THE CLIMATIC POTENTIAL FOR TOURISM ACTIVITIES OF THE ROMANIAN BLACK SEA COAST

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Abstract. The purpose of this paper was to evaluate the climatic potential for tourism activities in the Romanian coast of the Black Sea so that the development of the services in this domain becomes as lucrative as possible. It was thus observed that the impact of climate on tourism is manifested firstly at a psychological, bad weather becoming through its inconveniences an obstacle rarely overcome by the tourist. This paper emphasizes the degree of involvement of the main climatic elements such as nebulosity, frequency of precipitations and their aggregation state, air temperature, winds etc. in the definition of the notion of "good weather."

Key words: *tourism*, *Black Sea, balneary, thermal resources*

1. Introduction

The purpose of this paper was to evaluate the climatic potential for tourism activities in the Romanian coast of the Black Sea that may bring benefits through an important development of services. If the landscape provides the material support for all recreational activities, the climate imposes their "state." It generates the favourable or unfavourable "atmosphere" of the recreational activity, catalysing or, on the contrary, inhibiting its development. The absolute majority of tourists reduce the importance of the climate to the "good weather", whose frequency and duration are definitive for recreation and rest. It was thus observed that the climatic impact on tourism is manifested firstly at the level of individual psychology, the bad weather becoming, through its inconveniences, an obstacle rarely overcome by the tourist. This happens independently of the fact that all the other elements involved in the need for recreation or spa are functional, starting with the tourism attractions to the infrastructure or eventually to the tourism product. Several climatic elements are involved in the definition of the "good weather" such as: nebulosity, precipitations frequency and their aggregation state, air temperature, winds etc.

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2. Material and method

In order to analyse the climatic and tourism potential of Romanian coast of the Black Sea, the main climatic elements (nebulosity, rain frequency and intensity, air temperature and winds) with impact on tourism activities were analysed based on the data resulted from the recordings of 11 weather stations (table , fig.1). Among these, 12 had an observation period of 41 years (1965-2005), while six of them had a shorter observation period, between 10 and 21 years. Also, two representative indexes were used for the elaboration of this study: the balneary climatic index (I.C.B.) and the climate-tourism index (I.C.T).

Table 1: The weather station from Romanian coast of the Black Sea

| Weather station	Altitude	Latitude	Longitude	Period of
Sulina	3m	45°09'	29°40'	1965-2005
Sfântu Gheorghe	1m	44°54'	29°36'	1965-2005
Constanța	13m	44°13'	28°38'	1965-2005
Mangalia	6m	43°49'	28°35'	1965-2005
Valu Traian	56m	44°10'	28°29'	1965-2005
Jurilovca	38m	44°46'	28°53'	1965-2005
Gorgova	3m	45°11'	29°12'	1965-2005
Gloria	32m	44°31'	29°34'	1991-2005
Chilia	5m	45°25'	29°18'	1985-2005
Gura Portiței	2m	44°41'	29°00'	1985-2005
Mahmudia	168m	45°05'	29°04'	1992-2005
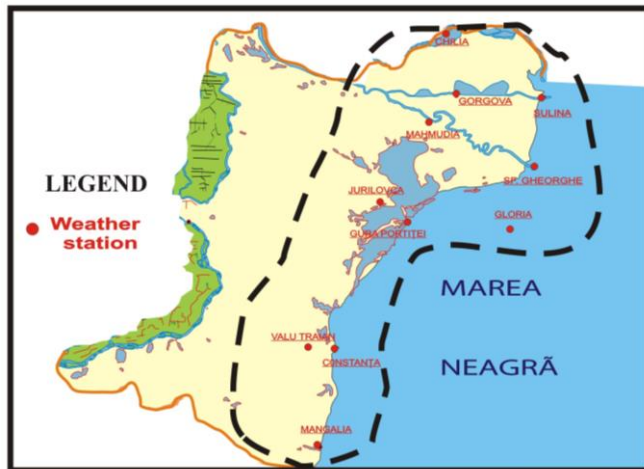
Figure 1: The location of weather station from Romanian coast of the Black Sea

3. The impact of the main climatic elements on the tourism activity in Dobrudja

Nebulosity. It is the factor that influences directly the sun shining, which is a vital parameter for the heliomarine cure in the littoral area. Nebulosity, when it does not occur excessively (when it is made up of thin clouds such as Cirrus), it has a positive role by diminishing the intensity of the caloric radiation in the afternoon. As shown in chapter no three, Romanian coast of the Black Sea has relatively small regional differentiations in terms of the

annual mean (tens) of nebulosity. Between 1965-2005, it varied between 5.0 tens in Mangalia and 5.6 tens in St. George.

