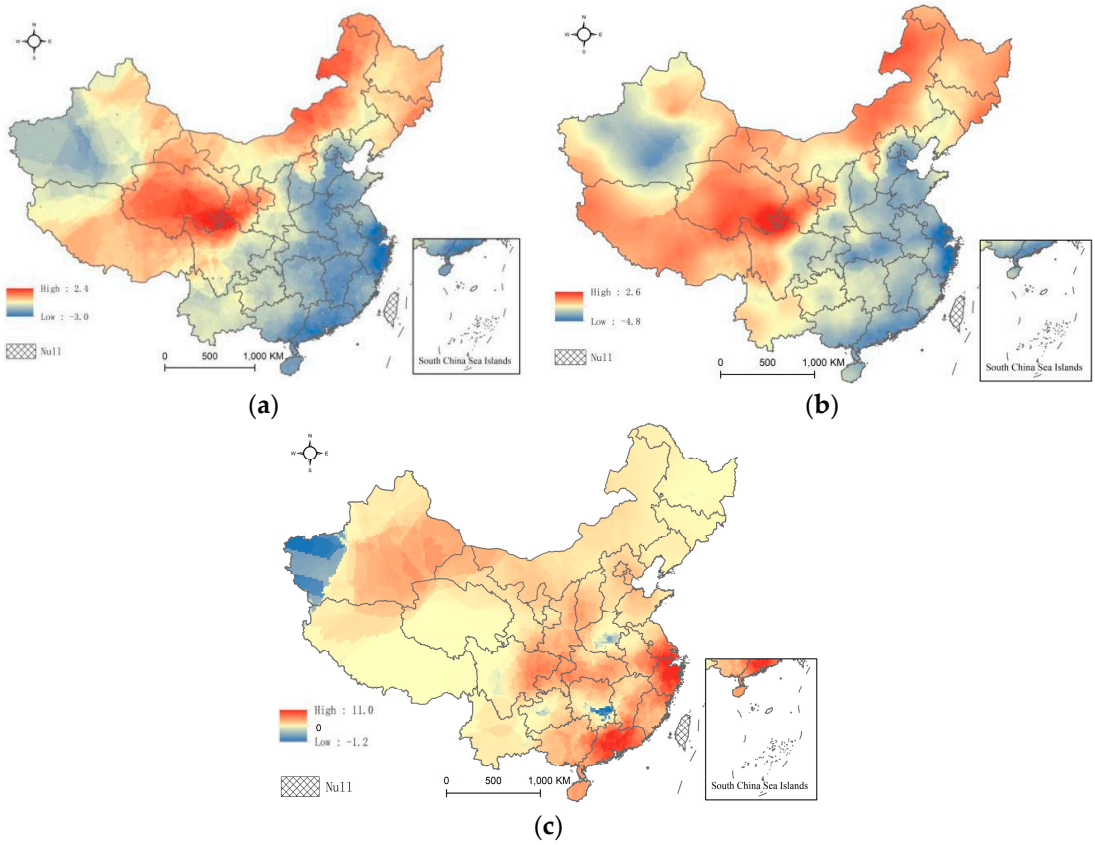

Figure 3. Spatial evolution of the annual average spatial evolution of the annual average HCI, TCI scores and high-temperature days in China during 1961–2020. (**a**) The HCI, (**b**) the TCI, and (**c**) high-temperature days.

4. Case Study: High-Temperature Response of Shanghai Disney Market

The world's largest Disneyland, Shanghai Disneyland, has garnered significant visitor attention since its official inauguration on 16 June 2016. Based on the available data, we have computed the average monthly visitor count to Shanghai Disneyland along with the corresponding average monthly temperature, HCI and TCI scores from April 2017 to March 2018 (Figure 4). The number of visitors exhibits an upward trend during months characterized by higher summer temperatures and lower tourism climate comfortable levels; conversely, it gradually declines as temperatures drop due to families' availability for travel during summers. Notably, a substantial decrease in tourist numbers occurred in September 2017 coinciding with the commencement of the school year. Conversely, there was an increase in tourist influx observed in February 2018 owing to the Spring Festival-China's most distinctive traditional festival. As tourism consumption continues its growth trajectory, traveling during the Spring Festival has progressively become a mainstream choice for tourists. Consequently, holiday schedules exert more influence over China's tourist numbers than temperature fluctuations.

Regarding the impact of temperature on visitor numbers under holiday constraints, a strong correlation has been observed between temperature and tourist numbers in parks. Based on statistical data from July to August 2017 (Figure 5), which includes the daily number of tourists in the park and corresponding temperature values, it is evident that fluctuations in temperature closely correspond with changes in tourist numbers. This finding suggests that high temperatures significantly influence tourist behavior when not constrained by holiday regulations.

