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Comparing the effect of climate condition on tourism calendar in arid and humid cities using Holiday Climate Index (HCI) (Case Study: Isfahan and Rasht)

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Abstract

Climatic conditions have a major influence in attracting tourists to a city in different months. In this study, the potential of Isfahan and Rasht as arid and humid cities, respectively, was investigated in terms of attracting tourists during a year. For this purpose, the Holiday Climate Index (HCI), which has been designed based on daily climate information, was used. The results showed that in Isfahan, with rising air temperature and reducing air humidity in March, April and May, the mean value of HCI is more than 69 and climatic condition is "very good". Also, from September 14, the value of HCI reaches above 69 and shows "very good" condition and this condition continues until the end of October. Therefore, these two periods are the best times for presence of tourists in Isfahan. In Rasht, in April and May, because of climate variables suitability (sunshine hours, cloudiness, and weather temperature) in comparison to other months, the mean value of HCI is equal to 66 (acceptable). It seems that the stable climate condition and therefore HCI value provide a suitable period for tourism in Rasht. In other months, because of high humidity and precipitation, the value of HCI is less than 60.

Keywords: Air humidity; Air temperature; Climate; Index; Thermal comfort

1. Introduction

One of the largest economic factors in the world is tourism which contributes significantly to national and local economies. In Other words, tourism is one of the largest industries in the world. The latest United Nations World Tourism Organization (UNWTO) report estimated that one-seventh of the world's population will cross international borders for tourism purposes in 2012 (United Nations World Tourism Organization, 2012). Destination attractiveness is considered as 'pull' factors which usually involve the effective characteristics such as climate, historical, accommodation, and cultural resources (Crompton, 1979). The firmly relationship between a destination attractiveness and climate to tourists has been ascertained by many researches. Some definitions of climate as a tourism resource include: it is free, renewable and non-degradable (Gomez-Martin, 2005).

Climate has an important influence for tourists' decision-making process and length of holiday season. Also, it is a significant parameter considered by the tourists especially for the purpose of travel planning and an initially motivator (Scott *et al*., 2012). Climate has three facets including thermal, physical and aesthetic components (de Freitas, 2003). The thermal component relates to the thermal comfort of tourists; the physical component involves precipitation and wind, and may act as limiting factor for tourist activities. The aesthetic component includes cloud cover, sunshine, and fog (Andriotis, 2005).

The evaluation of climate resources for tourism purposes was dominated by two major approaches: generalized approaches that "portrayed climate for tourists in simple

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descriptive terms" and numerical indices (de Freitas, 2003). Because climate as a tourism resource is multi-faceted and involves a complexity of weather variables (de Freitas *et al*., 2008), so developing multi-faceted numerical indices for assessing tourism climate has been proposed. Also, it provides a holistic interpretation about climate condition of destination and facilitates the comparisons between destinations. The usual climate information supplied to tourists includes daily air temperature, humidity, precipitation, sunshine duration, wind speed, UV-radiation and air pollution. The information is usually presented in the form of climatic averages, which is less meaningful to most users. In other words, climate information provided to tourists by weather stations is inadequate to satisfy tourists' needs and is hard to understand by the users. Due to the intricate nature of climate, a numerical index integrating all facets of climate relevant to tourism is introduced. Such numerical indices are user-friend and can easily interpret the climate condition. Several climate indices have been introduced and developed by researches. Some of these are Tourism Climatic Index (TCI) (Mieczkowski, 1985), Physiologically Equivalent Temperature (PET) (Hoppe, 1999), Beach Climate Index (BCI) (Morgan *et al*., 2000) and Climate Index for Tourism (CIT) (de Freitas *et al*., 2008). Among these indices, the TCI has been widely used to evaluate the climate suitability for tourism in the world (Scott *et al*., 2004; Amelung *et al*., 2007; Moreno and Amelung, 2009; Perch-Nielsen *et al*. 2010; Ping Lin and Matzarakis, 2011). Despite the TCI's wide application, various researchers have noted different deficiencies for the index. First, the TCI's rating system was designed solely based on Mieczkowski's (1985) own expert opinion and the limited available bio meteorological literature at the time (de Freitas *et al*., 2004, 2008). Second, thermal comfort has been assigned more weight in the index, so the numbers of very good, good, and acceptable days for tourist activities are more than those of other indices (de Freitas *et al*., 2004, 2008). A low temporal resolution (monthly average climatic data) is the third deficiency of TCI (Yu *et al*., 2009, Perch-Nielsen *et al*., 2010).

