STATISTICAL IDENTIFICATION AND QUALITATIVE EVALUATION OF CLIMATE TOURISM POTENTIAL BY USING TOURISM CLIMATE INDEX - TCI ON THE EXAMPLE OF HERZEGOVINA-NERETVA CANTON

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Climate characteristics of a certain tourist area, region or place have a direct and indirect impact on tourism development and tourism in the area. The climate is a direct tourist value if it is used for heliotherapy or winter sports in the snow, and indirect when influencing on hydrographic objects, geomorphology of the terrain, wildlife, causing their individual tourism component. How climate characteristics determine the water temperature, appearance and growth of vegetation, habitat requirements of humans and animals, the characteristics of the snow cover, the length of the winter ski and summer swimming season, the smooth flow of traffic and other it is of utmost importance of climate knowledge when it comes to tourism research. Additionally, climate of coastal destinations, spas and mountain areas have a stimulating and sedative influence on the human body, and they are recognized as a basis climatotherapy.

The frequency of occurrence of certain weather conditions affecting the appropriation of the most appropriate time of year for tourists in some tourist destinations as well as the variety of activities, using different content and movement of tourists within a tourist destination. Attractive values of climates of Herzegovina-Neretva Canton can be best seen by calculating the Tourism Climate Index (TCI). One of the favorable climatic characteristics of the tourist destination is one of the most important factors of tourist attractions. After the intensity of action climate can be complementary tourism resource or it may act independently, with regard to its recreational characteristics.

***Keywords**: tourism resources, climate, tourism, Tourism climate index (TCI), Herzegovina-Neretva Canton*

INTRODUCTION

Climate of geographical region or location is defined by an average or intersection of meteorological weather over long periods of time, which is not shorter than 30 years, as defined by World Meteorological Organization and we call that the standard climate (Spahic, 2004.). Climate is defined by meteorological variables and phenomenon and the two most important variables are air temperature and precipitation, although other variables are taken into consideration if needed, such as: humidity, atmospheric pressure, winds, overcast etc. Definition of climate and climate types, subtypes and classes, implies that climate factors which transform the main climate variables and phenomenon, and by that means they transform, change and reshape their quantitative and qualitative data, have to be taken into account. This is especially emphasized if the climate and climate types are in transition from zonal to high-latitude features.

Although in most international tourism literature the term tourism demand focuses on economy variables (Crouch, 1994; Lim et.al., 2008), climate is identified as key initiator in the domain of tourism and of the most important attributes of destinations (Hu & Ritchie, 1992). Climate represents the main resource for tourism, for example in the case of "sun and beach" tourism (Kozak et. al., 2008), or it acts as series of factors, which indirectly depend on the effects that climate has on tourism, and in that way allows different kinds of tourist activity (Martin, 2005). While Barbados is selling "nice weather" with money-back guarantee (Scott & C. Lemieux, 2009), other significant tourist destinations have found a way to turn potential deficiencies to their advantage. For example, Tarifa town in Spain has capitalized on frequent and strong winds, which are unfavorable to "sun and beach" tourism and in that way, became a tourist Mecca for board surfing (Martin, 2005).

Geographical studies in the domain of tourism have over many years as an ultimate goal had qualitative estimation of climate attributive factors for potential or existing tourist activity in a tourist destination. On the basis of research by many authors in aforementioned evaluation, a number of climate elements is to be included, such as: air temperature, chill effect, humidity and longevity of insolation. Other climate elements, like wind speed or snow levels, can also be extremely important for certain tourist recreational activity. The goal is to unify all climate factors in one index, which gives an indication about climate suitability of destination for different tourist activities.

One of the most important climate indices was developed and explained by Z. Mieczkowski (1985), the so called Tourism Climate Index (TCI), which unifies seven climate variables for potential valuation of climate. In recent times further classification has been conducted and new index CTI (Climate Tourism Index) was introduced, which unified thermal, aesthetic and physical aspect of climate (de Freitas et. al., 2008).

