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Evaluation of Climatic Characteristics for Tourism and Recreation in Northeast Anatolia (TRA1 NUTS II) Region in the Example of Erzincan City Centre

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Abstract

Tourism and recreation have numerous benefits to public felicity. Northeast Anatolia (TRA1 NUTS II) Region of Turkey has untouched nature with diverse tourism and recreational potentials, which have been planned to use for the service of socio – economic development of local people in the scope of a strategy, Innovation Based Tourism Development Strategy prepared by Northeast Anatolia Development Agency (KUDAKA in Turkish acronym). Even though the region shelters potentials especially for winter and nature and adventure tourism, general public opinion about its climatic characteristics is generally unfavourable because country's extreme weather events and values are reported from the region. This study was conducted to evaluate climatic characteristics of the region in the sample of Erzincan city for touristic activities all year round using a 37- year (from 1975 to 2011) data set and one of the newly developed tourism climate indices, CTIS (Climate-Tourism-Information-Scheme). It was found from the result of the study that the city and the region do not really have unfavourable climatic characteristics for tourism and recreation activities and it was suggested that both infra-structural investment based on landscape planning should be made and promotional and marketing strategies should be developed and applied in the region through new development programs and projects in order to achieve a sustainable tourism development.

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INTRODUCTION

Importance of recreational and tourism activities lies in the benefits they provide for both individuals and societies (Önder 2003). Regardless of their types, places and time, tourism and recreation activities have numerous benefits to socio-economical and health status of people since they take people away from the stressful work environments and provide possibilities for them to recreate themselves physically and psychologically (Toy and Yilmaz 2009). Social, psychological and economic importance of these activities is higher in developing countries, such as Turkey, where increasingly excessive economic and environmental stresses on people are prevalent (Toy and Yilmaz 2009**).**

Turkey has entered a rapid urbanisation and industrialisation process from 1950s onward (Kongar 1976), and dense and distorted urbanisation accelerated after 1980s in especially western and south western parts of the country due to the population movements from eastern and south-eastern parts to these regions because of various reasons such as developing industrialisation and tourism sectors in the western and terror in the eastern parts of the country (Işık 2005). These unfavourable conditions have created dense, distorted and overcrowded cities and devastations in natural reserves and surfaces in the west while less populated but unplanned ones in the east, where people live without any economical sources. In short, western and south-western parts of the country face destruction in natural resources while people in eastern parts lead a lower – standard of life due to lack of economic sources and investments even though they have many opportunities because of unpolluted and untouched environment (Karabulut et al. 2004**)**.

Mentioned conditions are also valid for the north – eastern part of Turkey, with which this study is dealt. This region is among the areas which are exposed to dense migration to west. Since there are no heavy industries, urban people in the region are engaged generally in service sector and traditional cultivation techniques are employed in rural parts. Therefore, the region is relatively more natural and untouched compared to western parts of the country. However, neither locals nor foreigners can take the advantages of these characteristics of the region for recreational and tourism purposes due to the lack of efficient facilities and promotion in spite of the diverse recreation and tourism potentials of the region.

The region bears considerably large potential for winter tourism for its rainfall regime and topographical features; culture and history tourism for its nearly 4000-year history; nature and water sports and adventure tourism for its rich water reserves and the location at the beginning points of three large rivers in Turkey (KUDAKA 2011). Touristic potential of the region is composed of six main tourism types; winter, culture and history, adventure and nature, eco and agro, health, and congress tourism (KUDAKA 2011). The region's potential for tourism and recreation was also evaluated by in details by Bulut and Yilmaz (2008) in the sample of Erzincan.

From a point of view, in the assessment of the convenience of a place for tourism and recreational activities, weather and climate along with topographical and orographical conditions, vegetation and fauna do not only play a defining role but also they are limiting and controlling factors over them (Rudel et al. 2007). Climatic parameters such as monthly means for maximum daily temperature, mean daily temperature, minimum daily relative humidity, mean daily relative humidity, total precipitation, total hours of sunshine, average wind speed and global radiation

are accepted to be effective on recreation activities (Fanger 1970; Scott et al. 2004; Matzarakis 2007; Lin and Matzarakis 2008; Zaninovic and Matzarakis 2009; Toy and Yilmaz 2010; Toy and Yilmaz 2010a; Toy and Yilmaz 2010b; Fröhlich and Matzarakis 2012). These mentioned climatic elements can affect recreation activities either individually or in a combined way. Although the individual effects of these elements are sometimes forefront, their combined effects are more dominant on people for their health status and work performance as well as their pleasure and the quality of experience taken from recreational activities. Lin et al. (2012) suggested that people tend to visit parks when the temperature declines below the acceptable thermal comfort range of 26–30 ◦C PET, which demonstrates the thermal adaptation of people in hot climates such as Taiwan.