Hein (2007) investigated the comfort condition in Spain using the TCI and resulted that the summer season has the most climate suitability for tourist activities. Farajzadeh and Matzarakis (2009) determined current climate conditions in the northwest Iran and the most suitable months by combining the TCI and the PET. Roshan *et al*. (2009) used the TCI to identify the effects of urban sprawl of cities on TCI oscillation in Tehran. They found that the urban sprawl of cities had a negative effect on the TCI. Amelung and Moreno (2009) used the TCI to examine current and future climatic suitability in the whole Europe. The results showed that summer of northern Europe will experience more favorable conditions than southern Europe for tourism. Kovacs *et al*. (2017) applied the TCI for the quantification of the climatic potential in Hungary in its original and modified forms. This modified version was suitable to reflect the seasonally different thermal perception patterns of Hungarian residents. The results indicated that, according to both versions of TCI, tourism climate conditions will likely to improve in the shoulder seasons and deteriorate in summer, remaining still at least acceptable for outdoor tourism purposes.

Esmaeeli *et al*. (2011) evaluated the comfort climate conditions of Rasht and Isfahan cities in Iran using daily data of 1961-2006. They used the PET and concluded that the period of comfort climate in these cities is short and divided to two separate periods in the beginning of spring and fall seasons. Ghavidel-Someesaraee (2014) using TCI studied the relationship between the climate conditions and tourism pattern of Rasht city in 2002-2011. The results showed that May has a suitable condition for tourism in this city. Bazdar and Nosrati (2015) investigated the effect of climate conditions on annual ecotourism in the Rasht city using TCI for 1990-2010. They concluded that June with TCI=81 has the best condition for tourist attraction. Nasabpour *et al*. (2017) using TCI investigated the role of climate in tourism seasonality in Iran. For this purpose, they selected 54 weather stations and concluded that April and October with a good potential are the best time for tourism during the year. In January and February, potential of TCI decreased and the lowest area was located in suitable class.

In addition to the above mentioned researches, the tourism status of other cities in Iran and other countries has also been investigated using TCI as well as other methods (e.g. Bakhtiari and Bakhtiari, 2013; Kovacs and Unger, 2014; Mubarak Hassan *et al*., 2015; Seyedi and Dalfardi, 2015; Amini *et al*., 2016; Andelkovic *et al*., 2016).

Recently, a new index, named Holiday Climate Index (HCI), has been introduced by Tang (2013) for investigating the effect of climate condition on tourism calendar. HCI is a daily-scaled index and therefore, has more accuracy than TCI and describes the climate

conditions in more details. Tang (2013) and Scott *et al*. (2016) conducted comprehensive study on climate suitability for tourism in 15 cities of Europe using HCI. The results showed that all of the cities located in the north, west and east of Europe have summer peak' climate distribution curve. In these regions the value of HCI is higher than 50 during a year indicating the acceptable climate condition. In the south regions, the cities mainly have similar climate condition, but Madrid, Rome and Athens have bimodal-shoulder peaks. In these cities, the value of HCI in late spring and early fall is higher than scores of the summer (Tang, 2013; Scott *et al*., 2016).

Limited researches have been conducted about evaluating daily climate adaptation using the HCI for tourism purposes in Iran and the world. The aim of this study is to investigate the potential of climate condition of Isfahan and Rasht cities as representatives of two different climates in Iran for tourist attraction. For this purpose, a proper tourism calendar was introduced using the HCI. The results of such studies could be used to manage the tourism tours programs and improve the quality of tourism services.

2. Materials and Methods

Isfahan and Rasht are respectively capitals of Isfahan and Gilan provinces in Iran. These two cities are located in the center and north of Iran, respectively (Fig.1). Isfahan is the cultural heritage pole and one of the biggest cities of Iran. Also, this city is introduced as the cultural capital of the Islamic world. Due to the variety of historical, cultural and economic attractions, the Isfahan city has the high potentiality for tourist attraction. Also, Rasht city is one of the important ecotourism destinations in Iran and attracts many tourists because of its natural resources. Therefore, it seems necessary to understand the holiday season duration and to plan properly for tourism activities in these cities. In this research, daily climate data of 2000-2010 was used to study of Isfahan and Rasht cities. The geographical coordinate and climate type of the cities are presented in Table 1.