Besides climate conditions in tourist destinations, domicile climate in places which represent potential tourist locations, is also important for developing tourism. (Maddison, 2001). Unfavorable nature of climate or bad weather conditions in potential tourist locations, whether in the year of actual travel or in the year before (Agnew, Palutikof, 2006), acts as a push factor for tourists to travel to warmer and more arid locations (Lise & Tol, 2002). Average summer temperature warmer for only 1°C in tourist destination of Canada resulted in rise of tourist spending by 4% (Scott et.al., 2008). Recent studies has shown that favorable climate in a region of residence refers to higher probability of travel inside of a country, while unfavorable climate conditions raises chances for international travels.

Weather conditions, from tourism perspective, are extremely important for many reasons. First of all, weather determines which tourist activities will be practiced, and at the same time it can be a limiting factor. So, for example, wind speeds of 15 km/h prevents fishing or water-skiing, while sailing with a motorboat can be carried out even with the wind speeds reaching as high as 50 km/h (Moore, 1988). Weather also effects the comfort of tourist activities, and therefore satisfaction of tourists can be largely dependent on weather and climate conditions. It is important to mention that tourist safety is also dependent on weather, as is in the case of bad weather conditions, tornadoes, typhoons, avalanches, heat waves, etc.

The best example of tourism dependency on weather conditions is ski tourism. Reliability of snow precipitation predisposes the possibility to ski. Ski resorts can accept tourists when the snow depth is more than 30 cm, when the temperature doesn't rise above 10°C in two consecutive days followed by rain, or when in one day falls over 20 mm of rain (Scott et.al, 2006). During ski season with low snow depth, 49 % of skiers in Switzerland would change the destination of their ski resort, 32 % would ski less often, while only 4 % of tourist would not ski at all during such season (Buerki et. al., 2003). Recent empirical research in North America have confirmed that the minimal and maximal temperatures, depth of snow and wind speeds are statistically related with a number of sold tickets for ski lifts (Shih et.al., 2009). Ski resorts in Switzerland are considered reliable for ski season planning if in the 7 out of 10 winters snow depth is higher than 30 cm during an uninterrupted interval of at least 100 days, from 1st of December until 15th of April. Tourist entrepreneurs in Finland consider that winters with an average duration of 90 to 120 days are economically justified and profitable. (Tervo, 2008).

Different climate characteristics of Herzegovina-Neretva Canton in interaction with other factors of geographical area cause the character and nature of tourist trade. Positive and negative effects of Herzegovina-Neretva Canton climate are best evaluated by calculating Tourism Climate Index (TCI).

TOURISM CLIMATE INDEX - TCI

Tourism Climate Index (TCI) is a composite measure of climate favorability for developing tourism and tourist comfort in certain tourist locations. Even though that climate is only one of variables which encourages people to travel, many tourists are completely motivated by climate characteristics of an area they are traveling to. Even tourists, whose motives for traveling are certainly (non)climate related, have an interest in choosing a time to travel when the climate characteristics of the location are most favorable, as is the case with educational or cultural tourism. This information is found in the Tourism Climate Index (TCI), especially for international tourist travels and tourists who, maybe, do not possess knowledge about climate conditions that prevail in different parts of the world and in the different time of the year. If tourists have a desire to visit a certain area, they can choose a time of the year when the climate conditions, by their standards, are optimal. Alternatively, if tourists have predefined holiday period, they can choose a destination which offers the most favorable climate conditions.

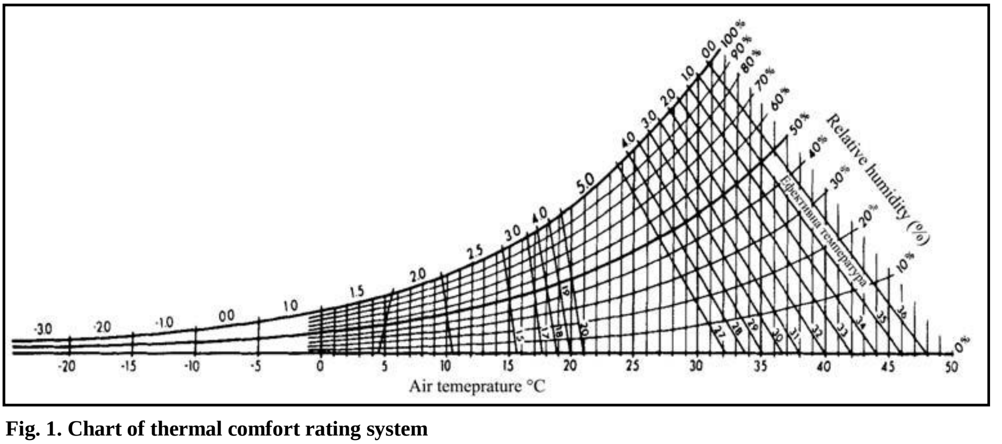

Fig. 1. Chart of thermal comfort rating system

Source: (27, 19)