North eastern part of Turkey has harsh continental climatic characteristics. In some parts of the region, long (at least six-month from late September to late May) and extremely cold (decreasing to -37.2 °C) winters are prevalent while summers are arid and torrid. However, in some parts, especially around the city of Erzincan, climate is milder. Because the city is located in a region with extreme weather events and values in winter, it does not have a popular image in the respect of climatic characteristics for tourism and outdoor recreation activities which can contribute to the socioeconomic development of the region either by increasing working performance of the locals or attracting domestic and international tourists. Because of the importance of mentioned activities for the region, any scientific study shedding lights on future investments and projects for the development of tourism in the region is urgently needed and may help smooth the inter-regional development disparities.

Due to the importance of the relationship between climate and these activities, numerous studies have been carried out on the subject e.g. Scot et al (2004a) reported in their bibliography over 200 references from academic journals, books, government and university reports, and conference proceedings from early 1900's to 2004, excluding the non-English research literature. Several researchers have recently been spending efforts to study the matter in details such as Hamilton and Lau (2004), Gomez Martin (2005), Nikolopoulou and Lykoudis (2006), Nikolopoulou and Lykoudis (2007) , Hein (2007), Matzarakis et al. (2007), de Freitas et al. (2008); Cengiz et al (2008), Amiranashvili et al. (2008), Mishev and Mochurova (2008) Perch-Nielsen (2008). Zaninovic and Matzarakis (2009), Lin (2009), Lin et al. (2011), Lin and Matzarakis (2011), Chronopoulos et al. (2012), Matzarakis et al. (2012).

According to Cengiz et al. (2008), several indices have been developed over the last 30 years to assess the suitability of climate for tourism activities (e.g. Pegay 1961; Heurtier 1968; Besancenot et al. 1978; Mieczkowski 1985; Becker 1998; Scott et al. 2004; Morgan et al. 2008) while Amiranashvili et al. (2008) stated that there are more than 200 climate indices in applied climatology and human biometeorology, which can more or less give interpretations about tourism climatology.

Climate is effective also on tourism as it is on other human activities and it can both serve as potential or be perceived to be obstacle for tourism. Therefore, climatic conditions are beginning to be among the most important criteria for the popularity of tourism destinations. The aim of this study is to reveal the suitability of climatic conditions of Erzincan for the touristic activities it has potentials since the province is included by a tourism development strategy prepared and implemented by a regional development agency (RDA) for recreational and tourism purposes using a new and complete tourism climate index; Climate-Tourism-Information-Scheme (CTIS;

Matzarakis 2007). As the result of the study, some suggestions were offered in order to develop tourism in the region. In addition, the study is important since it may be among the first studies which was carried out in Turkey to determine a city's climatic features for tourism and recreation.

STUDY AREA

The city of Erzincan, at an average elevation of 1.185 m, is in the north eastern part of Turkey (39º 02', 40 º 05' N and 38º 16', 40º 45' E ; Fig.1).