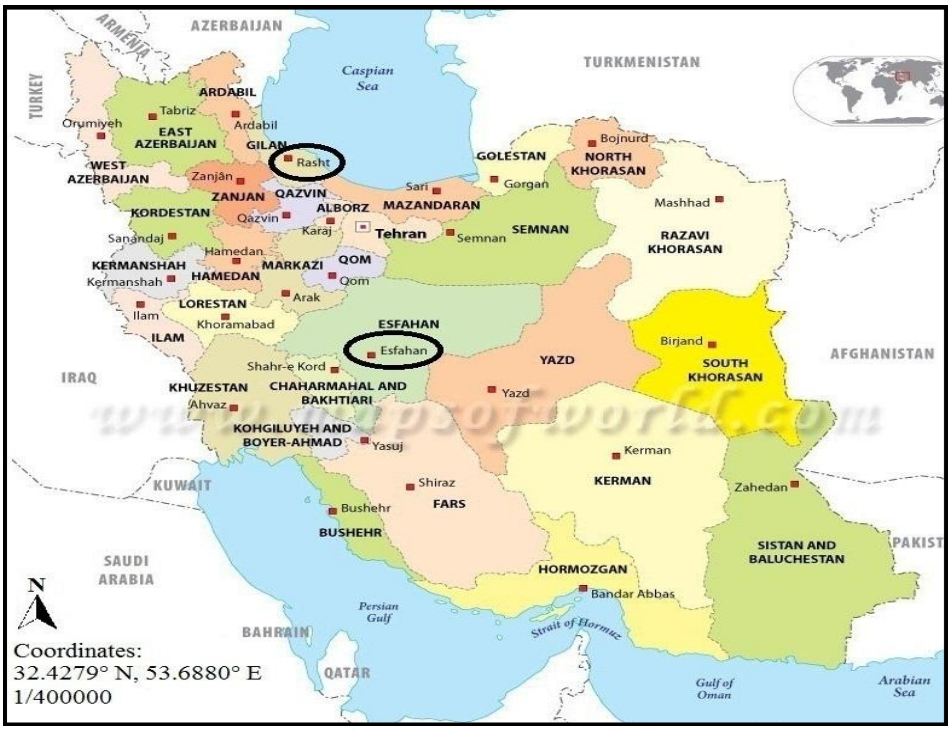


Fig. 1. Map of Iran with two cities selected for this study

Table 1. Geographical positions and climate classification of Isfahan and Rasht cities

City	Longitude	Latitude	Elevation from sea level (m)	Climate classification
Esfahan	51º 40'	32 º 37'	1550	arid moderate
Rasht	49º 39'	37 º 12'	36	humid subtropical

2.1. Tourism Climate Index (TCI)

Mieczkowski (1985) developed an index to evaluate a destination's climatic suitability for tourism and designed the TCI to integrate all climatic variables relevant to general tourist activities. TCI have five climatic variables including Daytime Comfort Index (CID), Daily Comfort Index (CIA) precipitation (P), hours of sunshine (s) and average wind speed (w). The CID presents the level of daytime climate conditions when maximum tourists' activities occur and includes maximum daily temperature and minimum daily relative humidity. The weight of this sub-index in the TCI equation is 40% to reflect the fact that tourists are most active during the day. The CIA assess the thermal comfort over the 24 hours includes mean daily temperature and mean daily relative humidity. The weight of this sub-index in the TCI equation is only 10%. In the TCI equation, monthly precipitation (P) is used and its weight is 20%. The hours of sunshine (s) is used as mean monthly and has the weight of 20%. The value of wind is presented in the form of mean monthly wind speed with the weight of 10% in the TCI equation. Rating of each sub-index was assigned to obtain the TCI value (equation 1) between 0-100. More details and descriptions about rating of the sub-indices and TCI have been given in the Mieczkowski (1985).

$$TCI = 2(4CID + CIA + 2P + 2S + W) \quad (1)$$

2.2. Holiday Climate Index (HCI)

The Holiday Climate Index (HCI) has been designed based on at least one decade researches with the purpose of overcoming identified deficiencies and limitations of TCI (Scott *et al*., 2004; Rutty and Scott, 2010 and Moreno, 2010). The HCI includes five climatic variables related to the three facets essential to tourism: thermal comfort (T), aesthetic (A), and physical (P) facets. The five climatic variables of HCI are maximum air temperature and relative humidity (T), cloud cover (A), precipitation (P) and wind (W).

