

## **THE IMPORTANCE OF CLIMATE FOR RECREATIONAL PLANNING OF RURAL AREAS; CASE STUDY OF MUĞLA PROVINCE, TURKEY**

M. Topay

Zonguldak Karaelmas University, Bartın Forestry Faculty, Department of Landscape Architecture  
Bartın-TURKEY  
mehmettopay@yahoo.com

**ABSTRACT** In recent years, alternative tourism activities have gained significance in the world and in Turkey. For this reason, the rural areas which have a lot of opportunities for recreational activities have become more important for the Turkish tourism industry. In this context, planning decisions should ensure optimal usage of these rural areas. The aim of Landscape Planning is to provide detailed information about the natural and cultural landscape values, and to implement a sustainable planning process based on this information. One of the main landscape values is climate. Humans are situated at the intersection of planning and climate. In this context, bioclimatic comfort, which depends on climatic effects, is important for planning.

The aim of this study is to identify the most suitable areas and months for human bioclimatic comfort in Muğla Province according to its climate data. For this reason, climate data was collected from 11 different climate stations in Muğla Province. Different climate stations, which lie at different altitudes between 3 and 850 meters, were chosen to analyse climatic variations. Average temperature, humidity and wind speed values of these climate stations were transferred into a Geographic Information Systems (GIS) using Arc View 3.2 software. The climate maps were calculated from the data which was transferred into GIS software. The most suitable areas and months for bioclimatic comfort were determined. In conclusion, the most suitable months in Muğla Province are June, August and September. The most suitable areas in terms of bioclimatic comfort conditions are situated in the north and the centre of the province.

**KEYWORDS:** *Recreation, Bioclimate comfort, Landscape planning, Muğla Province.*

### **INTRODUCTION**

Recreation is increasingly viewed as an important factor in maintaining adult health - both physically and mentally. The aim of recreation is physical or psychological revitalization through the voluntary pursuit of leisure time (Princeton, 2007). In this context, people have been searching for different areas to respond to their recreational needs. In many cities, recreational activities cannot be realised because of the building structure, the lack of suitable open space and

environmental problems (Matzarakis, 2001). In very densely built-up areas many people suffer from high temperatures and dry air in the summer while other areas in and around the city, such as forests, open green space and water surfaces, provide cool fresh air for the city (Matzarakis, 1996, Gulyas et al., 2006).

A rural landscape is shaped by both natural and cultural factors. It exhibits balanced or unbalanced forms according to different human utilization. For this reasons, rural landscape planning aims to stabilize the relations between humans and nature (Olgyay, 1973, Dirik et al., 2005). If a central purpose of planning is to create an environment suited to the needs of the public, then climate must be the first consideration. The physical well-being of people and their attitudes are directly affected by climate, and human requirement in turn prescribe the planning need (Simmonds, 1997, Nikolopoulou, 2001, Gajic-Capka, 2001). In urban areas, the weather conditions can be modified through construction material and other systems, but this is not possible in rural areas. Hence appropriate regional selection is very important for sustainable and economical planning (Svenson et al., 2003, de Freitas, 2003).

Several researchers showed that there are six parameters important for the human bioclimatic comfort. Four of these are related to climatic conditions: humidity, radiation, wind and temperature (Olgyay, 1973, Fanger, 1972, ASHRAE, 1996, Brandenburg and Arnberger, 2001). Some uncomfortable affects like sweating and shivering occur in the human body if the region's climate is outside of the bioclimatic comfort values. For this reason, the energy balance of the human body is affected depending on how much energy is needed to adapt to the environment. To gain the lost energy, people need heat or cool. Thus, the energy costs increase; but this is not desirable in landscape planning.

## **METHOD**

Muğla is a province in south western Turkey, along the Aegean and Mediterranean Sea (Fig. 1). It is located at 37<sup>0</sup> 56' N and 27<sup>0</sup> 20' E. The area of the province is 12851 km<sup>2</sup> and the total population of the province is 715 328. Turkey's largest holiday resorts such as Bodrum, Oludeniz, Marmaris and Fethiye can be found on the coast of this province, which has the longest coastline among all provinces in Turkey (approximately 1100 km). The province has a UNESCO World Heritage Site in Letoon near Fethiye. Muğla is characterised by a lot of historical ruins and there are 103 ancient sites. The relief, topography and the seas have various effects on the region's climate. There is a "typical Mediterranean climate" between 0-800 m and "Mediterranean mountain climate" above 800 m. Maximum and minimum temperature, humidity, precipitation and main wind directions have changed as a response to the local geographical structure (Muğla Valiliği , 2007).