Tourism Climate Index (TCI) as a bioclimate indicator is conceptualized by Mieczkowski (Mieczkowski, 1985), that would establish a connection between climate and physical comfort of tourists. It represents a quantitative and qualitative method for evaluating climate data for the benefit of tourism. By TCI calculation, both the significance of the climate as a tourism resource and geographical conditions that are specific to the tourism regions during the seasons, are emphasized. It includes a thermal (temperature, humidity and wind) and aesthetic (precipitation and insolation) component of the effect that climate has on tourism. For index calculation, seven variables are used and they are recorded on a monthly basis (maximum daily air temperature, average air temperature, average daily humidity, summation of precipitation, daily insolation, and average wind speed).

The analysis of the thermal comfort, by TCI application, includes simultaneous estimation of two climate elements: temperature and humidity. Thermal comfort level is affected by 6 factors: air temperature, pressure of water vapor or relative air humidity, radiant temperature, wind speed, clothing insulation and level of activity that affects the amount of heat produced inside the human body. Different combination of the 6 variables contributes to the different level of thermal sensation. Only two of the mentioned variables, air temperature and relative air humidity, are taken into account in TCI calculation, while others are considered as constants.

Thermal comfort reflects the human body reaction to the connection between air temperature and humidity. Additionally, thermal comfort is defined as psychological and physiological variable. According to the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), thermal comfort is defined as the condition of the mind, which expresses satisfaction with the thermal environment. On the basis of the afore mentioned definition, it is difficult to measure thermal comfort, but for the practical purpose, thermal comfort represents the condition of thermal equilibrium in which a person can't say if they prefer warmer or colder environment. This is the reason why it is presumed that the thermal comfort is equal to the thermal equilibrium.

In literature that deals with these issues, level of thermal comfort (discomfort) is measured by the comfort index. That's a variable which is defined as "psychophysiological feeling of an average person at certain temperature and humidity (Terjung, 1966). That's the reason why the term effective temperature (ET) was introduced, which in a simplified way makes the unique index of temperature and relative humidity. In other words, effective temperature represents the temperature which person feels in reality, at certain combination of temperature and relative humidity. Specification of effective temperature (ET) has been researched for almost a half of the century. The most precise diagram of the effective temperature has been published by the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) in 1974. Estimation of the thermal sensation system (thermal comfort) for the TCI formula is carried out by using the exact same afore mentioned diagram (Fig. 1.) A large number of researchers agree that the optimal thermal comfort for lightly clothed person that is sitting, at temperatures between 20°C and 27°C and relative humidity between 30% and 70%. Value of comfort index decreases at extreme values of relative humidity. Very high and very low values of relative humidity causes discomfort at any temperature value (Terjung, 1966).

A number of studies related to effective temperature research lead to the conclusion that relative humidity has significantly higher role at high temperatures. This is also reflected in the diagram (Sl. 1.) in the downtrend of effective temperature lines from right side the left side of the diagram. W.H. Terjung states: “ET lines (effective temperature), which in the warmer parts of the continuum have emphasized tendency and amplify the effect of high temperature and high humidity, have a tendency to do just the opposite at around 8°C towards (left) colder parts of the diagram.” (Terjung, 1966). Below 0°C, significance of relative decreases concerning the effective temperature.

Estimation of thermal comfort when calculating Tourism Climate Index (TCI) implies the calculation of both indices, which are dependent on average monthly values of temperature and relative humidity. First index, daily comfort index, represents the combination of variables of daily temperature and a minimum of daily relative humidity. Both values usually occur between 12:00 and 16:00 o’clock, as to say during the time when tourists have the tendency to be most active outdoors. That’s the reason why the daily comfort index is considered as the most important indicator of climate potential. Daily comfort index accounts for 40% of the total TCI formula.

