Creating natural climate resources and tourist landscapes on Shengsi islands in China

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Abstract. Shengsi County is located in Zhoushan City of Zhejiang Province at the junction of the Yangtze River estuary and Hangzhou Bay, which is known as an island county or the Shengsi Islands. The east side of the islands is surrounded by the sea, the south and west sides are facing Mount Putuo - a Buddhist resort - and Jinshanwei in Shanghai, and the north side of the islands are connected to the Yellow Sea. The islands, known as the only way of international access to the Yangtze River and Wusong from the ocean. The Shengsi Islands are made up of 404 islands, 16 of which are inhabited. The total area of the islands is 8,824 square kilometers. The Shengsi Islands, also known as a fairy mountain, are the only state-level scenic spot in China. There are reefs, rocks, nice beaches and precipitous cliffs distributed on the islands. The paper considers tourism resources of the Shengsi Islands, the elements of natural climate resources, tourist landscapes and reveals the present situation of tourism development of the islands. The purpose of this article is to discuss how to promote the sustainable development of tourism on the Shengsi Islands.

1. Tourism resources of the Shengsi Islands in China

The Shengsi Islands are located in the northwest of Dinghai district in Xinchang County - the secondary tectonic unit of South China’s fold system. The islands are the exposed portions of the Tiantai Mountain range in Zhejiang Province [1]. Tourists can enjoy the sceneries of crags, cliffs, peculiar peaks, grotesque stones, caves, mountains and cliffs on the Shengsi Islands. The cliffs stand upright about tens of meters and stretch for many miles. The typical spherical weathering granite geomorphology is formed by those marvelous landscapes.

According to the national standard, there are 8 main classes, 31 subclasses and 155 basic types of the aspects related to tourism resources [2]. The tourism resources of the Shengsi Islands include about 7 main classes, 17 subclasses and 36 basic types referring to the above contents. Their respective coverage rates are 87.5%, 54.84% and 23.23%. The coverage rates of fundamental resource types are shown in Table [3]. There are 104 physiographic landscapes, 10 water area landscapes, 4 astronomical phenomena and climatic landscapes, 8 relics, 65 buildings and facilities, 17 travelling commodities and 18 human activities on the islands. Their respective coverage rates are 281.09%, 66.67%, 50%, 11.27%, 550%, 34.7% and 112.5%. It is noteworthy that there are no biological landscapes on the islands.
Table 1. The coverage rates of fundamental types of tourism resources.

| Fundamental types           | Physiographic Landscape | Water area landscape | Biological landscape | Astronomic phenomena and climatic landscape | Site and relic | Building and facilities | Traveling commodity | Human activities |
|-----------------------------|-------------------------|----------------------|----------------------|---------------------------------------------|---------------|------------------------|-----------------------|-------------------|
| National standard           | 37                      | 15                   | 11                   | 8                                           | 71            | 12                     | 49                    | 16                |
| Shengsi Islands             | 104                     | 10                   | 0                    | 4                                           | 8             | 66                     | 17                    | 18                |
| Coverage rate(%)            | 281.09%                 | 66.67%               | 0%                   | 50.00%                                      | 11.27%        | 550.00%                | 34.70%               | 112.50%           |

The natural landscapes of the Shengsi Islands are gorgeous and spectacular. There are more than 50 tourist sites, including 9 state-level scenic spots. Golden beaches can be seen far and wide. Here are some famous places of interest, such as Jihu Beach shown in (Figure 1) and South Changtu Beach shown in (Figure 2). The two bathing beaches are second to none in the Yangtze River delta region, which are both more than 2000 meters long. When tourists visit the islands personally, they can admire other landscapes, such as Sweetheart Rock (Figure 3) on Mount Shengshan, Spirit reef on Mount Yangshan and Ingot Stones on Mount Huanglong. More cultural landscapes have been integrated into the natural scenery [4-6], and the scenery on fish islands is rich and colorful. There are vivid and touching stories about the relics of Mount Great Tragedy where Jianzhen stopped over for several days, Inscriptions Carved in Stone (Figure 4) engraved by the leader Houjī of the Ming dynasty, the blinking lights from Flower-and-Bird Lighthouse (Figure 5) which is remarkable as the largest lighthouse, plenty of masts, huge buntings, the lanterns at night and fishermen’s songs (Figure 6). The profound cultural background and historical stories have made the Shengsi Islands more interesting and attractive.