**Figure 1: Location of Muğla Province in Turkey**

A lot of research has been conducted to determine the minimum and maximum climatic values of bioclimatic comfort. The study by Olgyay (1973) on bioclimatic comfort chart methods has significant importance. In this study, Olgyay's (1973) bioclimatic comfort charts were used to determine the climatically suitable areas and months of Muğla Province. Bioclimatic comfort was defined by Olgyay (1973) as open areas, with temperatures between 21 and 27 °C, wind speeds less than 5 m/s and relative humidity between 30 and 65 %".

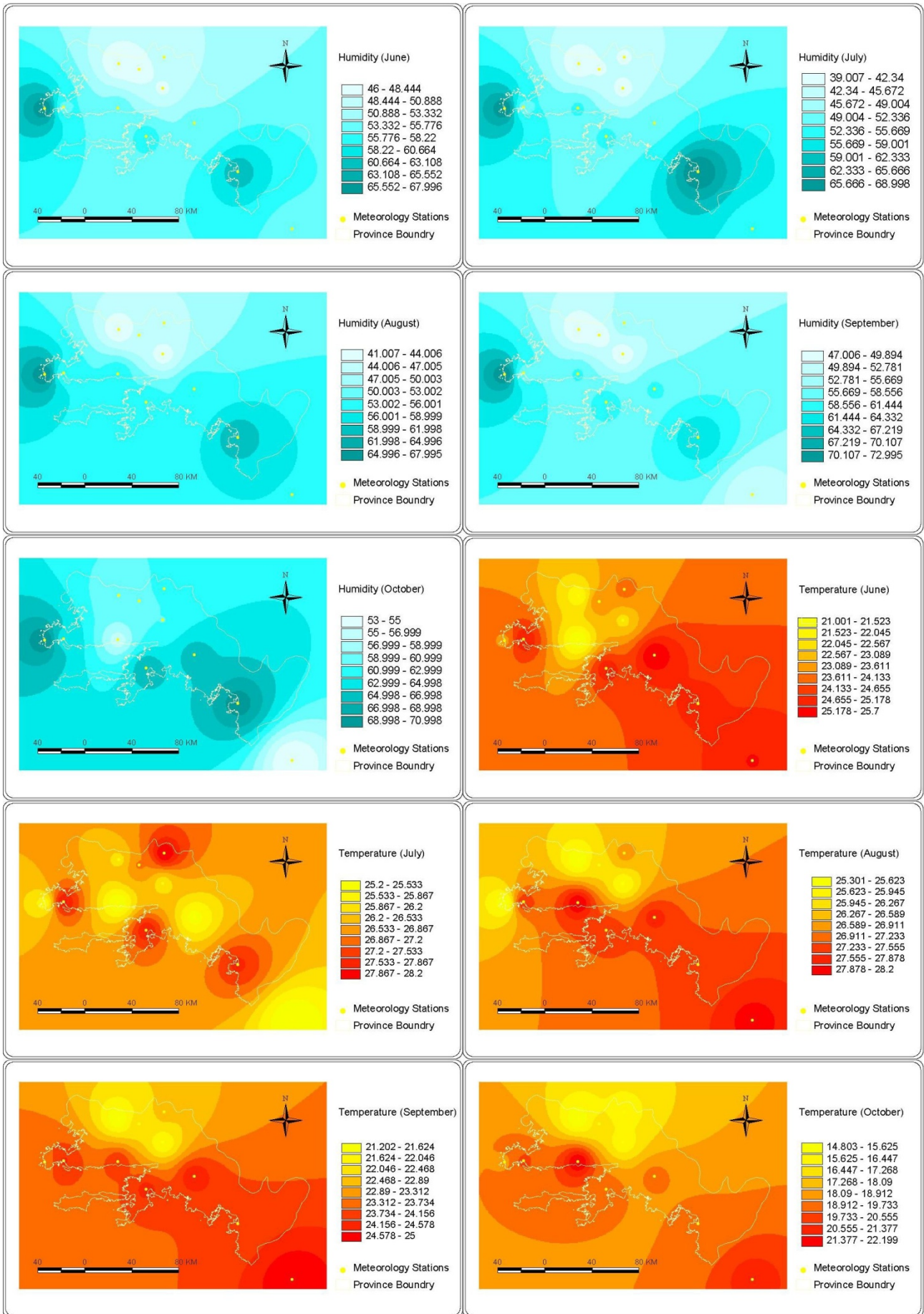
Climatic data was gathered from 11 meteorology stations from the National Meteorology Services. In this study, climatic records, which contain monthly mean temperature, wind speed and humidity values between 1929-2000 years, were used. Arc View 3.2 and Spatial Analyst extension in Arc View 3.2 software was used to create the climatic maps. Initially, climatic values were formatted and transferred into station points as the independent value in the GIS environment and monthly climatic maps were created from monthly mean temperature, wind speed and humidity values by means of IDW interpolate techniques. IDW interpolate techniques designate values to each cell in the output grid theme by weighting the value of each point by the distance that the point is away from the cell being analyzed and then averaging the values (By, 2004, Üneri et al., 2006). Equation (1) is used for the interpolation:

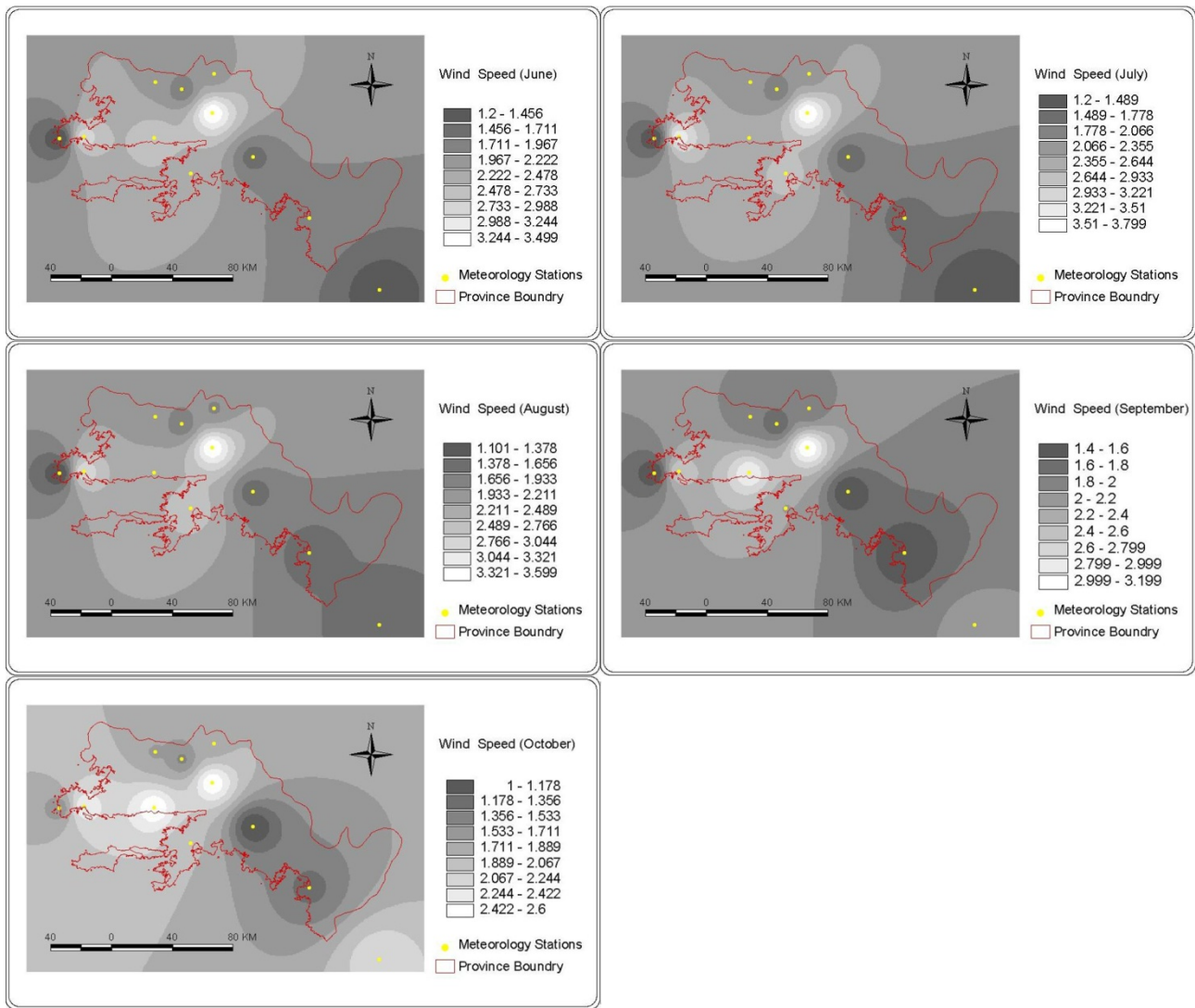
$$\sum_{i=1}^n m_i / d_i^2 / \sum_{i=1}^n 1 / d_i^2 \quad (1)$$