Frequency and intensity of precipitations. Rain is also an immediate consequence of nebulosity. Rainy weather adds, at psychological level, extra stress determining the tourist to remain temporarily sedentary. However, in the littoral area, where the balneo-marine tourism is practiced, the particularly low quantity of atmospheric precipitations constitutes a climatic resource.

Air temperature is part of the equation only in case it manifests itself excessively. The scorching summer periods, with strong solar radiation, are as unfavourable to the recreation activities as the frosty winter time, with temperatures below -15°C. Apart from these values, air temperature has negative consequences on tourism. In the Romanian coast of the Black Sea, however, the moderating effect induced by the thermal inertia of the sea leads to an optimum temperature, which is very favourable for tourism activities.

Winds. Depending on their duration and intensity, winds have a contrasting influence. Thus, the marine breeze has moderating action, especially in the littoral area, where they also have the role of transporter and disperser of aerosols. On the contrary, strong winds bring prejudices to the recreational act in the littoral area (blowing the sand off beaches and agitating the sea surface). The analysed meteorological parameters act, in the absolute majority of the cases, in a tight correlation determining certain types of climate and a hierarchy of their importance for tourism. Thus, the summer climate has certain particularities for Romanian coast of the Black Sea.

It is characterized by a reduced nebulosity, high insolation, optimum temperatures, less frequent winds with low intensity, but also aerosols in high quantities. These factors compete to promote thalassotherapy, orienting tourists' options and offer from the recreational feature to the mixed one (curative-recreational). It is the optimal climate for practicing the heliomarine cure in the resorts on the littoral area. The maximum duration for good weather in this season explains also the peak of tourism demand. Most tourists allot time for recreation and resources in the summer, which is thus the best time for traveling.

4. The evaluation of the climatic potential of the Romanian coast of the Black Sea based on the balneary climatic index and the climatic-tourism index

From the multitude of indices used on the Globe, we chose for this study the climatic-tourism index (established by R. Clausse and A. Guérout) and the climatic-balneary index (by L. Burnet), as these two can evaluate objectively the analysed territory.

4.1. The climatic-balneary index (I.C.B)

This index, elaborated in 1963 by L. Burnet, evaluates the tourism quality in the summer by means of the following formula:

$$ICB = N / T$$

where: N = the number of rainy days in the four months characteristic to summer (May, June, July and August); T = the average air temperature in that period.

If the index value is below 3, the respective region has a high tourism potential; if it is between 3 and 8, the potential is satisfactory and if it is above 8, the potential is low.

The main disadvantages this index has are:

-        The value indicated is an arbitrary number without absolute significance, therefore it cannot be concluded that in one region the tourism activities are, for example, five times more favourable than in a different one, but only that there are favourable conditions;

-        It does not take into account other climatic elements, which is why it can give erroneous results outside the temperate zone.

After an analysis of the data regarding the number of rainy days and average air temperatures in summer between 1965-2005 (based on which the climatic-balneary index was determined – table 2), we noticed that a high tourism potential occurs in Romanian coast of the Black Sea (the value of this index being in all stations below 3), Figure 1.

By analysing figure 2, we may notice that the highest climatic-tourism potential is encountered in the littoral zone and the Danube Delta, where the ICB value is the lowest, below 1.5 (1.258 in Sulina; 1.277 in Chilia Veche; 1.297 in St. George; 1.499 in Constanța; 1.449 in Gorgova). The largest part of Dobrudja has values inferior to those mentioned above over 1.5 and even 1.8 in Negru Voda Plateau in Southern Dobrudja, but also in the western part of Dobrudja: Macin Mountains and Tulcei Hills – e.g. ICB in Tulcea = 1.866), because of the higher altitudes and more frequent precipitations. Thus, based on this study, we can conclude that, even though the Dobruja territory has a high potential, the coastal area and the Danube Delta can be exploited to a maximum efficiency.