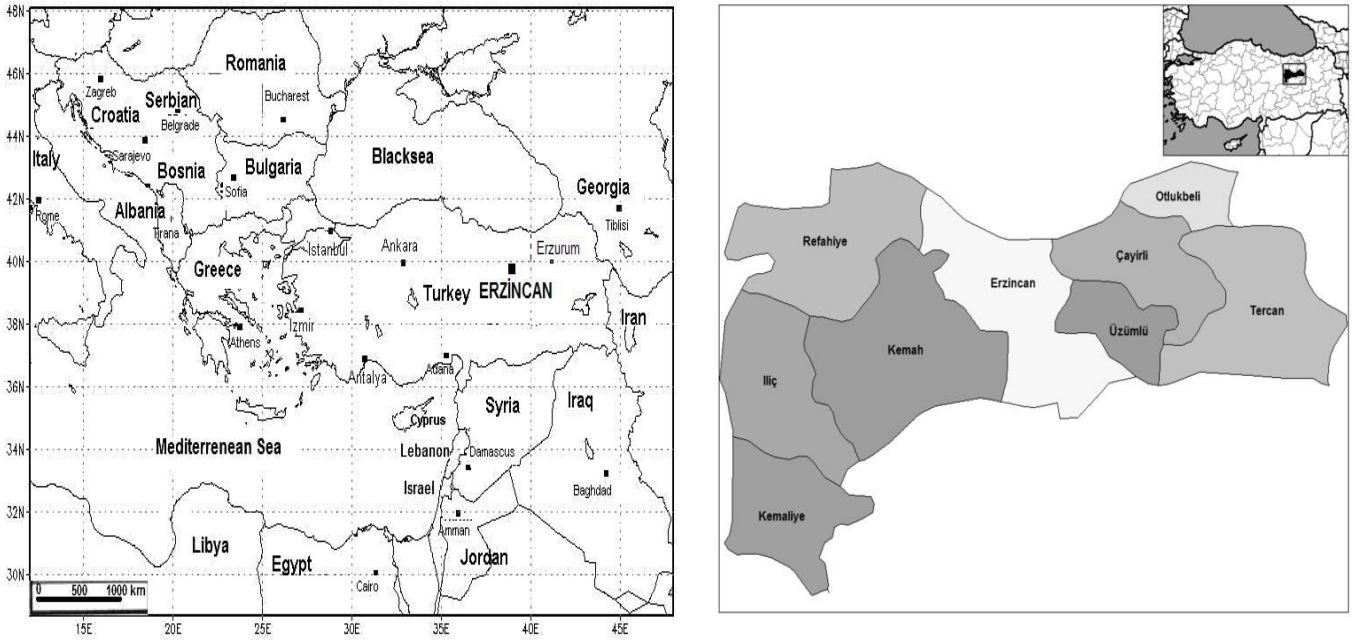

Figure 1. Location of Erzincan in Turkey

The provincial part of Erzincan is covered mainly by mountains and highlands, which account for 60 % of the area (Environmental State Report of Erzincan 2005). Centre of the city is located nearly on the North Anatolian Fault, which is known to have caused more than 30 quakes since 1268 A.D. Due to the emigration and earthquakes, the size of human population in the city centre is smaller compared to other cities in the region and the country. According to the census conducted by Turkish State Statistics Institution based on addresses in 2013, population of the city centre was found to be 96,474 (TurkStat 2013). The city of Erzincan has considerably large green area amount per capita (11.1 m²), which is among the largest in Turkey (Environmental State Report of Erzincan 2005). In the city, there is no important industrial area except for light industries, e.g. one sugar beet processing factory, one steel and iron products factory, a few flour and floury product factories, a few animal feed factories, a brick production facility, a dairy product factory and a plastic product factory (Environmental State Report of Erzincan 2005).

Although the city is located very near the Blacksea geographical region of Turkey, which receives the largest rainfall in the country and where mean temperature is higher than that in the city due to marine effect, it is closed to this effect because of its topography mentioned above. Therefore, the city has the characteristics of continental climate.

The city has high tourism and recreation potentials with the activities such as rafting, water skiing, paragliding, trekking, mountaineering and camping, skiing, hunting and fishing, jeered, hot waters (Bulut and Yilmaz 2008). The city has also cultural and historical potentials with ancient cities, (Altıntepe, an Urartian city dating back to 8th century B.C.) fortresses (Kemah fortress, dating back to Hittite – Urartian ages), mosques, tombs and religious facilities, (tombs of Terzibaba, Hıdır Abdal Sultan and Melik Gazi; Gülabibey mosque, Mama Hatun complex; Abrenk church). Natural ponds, (Otlukbeli pond, Girlevik waterfall, Aygır lake, Ekşisu, (Böğert Mineral water) ice cave, Ala cave, Köroğlu cave. This condition of the city can offer vast range of opportunities for people performing both tourism and recreation activities.

