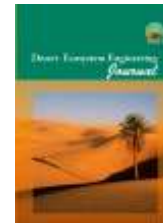




University of Kashan

## Desert Ecosystem Engineering Journal

Journal homepage: <http://deej.kashanu.ac.ir>**Evaluating the effect of climate change on tourism in Khuzestan province**Dariush Rahimi,<sup>1</sup> Fatemeh Bashirian,<sup>2</sup> Rastegar Mohammadi,<sup>3</sup> Mahdi Rahimpordanjani<sup>4</sup>

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**Introduction:** Limiting bioclimatic conditions, destructing natural tourist attractions, displacing the tourism calendar, climate change, and global warming may also displace tourism territories to different degrees (Xiu Xia et al., 2023). The findings of various studies assert that due to the increase in temperature, heat stress, and the deterioration of the bioclimatic conditions in the Mediterranean, Malaysia, and America, favorable areas for tourism have been moved to northern latitudes (Jong et al., 2023; Matzarakis & Amelung, 2008). The assessment of the effects of climate change on Iran's tourism also indicates an increase in the locational changes of favorable tourism sites and the shift of tourism classes from excellent or ideal to desirable and suitable due to the increase in temperature and droughts (Sobhani & Esmailzadeh, 2020; Moradjani, 2022; Abedi & Sedaghat, 2022; Farajzadeh & Ahmadabadi, 2010).

Located in southwestern Iran, Khuzestan Province is regarded as a region with extensive and concentrated tourism capabilities, whose geographical features have led to the formation of mountain, plain, sea, desert, and even desert landscapes. Moreover, Khuzestan plain is known as the cradle of ancient and historical civilizations that continue to the coast of the Persian Gulf, where the cold months of the year (November to April) make the site a suitable place to visit (Borna, 2018, Rahimi et al., 2019). However, the temperature rate has been increasing by one to three degrees from 2017 on (Mohammadi et al., 2024), placing some restrictions on the tourism calendar. Therefore, climate change (2020–2080) may exert an adverse influence on tourism territories in their golden visiting time. Considering the status of tourism in the prospective development of Khuzestan province and the high sensitivity of such potential to climate change, this study sought to investigate the effect of climate change on tourism in Khuzestan province through a temporal-spatial comparative study using the thermal comfort index coefficient.

**Study Area:** Covering an area of approximately 64236 square meters, Khuzestan province is located in southwestern Iran, whose average annual temperature varies from 15 °C in its northern regions to 26 °C in its southern regions. Moreover, more than 85% of the province's area measures less than 500 square meters, and 15% of the province falls within the north and northeast mountainous regions. As the province possesses great tourism potential, special tourism development plans have been incorporated into the policy documents of the province to prepare the grounds for its sustainable development. However, increasing chances of climate risks such as heat waves, dust, and floods pose a potential threat to the advancement of the tourism industry in the province. In this regard, the current study set out to investigate the change in the thermal comfort index and its territories until 2050.

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1. Professor, Hydro- Climatology, University of Isfahan, Iran; d.rahimi@geo.ui.ac.ir

2. Postdoctoral Associate, Climatology, University of Isfahan, Iran

3. Ms. Student, Climatology, University of Isfahan, Iran

4. PhD student, Tourism, University of Algarve, Portugal

**Method and Data:** To investigate the effects of climate change on the tourism calendar and its territories in Khuzestan Province, this study examined the thermal comfort index in terms of two periods: the historic period (1985–2020) and the future period (2021–2050). The index considers such climatic elements as air temperature, precipitation, humidity, radiation, and wind. As for the time periods investigated, the study collected the required data regarding the climate variables recorded in the meteorological stations of Ahvaz, Omidiyeh, Aghajari, Abadan, Behbahan, Dezful, Safiabad, Ramhormoz, Mahshahr, and Masjed Suleiman. Moreover, to calculate the thermal comfort index for the future period, the study used downscaled climate data based on CMIP6 scenarios under the SSP 4.5 scenario.

**Result and Discussions:** Climate change and global warming have changed climatic comfort conditions and the displaced territories in Khuzestan province. Comparing the maps prepared for the 1985–2020 period with the ones prepared for the future period (2021–2050), the study found that the thermal comfort index territories have been changed in different classes and months of the year. In other words, it could be said that global warming will create a longer summer in Iranian southern regions, leading to the reduction of the geographical territories' rank from ideal and excellent to lower classes and the movement of tourism territories. In the historical period (1985–2020), March was found to be the most ideal time for tourism. However, the findings revealed that November would be the best time for tourism in the future (2021–2050) when the province would experience the best thermal comfort index conditions. These findings are consistent with the results reported by Matzarakis & Amelung (2008), Xio Xia et al. (2023), Gössling et al. (2023), Rastegar & Ruhanen (2023), Bakhtiari et al. (2018), Shamsipour et al. (2014), Moradjani (2022), Abedi and Sedaqat (2022), and Farajzadeh and Ahmadabadi (2010).

**Conclusion:** The findings indicated that Khuzestan province will experience great changes in the future in terms of tourism thermal comfort index. In this regard, the province's thermal comfort index rank will, in the future period (2021–2050), decrease in the months of January, February, March, April, and October compared to the one found for the historic period (1985–2020), suggesting that no part of the province will have ideal conditions to attract tourists. Moreover, the conditions will be quite unfavorable in May, June, July, August, and September. However, compared to the historic period, the conditions will improve in November and December of the future period. Furthermore, the tourism territories of the province will be limited to northern latitudes and mountainous areas in the future.

The prospective changes in the monthly tourism calendar and its territories will exert a great influence on the province's tourism economy. Currently, tourism infrastructure such as accommodation, welfare services, transportation networks, and private sector investment have been prepared and developed based on the historical conditions of the climate. Therefore, the relocation of tourism territories, the weakness of facilities in new areas, and the neocolonialization of previously suitable areas will bring about great economic and social losses. Thus, it is recommended that various aspects of tourism development plans be considered based on uncertainties.

**Keywords:** Tourism, Climate Change, Thermal Comfort Index, Khuzestan Province.