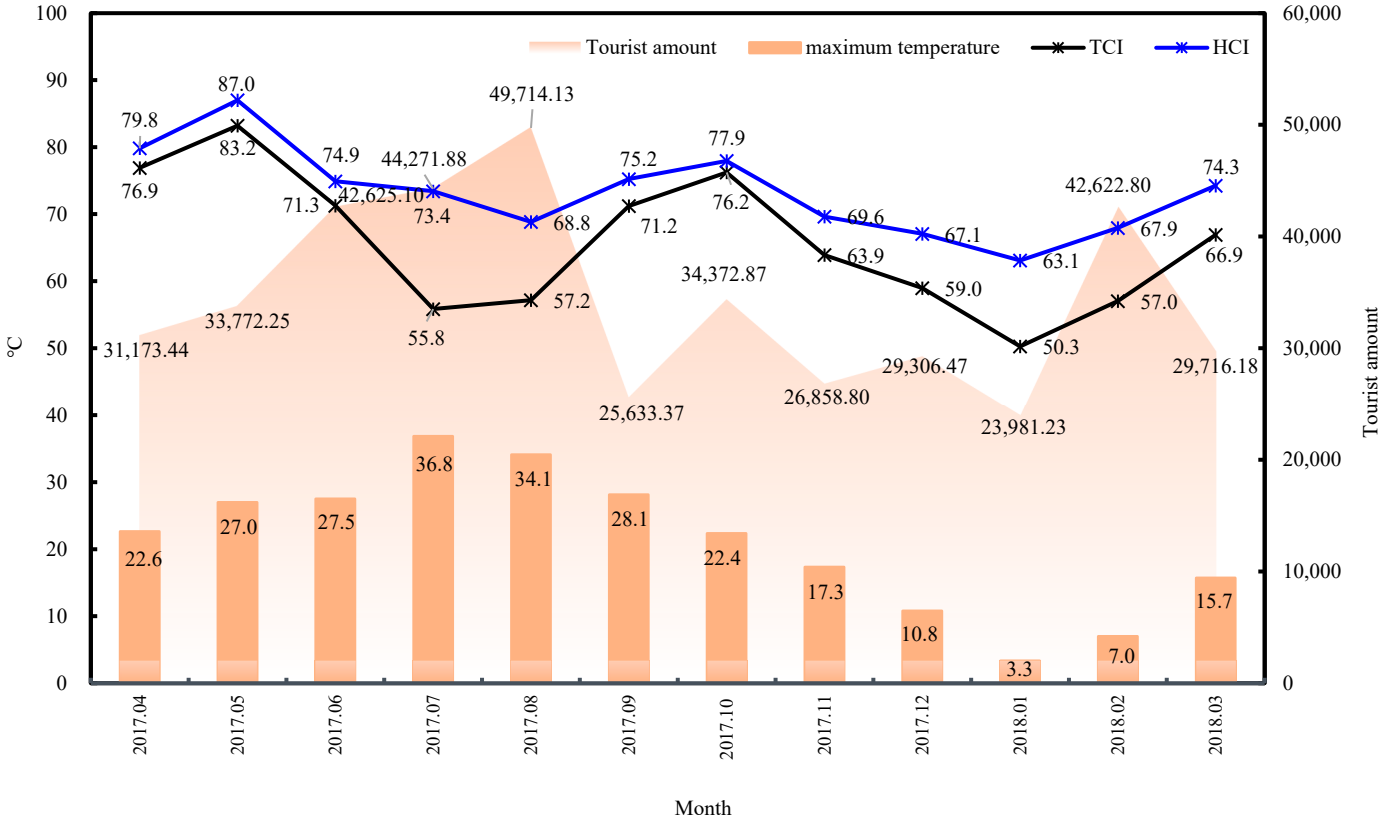

Figure 4. Average monthly number of visitors to Shanghai Disneyland and average monthly temperature changes (April 2017 to March 2018).