Second index represents so called all-day (24 hours) comfort index which is a combination of two different variables – average daily temperature and average daily relative humidity. This index accounts for only 10% of the total TCI formula, because it reflects the conditions of thermal comfort during a 24 hours period, including the night period, when most of the tourists are indoors.

Value of these two indices is calculated using a diagram of thermal comfort (Sl. 1.), by combining different values of temperature and humidity. That way, for example, a combination of average daily air temperature of 28°C with 30% of average relative humidity gives a maximum value of index at 5,0. Identical temperature with relative humidity of 40% gives a value of index at 4,5, with 70% of relative humidity only 3,5 and so on.

Third important meteorological element for TCI calculation is precipitation, which has a significant impact on climate comfort, no matter if it’s an amount of precipitation or their distribution in certain time periods. Long lasting moderate rain, even though they contribute very little to the total annual amount of precipitation, from tourism aspect, are more unfavorable than short term period with high intensity precipitation. Amount of average monthly precipitation and precipitation index values in the TCI formula, are given in table 1. Values of precipitation variable accounts for 20% of the total value of TCI.

Table 1. Valorization of precipitation variable for calculating TCI

Average monthly percipitation	Value
0 – 14,9 mm	5,0
15 – 29,9 mm	4,5
30 – 44,9 mm	4,0
45 – 59,9 mm	3,5
60 – 74,9 mm	3,0
75 – 89,9 mm	2,5
90 – 104,9 mm	2,0
105 – 119,9 mm	1,5
120 – 134,9 mm	1,0
135 – 149,9 mm	0,5
>150 mm	0,0

Source: (8, 226)

Solar insolation also represents an important climate variable, which is estimated within a TCI calculation. Value of insolation, as stated by Z. Mieczkowski in his study about climate index: “… I adopted an average daily duration of insolation in hours, as a value for calculating the TCI. Value is calculated by dividing an average monthly insolation expressed in hours with number of days in corresponding month.” (Mieczkowski, 1985) Scale of values of average daily duration of solar insolation for calculating the TCI is given in table 2. Similarly as in precipitation evaluation, duration of daily insolation accounts for 20% of the total TCI formula.

Wind is one of the most complicated climate variables for TCI calculation. It plays a crucial role in thermal comfort of human organism, because it accelerates the heat transfer caused by turbulence, and accelerates the evaporation. During a lower and below zero air temperatures, wind increases the chill sensation, because it blows away the created microclimate i.e. saturated heated air, and thereby the cooling through the skin. During higher temperatures, between 24°C and 26°C, wind cools a human body similarly as body cools itself, because wind blows away overheated saturated air. In this way it is easier to restore evaporation functionality, and thereby skin cooling. When the air temperature exceeds the comfort temperature of the skin (>33°C), wind increases the feeling of discomfort by adding convective heat to the body.

Table 2. Valorization of insolation variable for calculation of TCI

Average daily duration of insolation	Value
>10 h	5,0
9 h – 9 h 59 min	4,5
8 h – 8 h 59 min	4,0
7 h – 7 h 59 min	3,5
6 h – 6 h 59 min	3,0
5 h – 5 h 59 min	2,5
4 h – 4 h 59 min	2,0
3 h – 3 h 59 min	1,5
2 h – 2 h 59 min	1,0
1 h – 1 h 59 min	0,5
<1 h	0,0

Source: (8, 227)

Afore mentioned facts lead to three conclusions about importance of constructing a rating system for wind speeds. First, wind is basically a negative variable, so the lower values should be correspondent to the wind speed increase. That especially applies to cold and moderate climates (excluding the warmest months with an average maximum temperature higher than 24°C). Second, for colder climate conditions it is desirable to have a second system for evaluation of wind speeds based on chill sensation rating, in which an average monthly wind speed is integrated with average daily temperatures. It is also concluded that the wind speeds above 5 m/s (or around 18 km/h) doesn’t have to be considered in the rating system, because they don’t significantly worsen the feeling of human discomfort. (Kandror, Demina i Ratner, 1974). Third, given that the higher wind speeds can be of a good use under certain conditions, it indicates that it is necessary to introduce another rating system for areas with a constant wind speeds, and for areas in which the average maximum monthly temperatures are slightly lower than the average temperature of skin comfort. These areas are specific for warmer climate regions, but they can also be specific for moderate climate areas. Scale of the rating system for wind speeds in different climate systems for calculating TCI is given in table 3.