The two variables of the maximum air temperature and relative humidity related to thermal comfort which has the weight of 40%. The cloud cover (A) is related to the aesthetic facet and the HCI assigns 20% of its weight to this component. The variables of precipitation (P) and wind (W) are related to the physical facet and their weights are 30 and 10 percent, respectively. The HCI rating is calculated using the following equation (Tang, 2013):

$$HCI = 4T + 2A + (3R + W) \quad (2)$$

2.2.1. Thermal comfort (T)

The thermal comfort representing physiological and psychological sense is determined using the maximum air temperature and relative humidity from Figure 2. In the HCI, the overnight temperatures are not considered and the maximum daily temperature is used for describing the thermal comfort, because it represents the thermal conditions during the time of day when the maximum tourists' activities happening (Tang, 2013).

2.2.2. Cloud cover (A)

The cloud cover is considered as a negative factor in comfort climate because of its effect on the psychological state and quality of photography. However, this variable causes feeling coolness and a pleasant sense. In the HCI, the daily cloud cover percent is used and the rating of the sub-index is obtained from Table 2 (Tang, 2013).

2.2.3. Precipitation (R)

Total precipitation and its time distribution has significant effect on the climate comfort. Generally, precipitation is considered as a negative factor in tourism climate. A continuous rainfall with mild or moderate intensity is more difficult to endure than a short-term showery rainfall. In the HCI, the rating of precipitation is reduced with increasing its value, indicating precipitation's negative impact on the tourism pleasure (Tang, 2013).

2.2.4. Wind (W)

The role of wind in the tourism climate is complex and important. The wind due to evaporation and cooling has positive and negative effects in the hot and cold climates, respectively. Climate comfort reduces with increasing of the wind speed and so, this parameter is considered as a negative factor (Tang, 2013).

Each climatic variable is rated on a scale of 0 to 10, and the overall HCI index score is 0 to 100. Finally, the classification of HCI is done by using Table 3. The rating of the sub-indices in this method is based on extensive and comprehensive studies (Scott *et al*., 2004; Wirth, 2009; Rutty and Scott, 2010; Moreno, 2010). One the main advantages of HCI is that the weight of physical aspect (40%) is equal to

that of thermal comfort (40%), in order to considering the effect of precipitation and wind parameters in inappropriate physical conditions (e.g. storm and heavy rain). In order to capture the overriding effect when the physical facet is so poor, it overwhelms even pleasant thermal and aesthetic conditions (e.g. during rain storm of very high winds), the precipitation and wind rating schemes decline rapidly and have sufficient weighting in the index that a high HCI score cannot be achieved with low physical facet score (Tang, 2013).

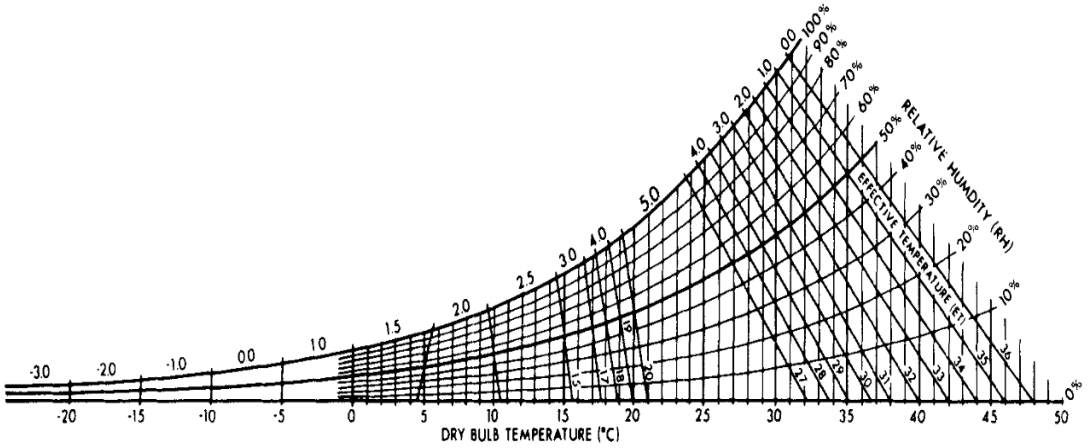


Fig. 2. Classification of thermal comfort based on the maximum air temperature and relative humidity (Mieczkowski, 1985)

Table 2. HCI's rating scheme (Tang, 2013)

Rating	Wind Speed (km/hr)	Daily Cloud Cover (%)	Daily Precipitation (mm)
10	1-9	11-20	0
9	10-19	1-10 21-30	<3
8	0 20-29	0 31-40	3-5
7		41-50	
6	30-39	51-60	
5		61-70	6-8
4		71-80	
3	40-49	81-90	
2		>90	9-12
1			
0	50-70		>12
-1			>25
-10	>70		

The HCI has a high temporal resolution because it uses daily climate data. This use of daily resolution data as important for all sub-indices, but especially of precipitation, as tourists not only want to know the amount of rain in a given month of a place, it is also important for them to aware the incidence and intensity of the rain (Tang, 2013).