where  $m_i$ : point value,  $d_i$ : distance of between points (By, 2004) .

## RESULTS

To create bioclimatic comfort maps for the Muğla Province, the monthly mean humidity, temperature and wind speed maps were derived from the station records and are shown in Fig. 2.



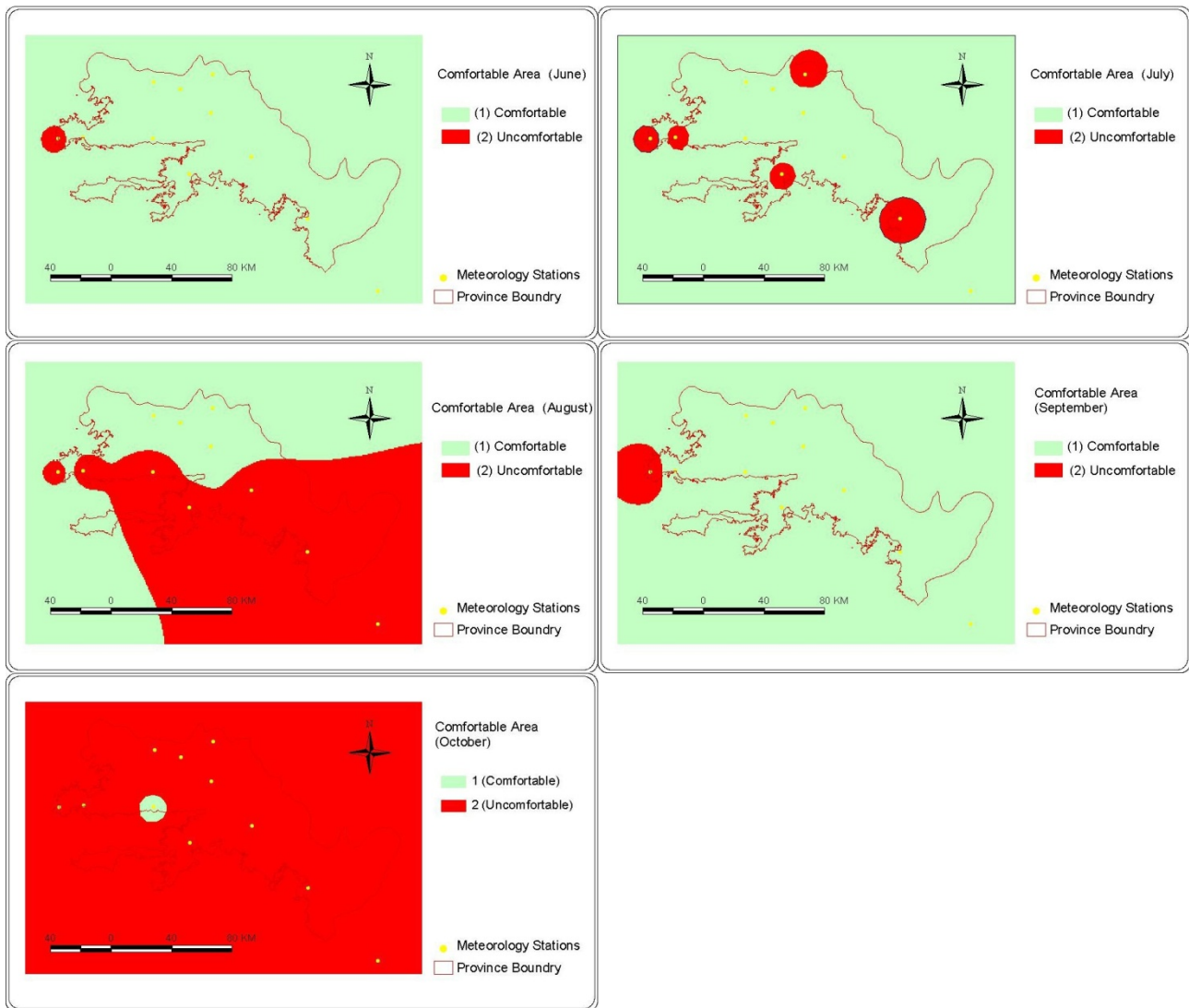


**Figure 2: Monthly mean humidity, temperature and wind speed maps according to the mounts (a-June, b-July, c-August, d-September, e-October)**

The spatial distribution of humidity across the study area can be described as follows. In June, humidity value changes were between 46 – 68 %, in July around 39 – 69 %, in August 41 – 68 %, in September 47 – 73 %, and 53 – 71 % in October. The west and southeast parts of the province have higher humidity values than other regions. The spatial distribution of temperature in the study area can be explained as follows. In June, temperature values vary between 21 - 25.7 °C, in July between 25.2 - 28.2 °C, in August between 25.3 - 28.2 °C, in September between 21.2 - 25 °C, and between 14.8 - 22.2 °C in October. The southeastern part of the province is hotter than other regions. The spatial pattern of wind speed in the study area can be explained as follows. In June, wind speed values vary between 1.2 - 3.5 m/s, in July between 1.2 - 3.8 m/s, in August between 1.1 - 3.6 m/s, in September between 1.4 - 3.2 m/s, and between 1.0 - 2.6 m/s in October. The central part of the province is windier than other regions.

The maps of monthly mean temperature, wind speed and humidity for the period June - October in Muğla Province were joined to determine the bioclimatic comfort areas and queried according to the

Olgyay (1973)'s human bioclimatic comfort value. It was found that June, July, August, September and October have the most comfortable climatic condition for human bioclimatic comfort in Muğla as shown in Fig. 3.



