

Study of tourism climate in Hamadan and Malayer cities based on TCI index

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Detailed abstract

Introduction

The development of tourism is one of the effective factors in sustainable urban development. Considering that Hamadan Province is located in a cold region, the weather is cold for most of the year, and since many of the tourist attractions in the province are outdoors, obtaining suitable tourism timing based on thermal comfort and planning the tourism conditions in this area is of special importance. The cities of Hamadan and Malayer are respectively considered the largest, most populous, and historically significant cities in the province. Given the historical and natural attractions of these two cities, they are regarded as two tourism hubs in the province, making the determination of their tourism climate significant.

Since human perception of the surrounding environment cannot be expressed solely by examining one climatic element such as temperature, relative humidity, or airflow; the combination of these elements affects individuals and is related to their physical comfort and needs to be examined in the context of thermal comfort indices. The Tourism Climate Index (TCI) is an index that systematically identifies the impact of climatic elements on tourism. This index provides a quantitative assessment of tourism climate by integrating climatic factors related to tourism into a single index. The TCI assesses variables such as the average maximum monthly daily temperature, average daily temperature, minimum relative humidity, average relative humidity, precipitation, number of sunshine hours, and wind speed.

The identification of suitable tourism periods and the provision of appropriate architectural and urban planning solutions to ensure comfort and extend tourism time in these two cities is one of the main objectives of the research. Therefore, this study seeks to answer the following questions: Which months of the year provide greater thermal comfort in the cities of Hamadan and Malayer and are considered suitable for tourism? What solutions can be proposed to create comfort conditions in urban spaces during the months close to comfort in Hamadan province?

Materials and Methods

The approach of the present study is descriptive-analytical. This research is practical in terms of objective and has used library and documentary methods for information gathering. Additionally, Excel software has been utilized for data analysis. Initially, climatic information required from nine synoptic

stations was collected from the meteorological organization of Hamadan for a ten-year period (2013-2023), and then the TCI index was employed at various stages to evaluate the climatic conditions of the two cities, Hamadan and Malayer, in the province, determining the suitable times for tourism in these cities. The stages for calculating the TCI index are as follows: The variables used in this index include the daily average temperature, daily maximum temperature, daily average relative humidity, daily minimum relative humidity, average monthly precipitation, daily average sunshine hours, and wind speed. This index indicates the conditions of thermal comfort during the peak of tourism activity. To calculate the tourism climatic comfort index, the aforementioned variables are weighted according to their relative importance in tourism climatic comfort and are placed in Equation 1 to obtain the TCI value.

Equation 1: $TCI=2(4CID+CIA+2R+2S+W)$

Findings

The average annual temperature of Hamadan is 12.66°C, and the average annual temperature of Malayer is 13.49°C. Therefore, the average annual temperature of Malayer is 0.83°C higher, and this temperature difference is distributed throughout the year, although the temperature difference is more significant in the cold season. In June, July, August, and September (Khordad to Shahrivar in the Iranian calendar), both cities experience thermal comfort in terms of outdoor temperature, making them suitable for tourism.

A comparison of the maximum temperatures of the two cities shows that there is not much difference throughout the months of the year, and the maximum monthly temperature is higher in Malayer. The average annual relative humidity of Hamadan is 46.96%, and the relative humidity of Malayer is 40.81%. The average annual humidity of Hamadan is 6.15% higher than that of Malayer, which is not a significant difference in terms of humidity, and both cities are within the range of humidity comfort. As seen in the monthly humidity chart, the relative humidity of Hamadan is higher than that of Malayer throughout the year.

The total annual rainfall in Hamadan is 280.82 mm, and the total annual rainfall in Malayer is 311.61 mm. Malayer receives an average of 31 mm more rainfall per year than Hamadan. The difference in monthly rainfall between the two cities is slight. Solar radiation conditions are very similar in both cities, except in December. In December, the sunshine hours in Malayer are 3.2 hours longer. The average annual sunshine hours in these two cities are between 8 and 9 hours per day.

Discussion and Conclusion

Discussion: The average annual temperature of Hamadan is 12.66°C, and the average annual temperature of Malayer is 13.49°C. Therefore, the average annual temperature of Malayer is 0.83°C higher, and this temperature difference is distributed throughout the year, although the temperature difference is more significant in the cold season. In June, July, August, and September (Khordad to Shahrivar in the Iranian calendar), both cities experience thermal comfort in terms of outdoor

temperature, making them suitable for tourism. A comparison of the maximum temperatures of the two cities shows that there is not much difference throughout the months of the year, and the maximum monthly temperature is higher in Malayer. The average annual relative humidity of Hamadan is 46.96%, and the relative humidity of Malayer is 40.81%. The average annual humidity of Hamadan is 6.15% higher than that of Malayer, which is not a significant difference in terms of humidity, and both cities are within the range of humidity comfort. As seen in the monthly humidity chart, the relative humidity of Hamadan is higher than that of Malayer throughout the year. The total annual rainfall in Hamadan is 280.82 mm, and the total annual rainfall in Malayer is 311.61 mm. Malayer receives an average of 31 mm more rainfall per year than Hamadan. The difference in monthly rainfall between the two cities is slight. Solar radiation conditions are very similar in both cities, except in December. In December, the sunshine hours in Malaysia are 3.2 hours longer. The average annual sunshine hours in these two cities are between 8 and 9 hours per day.

Conclusion : The examination of the monthly tourism climate index for Hamadan shows that the best conditions for tourism in the city occur in May, followed by October, June, and September. August and April also offer suitable conditions, followed by March and July. January, February, and December do not provide favorable conditions for tourism.

In reviewing the tourism climate conditions in Malayer, the months of May, June, July, and September have the best climatic conditions for tourism. October follows, with April next in line. March, August, and November also have favorable conditions. January, February, and December are not recommended for tourism.

Declarations

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