METHOD

In the study, Climate-Tourism-Information-Schemes (CTIS) of Matzarakis (2007) was used as an assessment tool to define the tourism climate characteristics of the study area. In order to assess the climate of a place for tourism purposes, many calculation formulas and indices have been produced to give direct and simple opinions about the subject and to facilitate interpretation of the integrated effects of a range of atmospheric elements and permit the measurement and rating of climate conditions for tourism (de Freitas et al. 2008).

From the early tourism climate indices to date, main components of the formulas are main climatic parameters (e.g. monthly mean for maximum daily temperature, mean daily temperature, minimum daily relative humidity, mean daily relative humidity, total precipitation, total hours of sunshine, average wind speed; Mieczkowski 1985; de Freitas et al. 2008) in addition to human thermal conditions, which serve as the basis of indices. Therefore, thermal comfort indices used in the tourism climate indices are very important to reveal the potentials of the climate of the studied regions for tourism and recreation. However, in some studies, (Scott et al. 2004; Perch-Nielsen 2008), it can be seen that thermal comfort index of original tourism climate index was modified or completely changed. Climate-Tourism-Information-Schemes (CTIS) of Matzarakis (2007) does not have such a weakness since it utilizes Physiologically Equivalent Temperature (PET), one of the most widely used thermal comfort indices in tourism and climate studies (Lin and Matzarakis 2008) and considering all the effective parameters on human thermal comfort (for details see Matzarakis and Rutz 2005; Matzarakis et al 2005; Matzarakis 2006; Matzarakis and Gulyas 2007; Farajzadeh and Matzarakis 2012). While proposing CTIS, Matzarakis (2007) considered:

a) Basic and available parameters (air temperature, air humidity, wind speed, precipitation) on daily basis,

b) High temporal resoluted information in decades (separation of months in three intervals),

c) Analysis of climatological and human-biometeorological conditions based on frequency classes and threshold values,

d) Consideration of thermal comfort, heat stress, cold stress and "sultriness" based on human-biometeorological thresholds and human energy balance i.e. PET,

e) Consideration of precipitation and its amount and type i.e. snow cover, dry days or wet days,

f) Consideration of fog and sunshine/cloudiness conditions,

g) Consideration of high wind conditions.

h) Consideration of snow cover.

When these terms are considered for the climate of a place, almost its every aspect can be evaluated for tourism and recreation. This method uses the decas (ten day intervals) of a month in order to give best time – resolution to detect at least some of the extreme events experienced daily. Since mean values of climatic variables can give no realistic results or opinions, this method combines maximum and minimum daily values with means putting threshold values for the classification. In this way, all the climatic parameters thought to be effective in a given study area on tourism and recreational area, e.g. snow cover or rainfall, can be included in the evaluation either in the combination of the prepared diagrams or schemes or discreetly. All favourable or unfavourable climatic and bioclimatic parameters can be presented in percentages in a distribution scheme combining these parameters with decas. Additionally, the frequency of extreme events is or can be implemented. The inclusion of parameters depends on whether or not they are important for a particular region in a seasonal or annual manner (Matzarakis 2007).

For the study area, the following threshold criteria (in Table 1) have been chosen as in Matzarakis (2007) for Heraklion (Greece).

Table 1. Effective Parameters and Their Threshold Values in CTIS (Matzarakis 2007; Matzarakis and Endler 2009)

Effective parameters	**Threshold values**
Thermal acceptance	PET between 18 °C and 29 °C
Heat stress	PET > 35 °C
Cold stress	PET < 8 °C
Cloudy	> 5 octas
Fogy	based on relative humidity > 93 %
Sultry	based on vapour pressure > 18 hPa
Dray	precipitation < 1 mm
Wet	precipitation > 5 mm
Windy	wind speed > 8 m/s
Ski potential	Snow cover >10 cm

The separated presentation and implementation of individual factors and facets allows the CTIS to provide a detailed description including information on different uses in tourism climatology (Matzarakis 2007). In this respect, because the study area has the potential of winter tourism and planned winter tourism areas, percentage distribution of snow cover was added to the scheme.

PET values were calculated using air daily means of air temperature (Ta; °C), relative humidity (RH; %), wind speed (WS; $m.s^{-1}$) and cloud amount or ratio (CA; octas; i.e. the ratio of cloud amount to full sky, which is considered to be 8 octas) which were taken hourly; and one of the recently used radiation and bioclimate models, RayMan (Matzarakis et al. 2007 and Matzarakis and Rutz 2005), which is well-suited to calculate radiation fluxes (e.g. Mayer and Höppe 1987).