![Figure 1. Jihu Beach.](image1)
![Figure 2. South Changtu Beach.](image2)
![Figure 3. Sweetheart Rock.](image3)

![Figure 4. Inscriptions Carved in Stone](image4)
![Figure 5. Flower-and-Bird Lighthouse](image5)
![Figure 6. Shengshan Fishing Port](image6)

2. Climate resources of the Shengsi Islands
The climate of the islands belongs to the mid-subtropical marine monsoon climate, which has obvious climate resources [7]. The weather of the island is pleasing. The average temperature of the islands is around 16.8°C in spring, 17.2°C in autumn, 25.5°C in summer, 7.5°C in winter and the annual mean temperature is around 16.75°C. The average temperature of the two seasons – spring and autumn – containing 156 days is between 15°C and 18°C, while the average temperature is around 25.5°C on the hottest days in summer and it is 7.5°C in winter. During the hottest days in August, the average temperature is around 26.8°C while during the coldest days in January, it is approximately 6.1°C. The average annual rainfall is up to 288.5mm and it rains a lot in summer. The rainy season is from mid-
June to early July. According to the statistics, it rains for approximately 36 days in the season. Another weather phenomenon of the islands is fog. It is mainly flat and dense fog with a large range throughout the year, especially in spring [8]. The data provided by the Shengsi Islands meteorological bureau show that there were 18 days of continuous fog in May 1967. The average annual sunshine duration is 2137.9 hours. It is obvious that sunshine duration in summer is longer than it is in winter. In addition, the number of annual average frost days is 8.8, while the frost-free period contains about 288 days. There are 115 days of fresh gale wind annually. There is no intense heat in summer, no severe winter, and the four seasons are distinct. The superiority of the Shengsi Islands’ resources becomes more visible through the unity of nature and amorous feelings.

3. Creating the climate and natural tourist landscape of the Shengsi Islands in China

The first definition of tourism climate was put forward by Professor Hibbs J R in University of Chicago in 1966. He brought up that tourism climate was a kind of assessed tourism resource which could be utilized for the development of tourism and could have favorable or unfavorable impacts in different time and space [9].

The concept of tourism climatology was put forward by Professor Wu working in Central South University of Forestry and Technology. It was described as a kind of climatology involving the development and creating tourism destination, protection and utilization of tourism resources and the relationship between various tourism activities, weather and climate [10].

The unique geographical and climatic characteristics of the islands create their superior climate resources. Meteorological and climatic conditions play important roles in molding of natural landscapes, because different surface configurations and physiographic landscapes can be shaped by different meteorological and climatic conditions [11]. Meteorological and climatic resources are important components of natural tourist landscape resources. Research shows that the temperature between 15℃ to 18℃ is the most suitable for human activities. This condition can make people feel comfortable and energetic. The higher the temperature, the more tired and depressed people feel. The lower the temperature, the higher is likeliness of getting sick. A meteorological data analysis showed that the climate of the Shengsi Islands belongs to the subtropical maritime monsoon climate. The annual average temperature is around 16.1℃ and it is 5.4℃ during the coldest days in January, while it is 27℃ during the hottest days in August. It is warm in winter and cool in summer and the four seasons are distinct on the Shengsi Islands, where it rains a lot and there is plenty of fog.

Tourism projects for different seasons have been planned and developed according to the resources, climatic and meteorological features by giving full play to superior events to create tourist climatic conditions and natural landscapes. Such influence of climatic conditions is observed in other countries [12].

Creating leisure tourist landscape according to the natural climate resources

Beautiful island sceneries are presented by natural scenic spots, pleasant climate, extraordinary landscapes of mountains and the sea, island-specific folk customs and abundant tourism resources. The natural scenery comprises unique landscapes of mountains and the sea (Figure 7), rich tourism resources, dotted islands (Figure 8), the magnificent ocean, harbor mast sails, vagarious ocean reefs (Figure 9), soft and pure sand beaches and simple and unsophisticated temples [13]. The gorgeous scenery is constituted by all the above.