Table 3. Rating categories of HCI (Tang, 2013)

HCI Score	Descriptive category
90-100	Ideal
80-89	Excellent
70-79	Very good
60-69	good
50-59	Acceptable
40-49	Marginal
30-39	Unfavorable
20-29	Very unfavorable
10-19	Extremely unfavorable
9- -9	Impossible
-10- -20	Impossible

3. Results and Discussion

3.1. Isfahan

In Table 4, the daily values of HCI and their ratings in Isfahan have been presented for different months of the year. In the winter, due to cold weather, the mean value of HCI in December and January is about equal to 63 and climatic condition for tourism is in the category of "good". In the late winter (February), with the apparent increase in the air temperature and decrease in the air relative humidity, the mean value of HCI has increased to 68. In this month, almost 8 days are in the category of "very good" (HCI>70), but this condition is not stable and changes alternatively to the "good" condition.

In the spring, the HCI value of all the three months is more than 69 and it indicates the "very good" climate condition. It seems that from early spring, the stable weather condition contributes to stabilizing the HCI value and therefore, tourists experience suitable condition in Isfahan. It is worth noting that May, having HCI=75, is the best month of spring for presence of tourists in this city. Spring coincides with the new year holidays of Iran and so, managing the tourism programs must be considered in this season.

With the arrival of summer, due to extreme increase of air temperature (averagely 5 ºC), a downward trend happens in the tourism climate conditions of this city. The increasing in the temperature of this season relative to the comfort temperature causes declining in the tourism climate trend. The mean value of HCI in summer is 67 ("good" climate condition).

The above conditions still continue until mid-September in fall months. Almost from mid-September, with cooling the weather and 4 ºC reduction in weather temperature, the HCI value increases again and reaches to "very good" condition. This condition continues until the end of October. The HCI value exceeds from 79 in some days of October (7 days) and overall, this month with mean HCI of 78 is the best month of fall for tourism in Isfahan. The results of HCI for climate condition of Isfahan city are in a good agreement with the results obtained by Omrani and Yazdanpanah (2011) and Ataei and Hasheminasab (2012). Omrani and Yazdanpanah (2011) calculated TCI in Isfahan province for years 1976-2005 and resulted that May and October are the best months for tourism in Isfahan city. Ataei and Hasheminasab (2012) investigated the comparative study of human bioclimatic in Isfahan city using TCI, PET and PMV and concluded that May and September are the best months in terms of comfort climate in this city.

3.2. Rasht

Daily values and rating of HCI of Rasht city for different months are shown in Table 5. In December and January, because of the cold weather and persistent rainfall, the average values of HCI are equal to 48 (marginal) and 50 (acceptable), respectively. In February, with relative increasing of temperature, the average value of HCI reaches to 55 and "acceptable" climate condition. In this month, 14 days are in "acceptable" condition, but this condition is not stable and alternatively changes to lower condition (marginal).

In March, the mean maximum monthly temperature increases as much as 5 ºC and the HCI value reaches to 57, but the climate condition is still in the "acceptable" condition. In April and May, with tangible improving of climate variables (sunshine hours, cloudiness, and weather temperature), the mean value of HCI is equal to 66 (acceptable). It seems that stable climate condition and therefore, HCI value provide a suitable period for tourism in Rasht. Thus, this period is the best time for the presence of tourists and tourist programs should be considered. Hormozan *et al*. (2013) investigated the tourism climate conditions of Rasht city using the TCI for years 1990-2010. They concluded that spring is the most proper season for tourist activities, showing a good agreement with the present study.