**Figure 3: The most suitable areas according to the mounts. (a-June, b-July, c-August, d-September, e-October)**

In this study, the most suitable months in the Muğla Province were found to be June, August and September. The most suitable areas in June and September were found to be almost all provinces. In July, the inner region of the province was found to be the most suitable area for tourism in terms of bioclimatic conditions.

## DISCUSSION

This study was carried out to determine the most suitable months and areas for tourism in terms of human bioclimatic comfort in the Muğla Province. Initially, maps with monthly mean temperature, wind speed and humidity were derived from long period records from climate stations. They were created in GIS and queried according to Olgyay's (1973) bioclimatic comfort conditions value. The

most suitable months in the Muğla Province were found to be June, July and September. In June and September, conditions were mostly comfortable in the province, in July the inner region of the province was also comfortable. In August and October, the bioclimatic comfort values decreased. In August conditions were comfortable only in the southern parts of the province. In October, only Oren Town had comfortable conditions. It was also found that temperature and humidity had the strongest effects on bioclimatic comfort. Wind speed did not negatively affect the bioclimatic comfort in the province.

The results of this study clearly show that June, July and September are the most suitable months with regards to bioclimatic comfort. In this context, tourism and recreation should be carried out during these months. The results are similar to those of previous studies (Topay and Yilmaz, 2004, Çınar, 2004) and further research in this matter is advisable. This study and further research will help local authorities to make sustainable landscape planning decision with regards to recreation.