Data

According to mean meteorological values measured in urban station between 1975 and 2011, mean yearly temperature in the city is 10.9ºC; the coldest month of the year is January with a mean temperature of -2.9 ºC while the warmest is July with 24.1ºC; maximum temperature ever recorded in the city is 40.6ºC while minimum is -26.7 ºC. Annual rainfall is 376.4 mm, and mean annual relative humidity is 62.6 %. Mean yearly wind speed is 1.5 m/sec, prevalent wind direction is ENE, and the second prevalent is WSW. Mean annual daily sunshine duration is 6.3 hours.

In the assessment of climatic features of the study area for tourism and recreation, all the effective climatic elements on the two activity types were taken into consideration and their all year distributions were determined using ten – day intervals covering whole year. Results were obtained from the analysis of daily data from the meteorological station in the city of Erzincan operated by Turkish State Meteorological Service for the period 1975 to 2008. Figure 2 represents the decal and percentile distributions of physiologically equivalent temperature (PET) during the mentioned period. Mean, maximum and minimum PET values were found to be 4.5, 27.3 and -28.2 ºC, respectively.

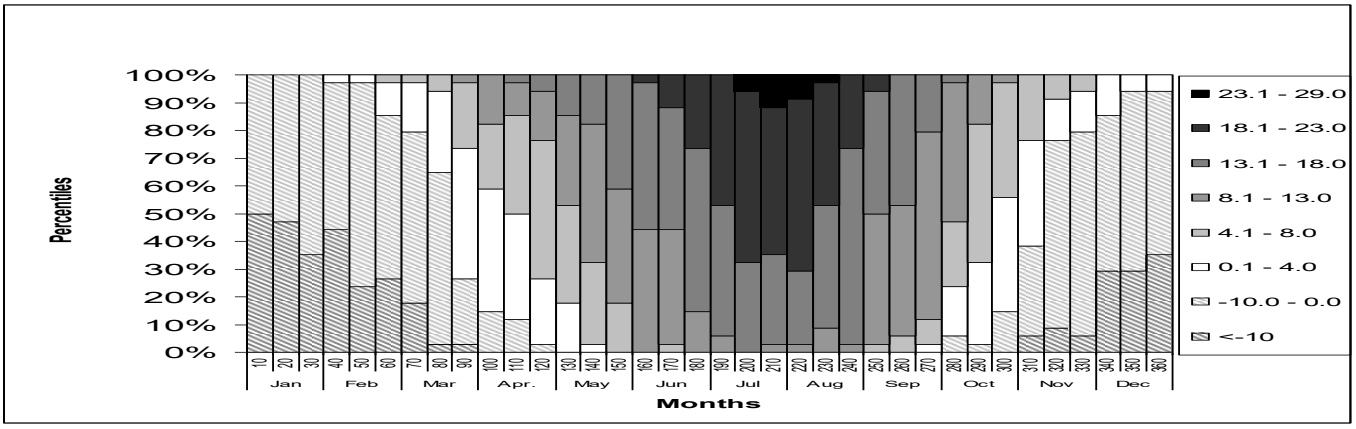

Figure 2. Whole Year PET Distribution of The Study Area

In figure 3 and 4, trends and distribution of related climatic elements with tourism are presented.