On the basis of the stated above it can be concluded that for the purpose of TCI calculation, it is necessary to consider 7 climate variables, from which every variable represents an average monthly value: 1. Maximum daily air temperature (°C); 2. Average daily air temperature (°C); 3. Minimum daily humidity (%); 4. Average daily humidity (%); 5. Precipitation (mm); 6. Average daily duration of insolation (h) and 7. Wind speeds (m/s). First 4 variable are taken into account when calculating the thermal comfort, during which the variables 1. and 3. are combined in order to calculate the daily (during insolation), and variables 2. and 4. in order to calculate all-day (24 hours) thermal comfort.

Table 3.: Valorization of wind speed for different climate systems for calculation of TCI

Wind speed in km/h	Wind speed Beaufurt scale	Normal system	System of constant winds	Hot climate systems
<2,88	1	5,0	2,0	2,0
2,88 – 5,75	2	4,5	2,5	1,5
5,76 – 9,03	2	4,0	3,0	1,0
9,04 – 12,23	2	3,5	4,0	0,5
12,24 – 19,79	3	3,0	5,0	0
19,80 – 24,29	4	2,5	4,0	0
24,30 – 28,79	4	2,0	3,0	0
28,80 – 38,52	5	1,0	2,0	0
>38,52	6	0	0	0

Source: (8, 227)

When the mentioned tourism variables are weighted in accordance with their significance for tourist comfort, TCI formula has the following form:

$$TCI = 2Tk + Tk_{24} + 2R + 2S + W$$

In the formula:

Tk – daily comfort index,

Tk_{24} – all-day comfort index,

R – precipitation,

S – duration of insolation and

W – wind speed.

In the numerical sense, formula is multiplied by a factor of 2, so to have a percentage as a result. For example, with optimal rating of 5,0 for every variable, formula has the following form:

$$TCI = 2x[(4x5) + 5 + (2x5) + (2x5) + 5)] = 100$$ (Mieczkowski, 1985.)

Index values are rated in the following way: ideal time (index 90-100), excellent (80-89), very good (70-79), good (60-69), acceptable (50-59), possible (40-49), undesirable (30-39), very undesirable (20-29), extremely undesirable (10-19) and impossible (-30-9) (Mieczkowski, 1985.). In spite of its significance this index doesn't apply to all tourist activities. Sun bathing, skiing, swimming and hiking assume different climate conditions (S. L. Perch-Nielsen, B. Amelung, R. Knutti, 2010). With consideration to disadvantages of TCI method, such as extensiveness of results and low flexibility towards a variety of tourist activities, index for climate rating according to needs of majority of tourists was used, for those who practice light physical activities during their travels.

CALCULATION OF TOURISM CLIMATE INDEX ON THE EXAMPLE OF HERZEGOVINA-NERETVA CANTON

On the basis of available data, calculations have been done for average values of TCI on monthly basis for 8 weather stations in Herzegovina – Neretva Canton. Problems arose in Neum weather station, because of lack of time for meteorological monitoring, which is 7 years. That is the reason that data from Neum can be taken into account with great assurance, but they are absolutely valid as a guide mark for this problem.

Table 4. Average monthly values of climate variables in Herzegovina-neretva canton