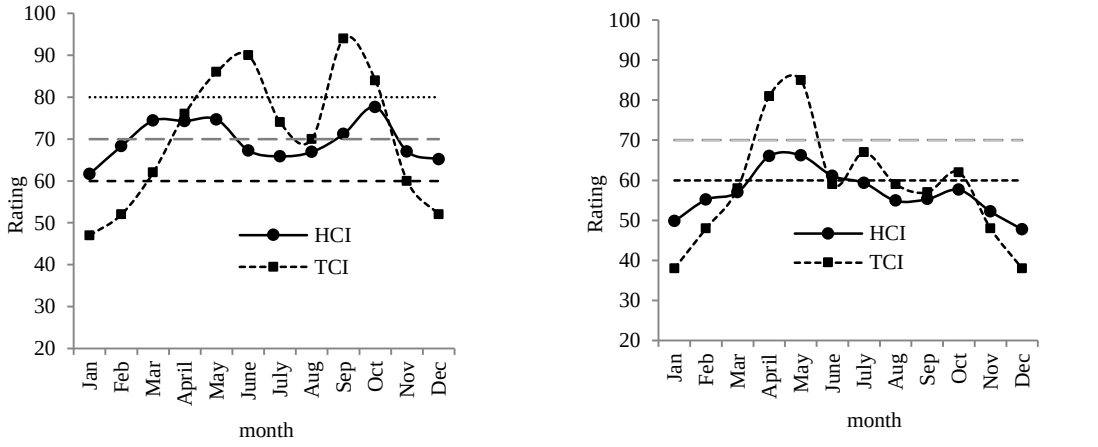
With the arrival of summer, due to relative increase of temperature (6 ºC), a descending in tourism climate condition occurs and the condition is still "good" (HCI=61) in June. In July and August, the climate conditions are "acceptable" with the mean HCI equal to 59 and 55, respectively. The first month of fall (September) with HCI=55 has the same climate condition as August. In October, with decreasing maximum temperature (as much as 6 ºC) the HCI value reaches to 58 (acceptable). However, in some days of October (8 days), the climate condition is "good" with HCI>60. In November, temperature extremely decreases and the HCI value reduced to 52. It should be noted that about one-fourth of this month's days have "Unfavorable" climate condition.

The annual HCI and TCI distribution for the two cities are shown in Figure 3. In Isfahan, both the HCI and TCI distributions are "bimodal-shoulder peaks". The peak values of TCI are more than 80 ("excellent" climate condition), but the HCI peak values are less than

80 ("very good" climate condition). Also, the peak months of TCI are June and September, which are different from those of HCI. HCI distribution is smoother than that of TCI, such that its peak values are in March, April and May (spring) and October. Also, in cold months (January, February, March, December and November), HCI is more than TCI. Generally, the thermal comfort sub-index has the highest weight in TCI, causing the warm months have a high TCI and the cold ones have a low TCI. For example, in TCI distribution, July has a "very good" climate condition, while this month is a very warm month and actually is not suitable for tourist activity. However, July in HCI distribution has a "good" climate condition which is closer to reality.

In some pervious researches, the tourism climate distribution (bimodal-shoulder peak) is similar to that of Isfahan. Tang (2013) investigated the climate conditions of different Europe cities and showed that HCI distributions in Rome, Athens and Madrid have 'bimodal-shoulder peak' shapes. Also, Scott *et al*. (2004) examined the effects of climate change on tourism calendar. They concluded that New Orleans, St. Louis, Charleston and New York represent a bimodal HCI curve, because of their pleasant spring and fall weather.

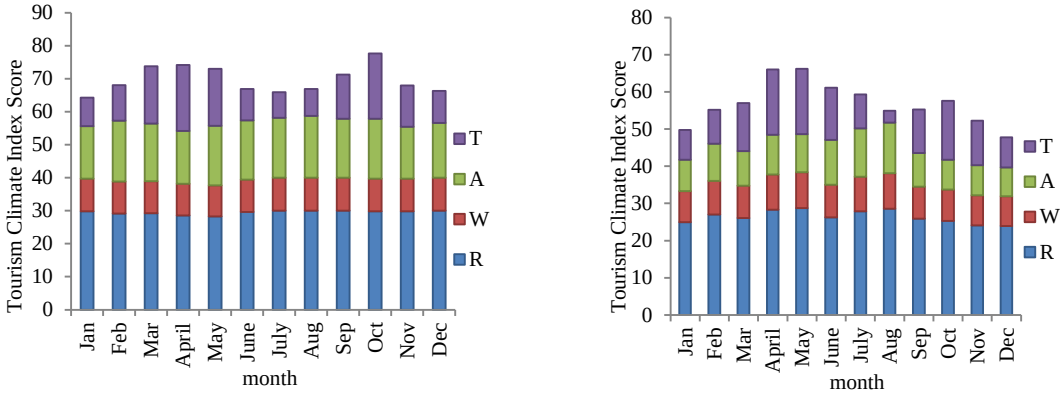
In Rasht, both the HCI and TCI distributions follow none of those introduced by Scott and McBoyle (2001). The HCI distribution has two peaks while the TCI distribution has three peaks and in both distributions the first peak is the higher one. Also, the first peak of TCI (85) is much more than that of HCI (66). However, the peak months of both distributions are almost the same. In HCI, the first peak is related to April and May months. In June and July, a nearly stable climate condition prevails with the mean monthly HCI equal to 60. The second peak has a lower value than the first one and don't reach to 60 (in October).