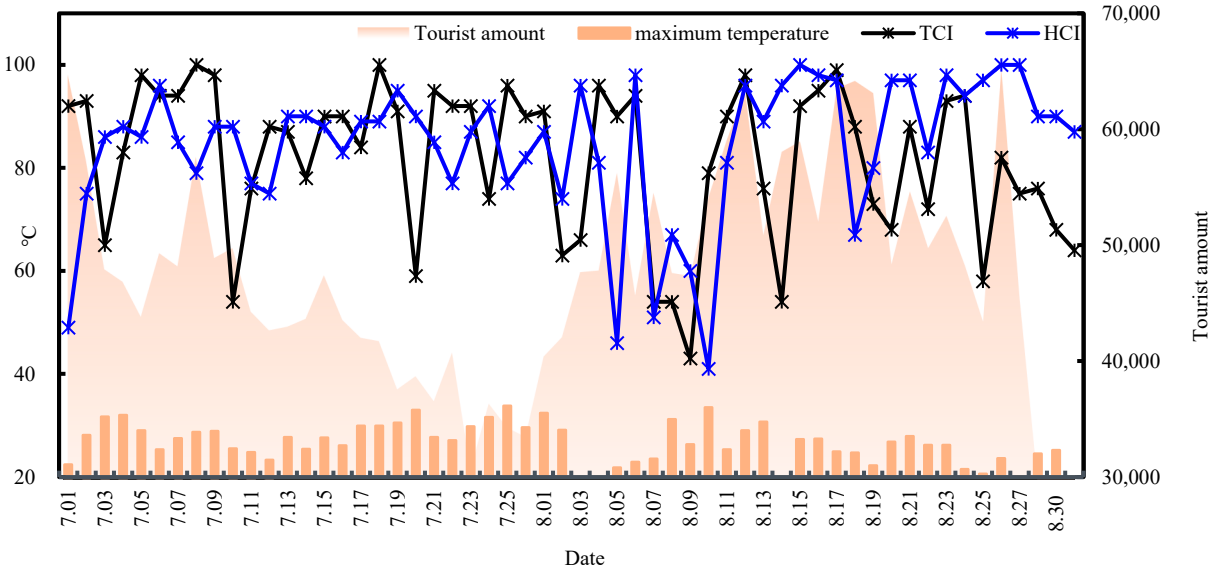

Figure 5. Average daily number of visitors to Shanghai Disneyland and average daily temperature changes (July 2017 to August 2017).

The statistics show that the number of tourists is higher on weekends than on weekdays, with a peak on Saturday. Wednesday is the period with the lowest number of tourists to Disney. It can be observed that holidays strongly influence the weekly pattern. Under the constraints of the holiday, how does temperature impact tourist numbers? On weekdays, from Monday to Friday, there is a clear correlation between temperature and the number of park visitors, with both factors positively related. However, during summer vacation

weekends, tourist numbers are still influenced by the holiday regime, at which point the effect of temperature weakens (Figure 6). Temperature is also less constrained during long holidays in China. The restriction of the holiday system is more significant than that of temperature.

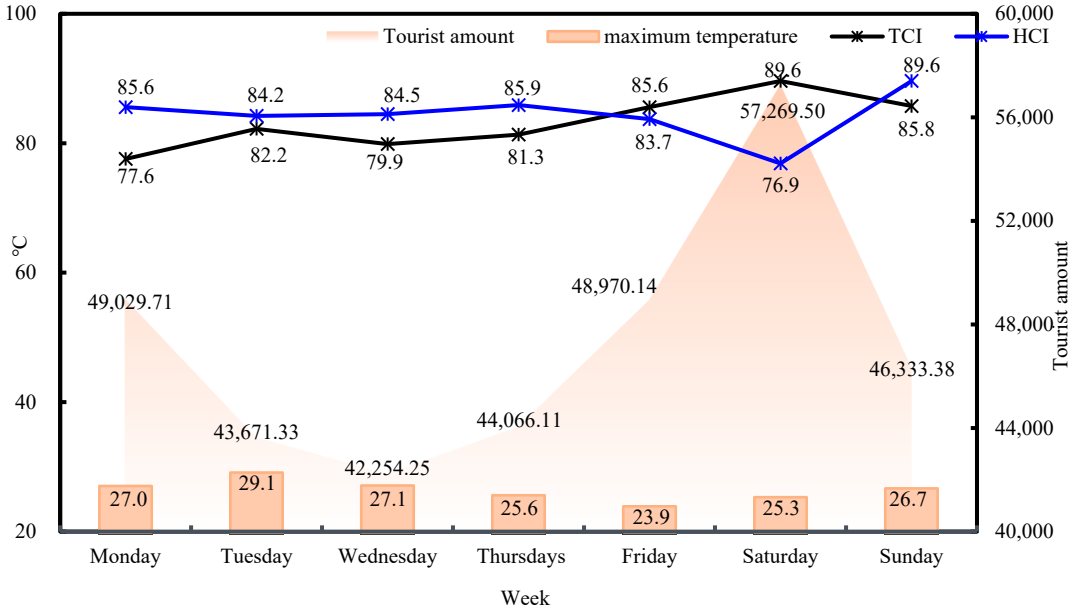

Figure 6. Average number of tourists in Disney on weekdays and weekends during summer vacation (July–August 2017).

The significance of the holiday system outweighs that of temperature constraints. Based on online comments from tourists visiting Shanghai Disneyland, collected by the Customer Evaluation Center-An Affiliate of SAQ (CEC·SAQ), it has been observed that winter and summer vacations are considered as low points in terms of tourist experience. These extended vacation periods are more suitable for family group travel, leading to a surge in visitor numbers. Moreover, winter and summer vacations coincide with frequent occurrences of extreme weather conditions, resulting in compounded negative effects on the overall tourist experience during these periods. Furthermore, long-distance tourists are not significantly influenced by sudden high-temperature weather events when it comes to their pre-booked tourism product choices or the corresponding supply in the market due to limited elasticity.