		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Bjelašnica	Tmax	-4,9	-5,3	-2,9	1,9	6,6	11,1	13,8	13,9	8,9	5,3	1,1	-3,1
	Tsr	-7,4	-6,8	-5,0	-1,3	3,4	7,5	10,2	10,3	7,0	2,4	-1,2	-4,8
	rmin	40,8	42,0	44,2	37,8	39,7	39,9	35,4	29,2	32,2	26,8	24,1	29,8
	rsr	88	88	87	89	85	84	81	78	80	83	89	90
	R	184	181	203	205	169	147	107	106	135	186	163	181
	S	2,6	2,7	3,4	4,0	4,7	5,5	7,1	7,5	6,0	4,8	2,5	2,0
	W	13,3	14,0	12,9	11,9	9,6	8,8	8,0	7,7	8,6	9,9	12,7	13,1
Čapljina	Tmax	10,4	11,7	15,5	19,4	23,9	27,2	31,3	31,2	27,7	22,4	15,3	11,5
	Tsr	5,9	7,0	10,0	14,0	18,3	22,2	24,7	24,4	20,5	14,9	11,1	7,3
	rmin	29,6	33,1	23,0	26,5	30,4	28,7	28,8	25,8	30,2	34,4	29,5	33,5
	rsr	78	76	73	71	68	66	60	63	71	76	80	80
	R	132	127	103	76	65	58	32	52	82	110	158	161
	S	4,2	4,3	5,6	6,7	8,0	9,6	11,3	10,8	8,6	6,8	4,4	3,6
	W	1,8	1,6	2,3	1,9	2,1	1,9	3,2	2,2	1,6	1,7	2,0	2,1
Ivan sedlo	Tmax	1,6	2,2	6,6	13,2	18,1	21,5	24,0	24,4	18,6	13,2	8,3	2,5
	Tsr	-2,7	-1,2	2,7	7,5	11,8	15,3	17,9	17,5	14	9	4,1	-0,2
	rmin	42,0	36,1	27,1	26,4	30,4	36,4	32,8	30,2	36,0	33,0	33,6	45,2
	rsr	85	84	78	73	75	76	74	72	76	82	85	89
	R	133	148	124	117	108	117	94	93	104	133	194	208
	S	2,0	2,8	3,9	5,2	5,9	7,0	8,5	8,3	6,5	4,9	2,2	1,2
	W	9,1	6,9	8,7	8,3	6,2	4,3	4,5	4,1	4,9	5,2	6,1	6,7
Jablanica	Tmax	5,3	7,5	12,4	17,1	23,0	25,5	29,0	28,6	24,3	17,6	10,4	6,5
	Tsr	1,6	3,7	7,3	11,7	16,2	19,1	21,2	20,6	16,8	12	7,1	2,7
	rmin	43,1	39,3	30,8	25,4	29,3	30,0	27,5	31,4	32,2	37,4	43,6	46,6
	rsr	77	79	75	70	70	72	68	71	77	77	78	84
	R	177	171	167	161	107	104	64	101	101	184	342	365
	S	2,6	2,5	3,9	4,7	5,9	6,6	9,3	8,3	6,3	5,8	2,7	2,1
	W	0,9	2,1	2,2	1,9	0,8	1,1	2,4	2,2	2,8	1,4	1,2	1,8
Konjic	Tmax	6,4	8,9	12,6	17,1	22,1	24,5	28,9	29,2	25,0	18,9	11,1	5,8
	Tsr	0,8	3	6,5	10,6	14,8	18	20,1	19,8	16,3	11,4	6,6	2,2
	rmin	41,4	40,5	32,7	29,0	31,7	32,6	31,6	33,9	35,3	39,3	42,5	46,3
	rsr	78	74	75	71	75	68	68	68	70	74	77	78
	R	141	177	96	102	102	76	58	54	104	134	198	222
	S	2,3	3,2	4,2	5,1	6,3	7,8	9,0	9,2	7,4	4,5	2,0	1,7
	W	2,2	2,4	2,5	2,3	2,1	2,9	2,8	3,1	2,3	2,2	2,0	2,2
Mostar	Tmax	9,1	10,5	15,1	20,8	25,3	29,8	33,6	33,6	27,8	21,5	15,1	10,3
	Tsr	4,8	6,6	9,6	13,3	17,9	21,5	24,7	24,2	20,4	15,3	10,1	6,2
	rmin	21,3	24,6	18,6	19,7	24,8	27,7	21,3	20,6	23,8	24,5	28,6	25,3
	rsr	66	65	61	60	61	60	51	51	58	64	71	70
	R	163	150	134	123	92	84	46	62	99	136	220	230
	S	3,5	4,1	5,3	6,0	7,5	8,9	10,8	10,0	7,8	4,4	3,5	3,0
	W	3,1	3,3	3,2	2,6	2,2	2,4	2,9	2,7	2,5	2,6	3,0	3,0