(a): Esfahan (b): Rasht

Fig. 3. Monthly HCI and TCI values of Isfahan and Rasht

Figures. 4.a,b illustrates how the contributions of the sub-indices change from month to month at Isfahan and Rasht and the disparate climatic strengths of the two cities. In Isfahan, the thermal comfort (T) sub-index has the most effect on the change of HCI during the year. The most values of T are in the two periods including March-April-May and September-October. In June, July and august, by increasing the maximum temperature and decreasing the thermal comfort, the HCI value are reduced. The cloud cover, wind and precipitation sub-indices have a constant positive effect on HCI during the year. In Isfahan, due to the low precipitation, the values of this sub-index are more considerable compared to three other sub-indices. In Rasht, similar to Isfahan, T is the most effective sub-index; its most values belong to April, May and October. In this city, because of the continuity of precipitation, values of the cloud cover sub-index decrease compared to three other sub-indices in all of the months. Also, the wind and precipitation sub-indices have a constant positive effect on HCI.

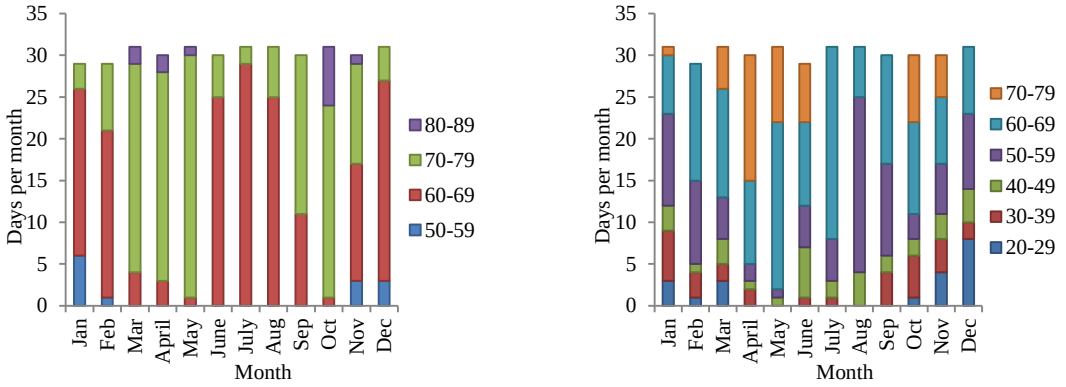


(a): Esfahan (b): Rasht

Fig. 4. Monthly HCI sub-index distribution

Figures 5.a,b show the mean number of days per month for each sub-index in Isfahan and Rasht. In Isfahan, in the late winter, the days with "very good" climate condition increase and during spring reach to the maximum value. In spring, the number of days with "very good" condition is equal to 79 days. In summer, "very good" climate condition extremely decreases (7 days). In the first two months of fall, the number of days with "very good" condition increases and reaches to 42 days. In October, the "excellent" climate conditions (7 days) occurs. Based on the results of Figure 5 and Table 4, it could be noted that during two continuous periods including spring and 49 days of fall, the "very good" and better conditions (HCI>69) prevail in Isfahan. These two periods are the best times for the tourism activities in this city.

In Rasht, the "excellent' climate condition is not seen in none of the months of the year. April and May, having respectively 25 and 29 days with "very good" and better conditions, are the best months. The climate condition of this city is not proper for tourism in winter especially in its first two months. In these months, the number of days with "marginal" and lower conditions (26) is more than those with "good" and better conditions (16).



(a): Esfahan (b): Rasht

Fig. 5. Mean number of days per month for each sub-index in Isfahan and Rasht

4. Conclusion

The knowledge of environmental potential could cause improving and stabilizing the tourism conditions in each area. Climate comfort is one of the most important issues that help tourists in choosing their destination and travel planning. In this research, the climate condition of Isfahan and Rasht cities in tourist attractiveness was investigated using HCI. The results showed that the comfort climate sub-index has the most influence on the HCI variation in Isfahan and Rasht. The tourism climate curve of Isfahan has a "biomodal-shoulder peak" distribution. In this city, spring and two months of fall show a "very good" climate condition for tourism. In Rasht, because of the vast variation of the climate parameters (humidity and temperature) during the year, the HCI distribution has not a regular shape. In this city, only April and May months have a "good"