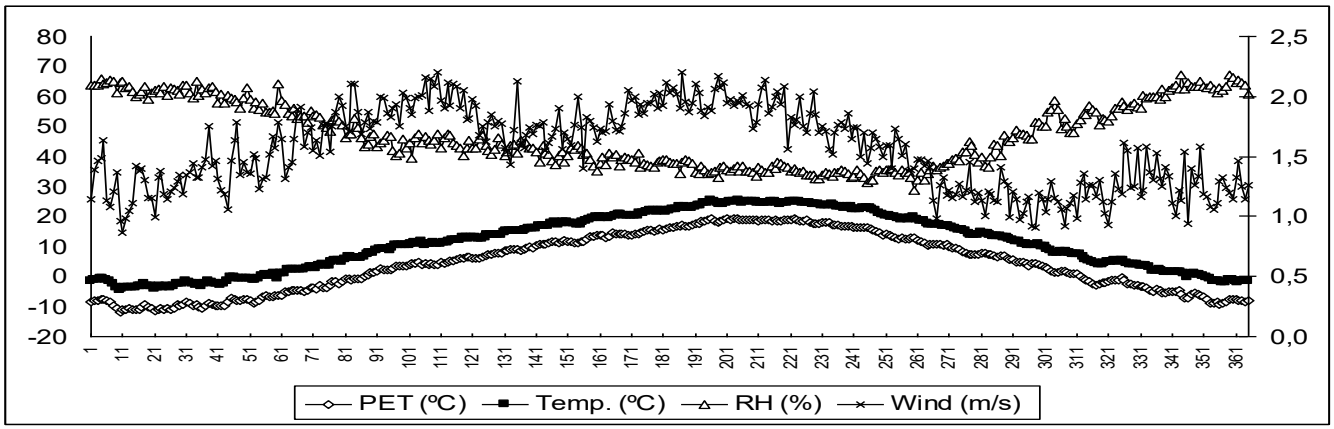

Figure 3. Whole Year Distributions Related Climatic Parameters

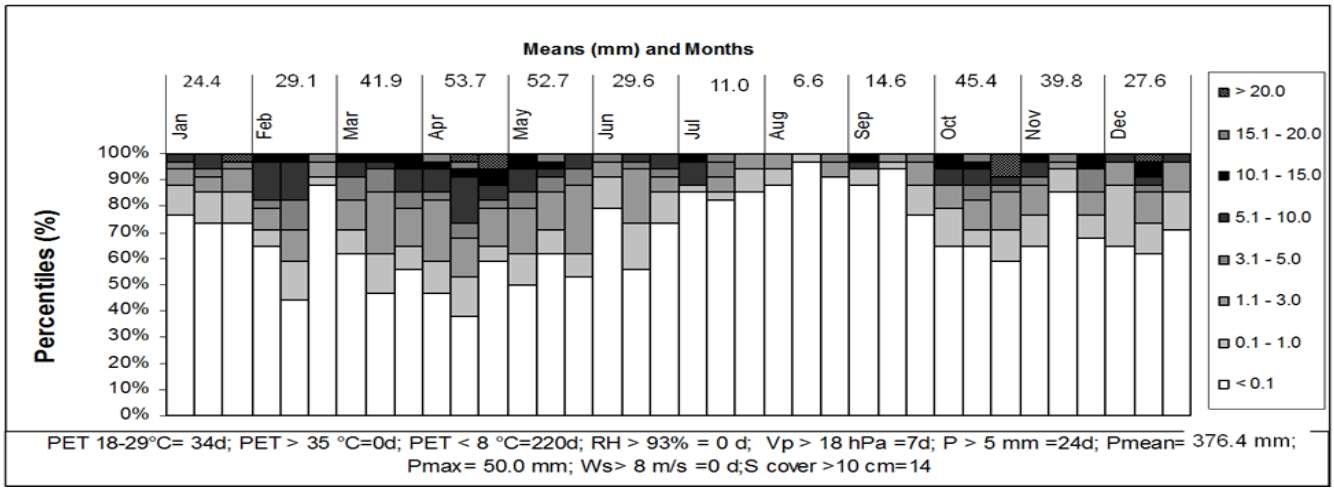

Figure 4. Whole Year Distribution of Daily Precipitation

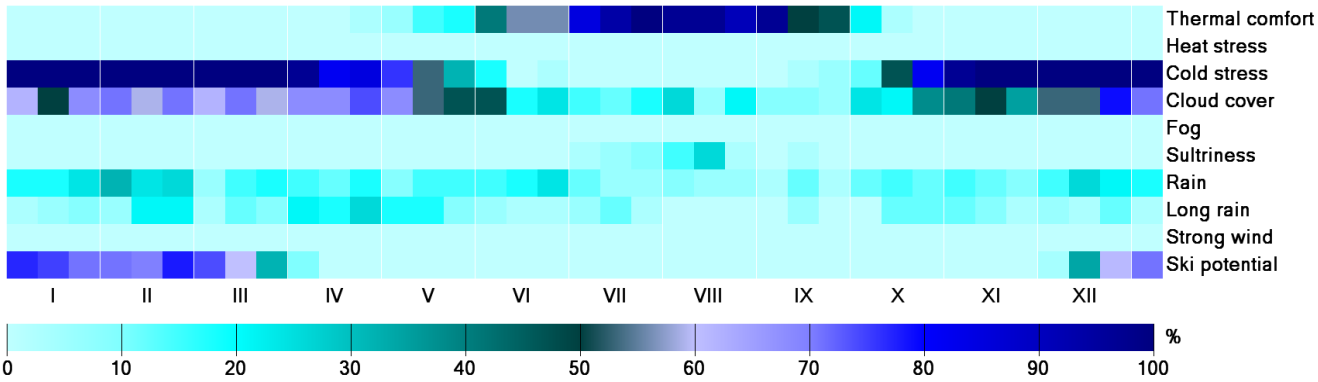

Figure 5. Decadal Distribution of Considered Parameters in CTIS

Figure 5 represents decal distribution scheme of main climatic parameters considered in the tourism climatic index.

DISCUSSION

From the results, it can be seen that favourable PET values coincide with the possible tourism and recreation period from May to October and in that period, which is suitable for tourism and recreation, people may not face thermally uncomfortable situations. Values of air temperature, wind and PET increase in spite of the decrease in relative humidity in the tourism and recreation period, however comfort conditions remain in comfortable ranges due to the lower humidity and higher wind velocity.

From the distribution and mean values of parameters, it can be said that the area represents the normal rainfall pattern of the region in Turkey, where much of the rainfall is received in spring months. This condition of the study area means that in tourism and recreation period especially from June to September, there is no emergency condition caused by excessive rain or other extreme conditions. In this respect, evaluated parameters show the suitable characteristics of the study area for tourism and recreational activities in a long period ranging from spring to mid-autumn. During the considered period, comfort ranges are suitable and no heat stress is experienced. Cold stress is prevalent generally in winter time and wet period. Presence of cloud cover in hot days is an advantageous condition in hot period and no foggy weather condition is seen whole year, which is a favourable condition for

those who may be interested in photography. Sultriness conditions are seen in only three decas in the related period caused by high water vapour pressure because of high temperatures. No heavy rain is seen in the period and wind condition is generally in the desired ranges. An additional parameter was added to the index, the number of snow covered days with more than 10cm, which may be necessary for skiers since there is a ski centre in the proximity of the city. Distribution of this parameter shows that the area can serve for the winter tourism either with its untouched nature or snow cover.

