



Evaluation of human comfort conditions based on bioclimatic indicators (Case study: Si Sakht tourist city)

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Abstract

Background and Aim: Climatic characteristics and most of its elements play a decisive role in the spatial distribution and formation of environmental behavior of human societies, so that nowadays, studies and investigations of human bioclimate and the use of its various capabilities are the basis of urban, development, settlement, architecture, and tourism planning. Accordingly, the aim of this study is to investigate and analyze human comfort based on bioclimatic models and indicators.

Methodology: The research method is descriptive-analytical. This study was conducted in 2024 in the city of Sisakht, using climatic data such as temperature, relative humidity, wind speed and air pressure for the period from 2006 to 2024. The required data was collected from the Sisakht synoptic station. After collecting data, human comfort or discomfort was analyzed based on the bioclimatic models and indices of Terjung, Baker, nervous stress, and thermohygrothermic for different seasons of the year. This analysis included examining the temporal and spatial changes of the indices to determine which month and hours of the day have the most favorable climatic conditions for tourists. Finally, the models and indices were examined and compared to determine the most effective and efficient method for assessing the bioclimatic conditions of the city of Sisakht.

Finding and Results: The results of this study showed that Sisakht has bioclimatic diversity throughout the year, ranging from hot to very cold conditions; during the winter and summer seasons, it is outside the range of bioclimatic comfort, and with the beginning of the spring and autumn seasons, in the months of transition from cold to heat (April) and heat to cold (November), the climate of Sisakht approaches human comfort conditions. In general, spring, with its unique conditions of human comfort, is the best season for environmental activities and tourism in the city of Sisakht. Also, considering the climatic characteristics of the studied area, the Baker method, neurotic pressure, and then the Terjung method are more suitable and reliable in evaluating the bioclimatic conditions of the city of Sisakht than other bioclimatic indicators.

Keywords: Models, indicators, bioclimatic, Si Sakht city

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Extended Abstract

Introduction

The study of human bioclimate is currently considered as a basis for regional development planning, especially in the fields of urban, residential, architectural, tourism and health. Thermal comfort conditions refer to a set of conditions in which at least 80% of people feel comfortable and are influenced by four climatic elements (temperature, humidity, radiation and wind). Temperature and humidity have a greater impact on human comfort, and numerous studies have been conducted at the global and domestic levels to measure thermal comfort. Studies using different models and indicators have also been conducted in Iran. The present study examines the climatic conditions of the city of Sisakht in terms of thermal qualities and its physiological effects and presents a model for determining the degree of thermal comfort during different months and seasons.

Methodology

The research method in this study is a (combined) method with a systematic approach, descriptive and analytical method. The data collection method in this study is a combination of library, descriptive, field methods, document review and data classification. The data studied in this study include all monthly measurements of climatic elements of the synoptic station of Si Sakht city with a statistical period of 17 years (1385-1402) which have been processed as a database. The research method in this study is based on the use of mathematical relationships, models and bioclimatic indices (Terjung, Baker, nervous stress and thermohygro-metric) that evaluate human comfort according to the climatic characteristics of the studied area, which has its own capabilities and limitations.

Findings and Conclusions

The Terjung index is one of the most important human bioclimatic methods for assessing human comfort (Mohammadi, 2007: 186). Using this method allows us to understand the bioclimatic conditions of the studied area, which can be a solution to housing-related problems, including energy-related issues. In addition, it can be widely used in the tourism industry and in urban and regional planning (Chou et al, 2023: 2). The advantage of this method over other methods is that all important climatic factors, including temperature, humidity, wind, radiation, and sunshine hours that control the set of thermal conditions of the human body, are used simultaneously (Kaviani, 2003: 78). At the same time, in order to facilitate calculation, two components are used in the structure of the diagram: the average daily temperature in Fahrenheit and the average monthly relative humidity in percent. So that this diagram actually expresses the human comfort coefficients under different combinations of temperature and humidity and conventional conditions (normal clothing and physical inactivity) (et al, 2024: 4. Hatef). In this diagram, the horizontal axis represents the temperature in Fahrenheit and the curved lines represent the relative humidity in percent. The intersection of these two climatic parameters under conventional conditions is in different ranges that are shown by numbers and symbols (Table 1). According to Figure 2 and Table 1, the human comfort coefficient for the city of Si Sakht has been set in the form of Table 2.

Assessing bioclimatic conditions, while identifying the climatic comfort or discomfort prevailing in the region, by guiding planners, enables the added value of national and regional investments in the most sustainable and appropriate way. Today, the results of human bioclimatic studies are used in human settlement in new areas as well as in the development of existing settlements.

Given that the assessment of human physiological comfort and discomfort depends on climatic and atmospheric factors and characteristics, therefore, in this study, the bioclimatic

indices of Terjung, Baker, nervous stress, thermohygro-metric and wind-cold index have been used to determine and evaluate the comfort coefficient of the city of Si Sakht.

Declarations

- **Compliance with research ethics:** In this study, informed consent forms were completed by all subjects.
- **Sponsor:** The costs of this study were covered by the authors.
- **Conflict of interest:** According to the authors, this article has no conflict of interest.

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