## REFERENCES

- ASHRAE (1966) Thermal Comfort Condition, ASHRAE Standard 55-66, New York. USA.
- Brandenburg, C., Arnberger, A. (2001) The Influence of the Weather upon Recreation Activities, Proceedings of the 1st Int. Workshop on Climate, Tourism and Recreation. Int. Society of Biometeorology, Commission on Climate Tourism and Recreation. December 2001. p: 123-132.
- By, R. A. (2004) Principle of GIS, ITC Educational Textbook Series, Netherlands.
- Çınar, İ. (2004) Biyoklimatik Konfor Ölçütlerinin Peyzaj Planlama Sürecinde Etkinliği Üzerinde Muğla-Karabağlar Yaylası Örneğinde Araştırmalar (Phd Thesis), E. Ü. Fen Bilimleri Enstitüsü, İzmir, Türkiye.
- De Freitas, C. R. (2003) Tourism Climatology: Evaluating Environmental Information for Decision Making and Business Planning in the Recreation and Tourism Sector, Int. J. Biometeorology 48: 45-54.
- Dirik, H. (2005) Kırsal Peyzaj, İÜ. Orman Fakültesi Yayını, Yayın No: 4559, İstanbul, Türkiye.
- Fanger, P. O. (1972) Thermal Comfort, McGraw Hill Book Comp., New York.
- Gajik-Capka, M. (2001) Climatological Basis for Planning in Mountain Recreation. Proceedings of the 1st Int. Workshop on Climate, Tourism and Recreation. Int. Society of Biometeorology, Commission on Climate Tourism and Recreation. December 2001. p: 227-237.
- Gulyas, Á., Unger, J., Matzarakis, A. (2005) Assesment of the Microclimatic and Human Comfort Conditions in a Complex Urban Environment: Modelling and Measurements, Building and Environment 41: 1713-1722.
- Matzarakis, A. (2001) Assessing Climate for Tourism Purposes: Existing Methods and Tools for the Thermal Complex. Proceedings of the 1st Int. Workshop on Climate, Tourism and Recreation. Int. Society of Biometeorology, Commission on Climate Tourism and Recreation. December 2001. p: 101-111.
- Matzarakis, A., Mayer, H. (1996) Bioclimate Maps of Greece for Touristic Aspect, Proceedings of 14<sup>th</sup> Int. Congress of Biometeorology, September 1996, Biometeorology 14, Part 2, Volume 3, p: 222-229.
- Muğla Valiliği (2007) Muğla Province, <http://www.mugla.gov.tr>.
- Nikolopoulou, M. (2001) The Effect of Climate on the Use of Open Spaces in the Urban Environment: Relation to Tourism. Proceedings of the 1st Int. Workshop on Climate, Tourism and Recreation. Int. Society of Biometeorology, Commission on Climate Tourism and Recreation. December 2001. p: 185-193.

- Olgay, V. (1973) *Design with Climate, Bioclimatic Approach to Architectural Regionalism*, Princeton University Press, New Jersey.
- Princeton (2007) *Defining of Recreation*, <http://www.wordnet.princeton.edu>.
- Simonds, J.O (1997) *Landscape Architecture, A Manuel Site Planning and Design*, Mc Graw Hill Book, New York.
- Svensson, M. K., Thorsson, S., Lindqvist, S. (2003) A GIS Model for Creating Bioclimatic Maps- Examples from a High, Mid-latitude City, *Int. J. Biometeorology* 47: 102-112.
- Topay, M., Yılmaz, B. (2004) Biyoklimatik Konfora Sahip Alanların Belirlenmesinde CBS'den Yararlanma Olanakları: Muğla İli Örneği, *Proceedings of 3<sup>th</sup> GIS Days in Turkey*, September 6-9 2004, Turkey. p: 425-434.
- Üneri, D., Kara, S., Özdemir, H. (2006) İklim Verilerinin Haritalanmasında CBS'nin Kullanımı.: Kasatura Körfezi ve Çevresi Örneği, *Proceedings of 4<sup>th</sup> GIS Days in Turkey*, September 13-16, 2006, Turkey. p: 503-510.