5. Conclusions

In the past century, there has been a significant global climate change characterized by warming. The tourism industry is profoundly impacted by the climate and its fluctuations, influencing tourists' travel preferences and behavior as well as altering the product structure and supply within the industry. This chapter delves into an analysis of China's tourism situation under high-temperature scenarios, outlining a distinct "relationship between high temperature and tourism" in the Chinese context, ultimately drawing the following conclusions.

(1) In terms of demand, the heat-escape tourism market driven by high summer temperatures generally exhibits a "short-range orientation" and a "resource orientation". High temperature, as a typical meteorological and climatic factor, influences tourists' travel willingness and spatial behavior, with an increasing inclination towards heat escape among tourists. Furthermore, comprehending these travel patterns can assist destination management organizations in formulating sustainable tourism practices that conserve natural resources while simultaneously satisfying tourists' demands.

(2) In terms of supply, pioneer summer tourism products undergo changes over time, following an evolutionary path of "mountain-waterfront-comprehensive". Prior to the 1980s, the forefront was occupied by "mountain heat-escape" products. The 1990s witnessed a surge in the development of "waterfront vacation" products. In the 2000s, there was an increasing trend towards "water creation for leisure" products. Since the 2010s, comprehensive tourism focused on urban heat escape has garnered significant attention. With the advancement of immersive and experiential tours, tourists' demands for tourism products have become more profound, diversified, and personalized. The essence of heat-escape tourism lies in abundant and highly appealing offerings that provide a high-quality service experience in cool and pleasant summer climate resources. This finding underscores the significance of diversifying destinations and developing alternative tourist attractions to cater to evolving travel preferences. Tourism stakeholders can utilize this information to identify emerging destinations and invest in infrastructure and services that meet the changing demands of heat-escape tourists.

(3) Over the past 60 years, the northern regions of China have predominantly experienced an annual average temperature increase, with varying degrees of warming observed in the northeastern part, Inner Mongolia, and the western basin. The occurrence frequency of high-temperature events in China has also undergone changes following global warming and extreme climate events. Notably, there is an increasing trend in extreme high-temperature events across China. In the 21st century, significant warming will persist in China's climate, particularly in the northern areas. Consequently, there will be a substantial rise in the probability of extreme high-temperature events during summer.

(4) The holiday system holds greater significance than temperature constraints. Taking Shanghai Disneyland as an example, the flexibility of the supply and demand market is compromised when it comes to certain tourism products in high-temperature environments, resulting in a substantial decline in experiential quality. However, for long-distance tourists, sudden high-temperature weather does not exert sufficient influence to alter their pre-booked tourism product choices or weaken the corresponding product supply; thus, the market lacks elasticity.

6. Discussion

The summer economy is emerging as a new catalyst for stimulating consumption. Given China's vast territory, each summer resort possesses unique characteristics and conditions, thereby offering differentiated products based on the regional climate. Specifically speaking, significant increases in summer tourism climate amenity have been observed in various regions, both in the high-latitude areas and high-altitude locations of China [39]. In response to these notable increases, it is advisable to adjust local tourism development strategies and optimize the utilization of tourism climate resources facilitated by climate change. Conversely, areas where the increase in summer tourism climate comfortable degree is not significant, particularly those experiencing a decline, should promptly respond by implementing appropriate measures to address the risks associated with climate change. It is crucial to mitigate and alleviate the adverse impacts of climate change. Consequently, one of the primary responsibilities for tourism destination operators lies in providing tourists with accurate information regarding weather and climatic conditions at their chosen destinations to align with their preferences. This enables diverse consumers to select suitable destinations according to their individual circumstances.

The significance of the holiday system extends beyond temperature constraints in tourism, as exemplified by Shanghai Disneyland. High-temperature environments pose challenges to the flexibility of supply and demand in the market, resulting in a decline in experiential quality for specific tourism products. However, long-distance tourists are less susceptible to sudden high temperatures, and their pre-booked choices and corresponding product availability remain unaffected, leading to limited market elasticity. Recommen-

dations include diversifying tourism offerings, implementing weather contingency plans, employing dynamic pricing strategies, ensuring effective communication, and fostering collaboration with stakeholders. These measures enhance market adaptability and uphold visitor satisfaction. Furthermore, this finding underscores the significance of diversifying destinations and developing alternative tourist attractions to cater to evolving travel preferences. Tourism stakeholders can utilize this information to identify emerging destinations and invest in infrastructure and services that meet the changing demands of heat-escape tourists.

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