Neum	Tmax	11,5	11,9	14,3	19,0	23,1	26,5	31,0	30,8	27,2	21,4	15,0	11,9
	Tsr	6,5	6,8	9,3	13,7	17,6	23,7	27	25,5	21,7	17	12,8	7,5
	rmin	25,5	26,3	21,5	31,8	32,0	35,0	28,0	32,8	31,0	27,3	28,3	28,5
	rsr	67	68	66	67	68	68	61	65	68	70	71	68
	R	133	94	124	76	84	35	33	40	96	140	178	214
	S	5,0	6,0	6,8	7,8	9,7	11,8	13,2	12,4	8,0	6,7	5,5	4,4
	W	1,8	1,6	1,4	0,9	0,8	1,4	1,6	2,1	2,0	1,3	0,9	1,2
Prozor	Tmax	4,9	6,8	9,7	14,5	19,7	22,4	26,1	26,3	22,5	16,9	10,0	5,6
	Tsr	0,0	1,7	4,9	7,5	12,5	13,4	17,2	16,6	12,7	9,2	3,9	1,0
	rmin	39,7	41,7	34,6	32,6	34,1	35,3	35,7	36,4	38,4	41,1	41,4	46,0
	rsr	80	79	75	65	68	69	66	64	72	77	81	83
	R	78	79	68	78	89	81	50	61	63	91	132	142
	S	3,2	3,8	4,4	5,2	6,2	7,4	8,9	9,3	7,3	5,4	3,0	2,5
	W	2,2	2,4	2,1	1,9	2,2	2,6	2,8	2,9	1,8	1,9	2,4	2,2

Source: (24, 25, 26)

Results show the weather and spatial variations of climate conditions for tourism throughout a year in the destination that is being evaluated (table 5). The effect of geographical factors on intensity and duration of desirable conditions for recreational tourist activities is self-evident.

Monthly TCI values of 8 analyzed weather stations range from 4 to 95, or from impossible to ideal weather. All weather stations expressed summer maximum and winter minimum of TCI. Similar relation, with maximum TCI during June, July and August, is apparent in most of the tourism regions in the Mediterranean, central and southeastern Europe (Amelung, Viner, 2006.; Perch-Nielsen, Amelung, Knutti, 2010). Therefore, in Herzegovina-Neretva Canton summer time is the most suitable season for tourism. Similarities are shown among weather stations on the coast and in relative proximity of Adriatic Sea on the one hand, and locations in the continental inland, on the other hand.

Table 5. Monthly values of Tourism climatic index – TCI in Herzegovina-neretva canton

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Bjelašnica	12	4	16	22	29	38	47	49	36	29	18	14
Ivan s.	24	24	31	42	54	72	78	81	55	42	24	21
Jablanica	32	31	38	45	71	77	84	79	71	52	37	31
Konjic	33	33	48	55	74	79	85	85	76	57	36	29
Prozor	39	43	47	52	71	76	84	83	79	54	41	33
Mostar	32	39	46	64	78	80	75	73	80	63	42	33
Čapljina	40	44	51	67	82	90	81	80	84	71	45	38
Neum	46	52	49	70	85	95	86	82	82	70	44	41

ideal weather (90-100) excellent (80-89) very good (70-79) good (60-69) acceptable (50-59) possible (40-49) unfavourable (30-39) very unfavourable (20-29) extremly unfavourable (10-19) impossible (-30-9)

RESULTS AND DISCUSSION

Through TCI values analysis it is quite apparent that favorability of climate for tourism development decreases as we go further from Adriatic Sea and with the increase of altitude. In accordance with this the most favorable climate conditions in Herzegovina-Neretva Canton are found in Neum, Capljina and Mostar. In other words, the most favorable climate potential for tourism development in Hezegovina-Neretva Canton is found in regions with Mediterranean climate. Maximum TCI values are recorded at the beginning of summer season, in June, when the weather conditions in Neum and Capljina are excellent. In the same month, weather conditions in Mostar are also excellent. It is important to state that in the period of five months, from May until October, in Neum and Capljina the weather conditions are excellent and ideal for tourism development. All of the above is in favor of the stated fact about a possibility of extending the summer swimming season to the spring and autumn months. Furthermore, TCI values show the potential of tourism development throughout a year, without seasons, because during a year there are no unfavorable or impossible weather conditions. The exception is December in Capljina, which has unfavorable conditions for accommodation and tourist outdoors activities (table 5).