Studies on the determination of climatic characteristics of specific places have been carried out for some time in the world and Turkey (e.g. Matzarakis et al. 2005 for Crete, Greece; Matzarakis 2007 for Heraklion, Greece and Matzarakis and Karagülle 2007 for Istanbul, Turkey). In such studies, almost every effective parameter on tourism and recreation was evaluated and their trends and distributions were detected. However, this study is the first to be carried out in Turkey to determine a city's climatic features for tourism and recreation since the index used was shaped after the mentioned study.

CONCLUSION

This study shows that the study area with its distinct nature and high tourism and recreation potentials has also suitable climatic characteristics for these activities. Therefore, using suitable advertising and infrastructural investments the area should be made ready for tourism and recreational activities. In the completion of deficiencies in infrastructures, landscape architecture works should be used and suitable landscape planning and designs should be taken into consideration.

As it is evident that earth's climate has changed and it drops some effects on some parts of its surface, almost all human activities are to an extent affected by this change. Tourism is both a vital and fragile sector being very sensitive to every type of outer effects including climatic and bioclimatic conditions. Therefore, knowing the climatic conditions of an area to be suitable for the desired touristic activities is really a good and advantageous situation for a destination. In this respect various measures or indices have been developed to grade climatic conditions of the areas for tourism activities.

The study suggest that tourism climate indices should be easy to use for both researchers and users in addition to giving satisfactory results. The index used in the study, CTIS, is a very easily applicable index and every type of climatic information considered to be necessary for the studied areas can easily be added to the index as in the present study.

This study is important since it can prove that a newly developed tourism climate index, CTIS, can give best results in the studied area, in addition to the area it was used first. Therefore, it can be used more widely considering different parts of a country and the world to give opinions to related people about their destinations for both tourism and recreation activities.

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