Table 4. HCI's rating score for different months of year in Isfahan

Month \ Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan	70	61	63	68	64	58	40	64	62	58	51	58	34	64	62	68	61	64	66	68	66	70	62	68	66	66	50	56	65	68	70
Feb	66	65	66	68	68	68	66	68	68	68	68	71	68	66	59	68	72	72	71	67	68	68	69	72	67	73	69	70	72		
Mar	74	69	73	73	70	74	78	78	78	80	78	75	74	75	64	72	74	74	67	75	68	76	78	76	80	78	76	72	78	76	73
Apr	75	80	77	60	60	78	76	68	73	75	75	74	66	75	76	73	70	76	72	73	76	78	75	77	75	78	80	78	75	75	
May	69	73	79	75	77	76	75	78	75	76	76	75	77	80	75	79	77	78	75	73	75	74	72	72	72	71	73	70	73	71	74
June	70	70	67	68	66	68	64	66	66	66	66	65	72	74	72	68	68	68	66	66	68	66	68	68	66	65	65	66	66	64	
July	64	68	64	64	64	62	64	66	64	64	64	62	66	64	64	64	66	68	68	70	68	68	68	68	68	70	66	68	66	66	66
Aug	68	66	66	64	64	64	66	64	66	66	64	68	66	66	64	66	66	66	70	68	70	70	70	68	66	68	68	70	68	70	68
Sep	68	70	68	68	68	68	68	68	70	68	68	68	68	70	70	72	72	70	74	76	74	74	72	74	72	76	76	74	76	76	
Oct	76	76	80	78	78	78	78	78	76	76	78	78	78	78	76	76	80	78	78	78	78	78	80	78	78	80	80	80	80	69	73
Nov	80	78	66	73	60	58	66	70	66	62	61	68	70	70	66	66	60	61	56	59	74	70	70	70	70	72	68	68	70	63	
Dec	59	68	66	61	61	68	70	64	59	63	61	65	67	65	59	62	66	68	68	68	68	68	64	66	63	61	70	70	66	68	70

Table 5. HCI's rating score for different months of year in Rasht

Month \ Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan	54	57	37	55	31	23	30	64	60	58	37	24	26	46	60	57	58	56	55	63	48	70	63	59	63	50	38	43	57	66	36
Feb	54	41	63	66	60	57	28	65	62	66	55	30	39	50	61	67	56	51	62	62	66	64	61	62	52	52	59	57	32		
Mar	51	52	74	63	75	69	54	26	43	64	68	50	39	26	27	42	68	61	66	71	74	67	53	38	69	69	65	61	74	68	41
Apr	61	72	56	36	47	76	70	72	67	72	74	72	74	76	68	57	33	68	66	61	71	70	69	76	66	72	73	74	66	66	
May	63	69	70	49	58	63	63	68	64	68	70	72	64	60	67	65	68	63	60	65	71	71	68	74	72	68	66	63	70	69	72
June	57	44	71	69	66	78	74	76	72	67	44	46	72	80	38	40	49	53	70	64	59	62	66	66	68	62	57	63	57	48	
July	46	46	61	61	63	63	62	32	60	64	58	64	64	64	58	60	64	64	62	53	55	62	66	64	62	62	58	60	60	60	62
Aug	60	58	58	53	50	41	58	62	54	54	60	60	57	43	56	56	55	60	56	56	58	55	58	60	56	46	53	50	48	58	38
Sep	36	34	55	60	58	54	34	47	54	52	33	55	46	60	61	63	59	59	58	66	68	64	66	64	62	62	61	53	53	62	
Oct	39	67	53	70	42	73	72	70	72	62	67	62	34	27	61	70	60	67	71	53	61	53	34	62	67	38	34	64	42	63	47
Nov	32	60	59	57	26	36	36	25	23	24	62	66	30	58	60	65	72	48	56	72	74	74	52	61	66	74	40	43	56	60	3
Dec	43	25	61	66	66	43	62	34	26	32	26	28	58	62	24	28	27	49	58	60	58	48	58	59	59	23	59	59	63	56	61

Very Unfavorable (20-29)	Unfavorable (30-39)	Marginal (40-49)	Acceptable (50-59)	Good (60-69)	Very good (70-79)	Excellent (80-89)

climate condition for tourism activity. This study is one of the first index comparison research and more efforts are needed in the future to conduct research on comparison of indices in many climatic locations

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