Average climate conditions in Mostar are slightly unfavorable. Primary maximum of TCI is recorded in June, while the secondary maximum is in September, at TCI value of 80. Mostar also has emphasized climate potential for tourism development, especially if we consider that in the period from April until October (seven months) the climate conditions vary from acceptable to excellent for accommodation and outdoors activities. Undesirable weather conditions in Mostar are expressed in winter period and they vary from 32 in January, to 39 in February.

Excellent climate potential for tourism development are present in the valleys of Neretva and Rama, regions with moderately warm and humid climate of maritime variant. This fact especially applies to Prozor, where the TCI values during July and August exceeds the maximum values present in Mostar (Prozor max. 84 in July, Mostar max. 80 in June). Advantage of Prozor over Mostar, according to TCI values, is reflected in the fact that throughout the year TCI values with undesirable conditions are present in two months only (December and January). In this climate maximum TCI are present during the warmest month, July, when the value in Konjic is 85, and in Jablanica 84. Continuous period with TCI values ranging from possible to excellent in Konjic lasts from March until November, and in Jablanica from April until November. Minimum TCI values in Jablanica have the properties of undesirable weather conditions for tourism and they are present during a colder period of the year, from November until March. Period of bad weather conditions in Konjic is somewhat shorter and lasts for four months, provided that the TCI values in December have the properties of very undesirable weather.

TCI values for Ivan-sedlo, qualitatively, at least with respect to the warmer periods of the year, don’t lag behind regions with moderately warm and humid climate of maritime variant. Maximum TCI has been moved to August and it is valued at 81, which represents excellent weather for outdoor activities. Periods with favorable climate conditions (TCI values from possible to excellent) continuity lasts from April until November. Breaches of cold fronts from the inlands of the continent during the winter, condition significantly lower TCI values, in comparison with weather stations in lower hypsometric levels. TCI values of four months from November until February imply a very undesirable period for tourism development. TCI value of 31 recorded in March implies an undesirably weather for outdoor activities.

The most unfavorable climate characteristics, with respect to TCI values, are on Bjelasnica. Maximum TCI, similarly as on Ivan-sedlo, is recorded in August and it is valued at just 49. In other words, the month with the most favorable conditions for outdoor activities on Bjelasnica has the TCI values which imply at only a possible weather conditions for tourism development. Furthermore, throughout a year, only July has these kind of properties, while the rest of the year is dominated by unfavorable climate conditions for outdoor activities. The lowest TCI value on Bjelasnica is in February, with TCI value of 4. These low values of TCI, in accordance with the above stated classification, imply impossi-ble weather conditions for outdoor activities. Besides February, November, December, January and March have the properties of extremely undesirable weather conditions for tourist activities, while April, May and October have the properties of undesirable conditions, and June and September undesirable weather for outdoor activities.

CONCLUSION

South regions of Herzegovina-Neretva Canton, which are called Humine, Mostar plain and Neretva valley upstream to Konjic, have the properties of Mediterranean and modified Mediterranean climate. Opposite to that, higher hypsometric levels of analyzed area such as Prenj, Cvrsnica, Cabulja, Ivan-planina, Visocica, Velez, Bjelasnica, etc., have the properties of mountain climate. The best valued climate characteristics, using the TCI index method for calculations, are at the lowest hypsometric levels of Canton, such as Neum, Capljina, and Mostar. On the other hand, mountain regions, like the weather station on Bjelasnica, with respect to TCI values, have the properties of modest tourism climate potential. Regardless of which part of the Canton is the focus on, climate characteristics are more favorable during a warmer part of the year (summer-autumn), and they represent a tourism potential which can be evaluated for development of broad spectrum of tourism trade, such as: “sun and beach”, recreational, adventure, mountain, sightseeing, cultural, wine, and other tourism.

Maximum TCI values are recorded during the month of June, which is especially the case for Neum and Capljina, where the ideal weather conditions for tourism development dominate. At all of the weather stations inside of Herzegovina-Neretva Canton, with the exception of Bjelasnica, climate conditions vary from acceptable to ideal weather for tourism development, in continuous period of six months. On Bjelasnica, only during two months, July and August, favorable climate conditions are dominant for unhindered tourism activities. Stated variables refer to thermal comfort and outdoor activities in light clothes. Accordingly, that doesn’t mean that Bjelasnica has no potential for development of, for example, winter tourism, which implies outdoor activities, but in a suitable clothing.

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