Tourists can enjoy the surging ocean with a wide expense of mist-covered waters at different time and places. On the islands, tourists can take a relaxing vacation, avoid a sun stroke, sunbathe and swim in the sea. At the same time, they can enjoy the delicious sea food of the islands and experience such activities, as fishing, yachting, bonfire and barbecue parties, catching crabs and shells, trawling and, etc [14-16].
Visitors admire tourist landscapes in summer: such as Jihu Beach, Great Tragedy Mount, spectacular landscape of mountains, the Donghai Bridge, inscriptions on precipices, Rocks cape, etc. A constant stream of visitors can not only enjoy the sea views, but swim and surf on the islands as well (Figure 10).

Visitors can admire these tourist landscapes in winter: such as the fishing port, Matsu Temple, Mount Niu Beiji, Crow cay, Mount Maji, Meta-gem, Finger Fountain, Zhuge Liang’s Hat, Minor Western Heaven, etc. The landscapes are associated with the culture of Long-Wang, amorous feelings and fishermen’s folklore.

Some characterized tourism projects can be carried out in all seasons, such as fishing, enjoying seafood, visiting the historical relics, admiring the garden art and natural landscape, shopping, swimming, etc [17].

Creating tourist landscape with natural meteorological resources

The Shengsi Islands are the kinds of marine tourist areas which have north subtropical monsoon climate. Tourists can enjoy the nautical landscapes of reefs, rocks and stones scattered and dispersed on the islands because of the great amount of precipitation and dissolution capacity [18]. Birds and seagulls fly over the ocean, which sometimes is full of roaring waves and sometimes calm. The distinctive Shengsi Islands’ tourist landscapes are not presented only by the landscape of natural mountains, but also by the scenery of mountains, ocean, rain, clouds, mists and phantoms as well (Figure 10) [19,20].

The meteorological resources of the Shengsi Islands mainly comprise clouds, fog, smoke, rain and brilliant rays of gemstones, which combine with other natural and cultural landscapes to form more splendid landscapes, such as the Stone Dragon on Xiao Yang Island (Figure 11) [21]. The name originates from the shape of the two natural stones which look like two lying dragons nestling with each other [22]. The two stone dragons heading west are over 100 meters in length and 10 meters in waist width. The naturally formed dragon scales can be observed clearly on the back of the Stone Dragon. There is an inexhaustible pool of water, as clear as a mirror and a cave called Stone Dragon Cave among the heaps of the grotesque stones around the tail of the dragon. According to the legend, the cave is connected with another one located behind the Great Temple on Ocean Island a few miles from Zu Hai. When tourists stand on the island, they contemplate the scene of a dream fairyland of the landscape, created by Stone Dragon Cave, a splendid sunrise, charming and magical foggy, rainy weather, etc. Tourists can also appreciate the illusion scope, a kind of atmospheric optical phenomenon appearing above Mountain Great Tragedy and the Spirit Temple (Figure 12). The atmospheric phenomenon of glory and mirage combines with the Buddhist culture which attracts plenty of tourists who feel unable to tear their eyes off all above.
There can always be unexpected changes in climatic phenomena. Tourists can see various physical states of atmosphere, such as the light, acoustic and electric phenomena. The weather and climate change greatly due to the combined effect of multiple factors, such as average conditions of atmospheric pressure, air temperature, the extreme condition, etc [23]. Rich and colorful climatic phenomena are interconnected with the natural landscape, climate resources, hydrosphere, biosphere and cultural landscape. There are many dazzling landscapes, which can be appreciated by tourists on the islands, including gorgeous climate resources, the miserable scenery of rain, bright moon, sunrise, clouds, the light of Buddha, etc. Moreover, tourists can enjoy such sceneries, as undulating waves and scattered cloud strips and blocks. As the poet Bai Juyi in Tang Dynasty described, there is a phantom of a mountain standing in the sea, hidden in clouds and mist. The island has been regarded as a fairy mountain with spectacular natural scenery, landscape and human resources and the magical meteorological landscape has been demonstrated by distinctive features of the island [24].

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