Table 2: The value of the climatic-balneary index in Dobruja between 1965-2005

Station	The rainy days number	The average temperature	The value of the
Mangalia	28,2	19,5	1,446
Constanța	30,1	20,07	1,499
Sulina	25,8	20,5	1,258
Sf. Gheorghe	26,4	20,35	1,297
Gorgova	30	20,7	1,449
Tulcea	38,1	20,42	1,866
Chilia Veche	26,2	20,52	1,277

4.2. The climatic-tourism index (I.C.T)

The interdependence among the meteorological elements and their variability in space and time has led to the necessity to calculate a climatic-tourism index. An expression of this is given by Clausse and Guérout (according to Fărcaş and colab., 1968) who takes into account three main elements, namely: sunshine duration, temperature and precipitation duration in a given region, which he associates in the following formula:

$$I = \frac{S+T-5D}{5}$$

where: I = the climatic-tourism   index; S = sunshine duration (in hours); T = average air temperature (°C); D = average precipitation duration during the day (hours) (considering that an hour of rain equals five hours of sunshine). This index allows the establishment of an optimal duration for the tourism season and open air cures during the warm period of the year. In order to emphasize the climatic-tourism potential of the Romanian coast of the Black Sea, we stopped at this index in particular, as it takes into account those meteorological parameters with the highest impact on the summer tourism activities (the main

type of tourism in the analysed territory). From this perspective, using the data in table 3, we analysed the ICT for the entire summer season (May-August) but also for each month in turn.
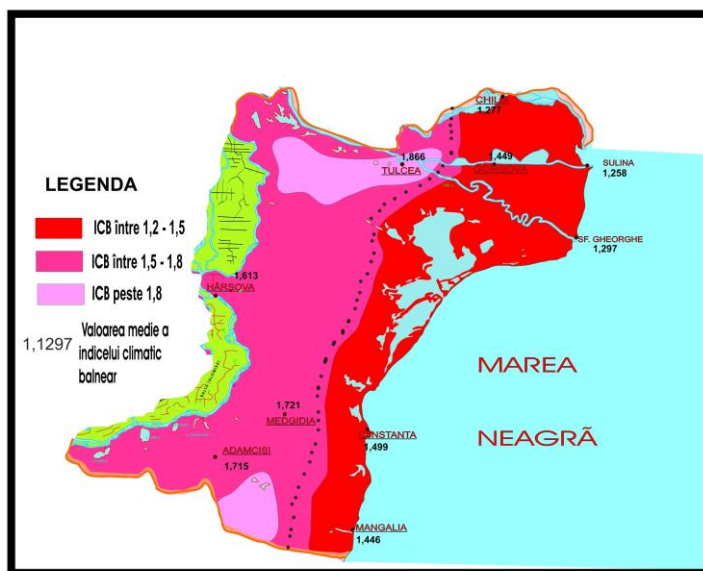

Figure 2: The climatic-tourism potential evaluated by the climatic-balneary index (ICB), in Romanian coast of the Black Sea (1965-2005)

Table 3: Average values in May, June, July and August, but also for the entire summer, for the elements calculated for the determination of the climatic-tourism index in Romanian coast of the Black Sea (1965-2005)

Station	In May			In June			In July			In			The average of		
	S	T(°C	D	S	T(°C	D	S	T(°C	D	S	T(°	D	S	T(°C	D
Constanța	263,	15,6	3,67	286,6	20,2	3,36	325,6	22,4	2,71	305,	22,1	2,01	295,3	20,0	2,94
Mangalia	26	15	3,21	302,5	19,6	3,12	324,6	21,8	2,59	305	21,6	2,09	299,0	19,5	2,75
Sulina	257,	15,7	3,02	282	20,5	2,8	312,5	23	2,36	291	22,8	1,9	285,7	20,5	2,52
Sf.Gheorgh	275	15,8	3,06	305,1	20,5	2,88	338,8	22,9	2,4	318,	22,2	1,97	309,3	20,3	2,58
Gorgov	258,	16,7	3,64	289,7	20,9	3,32	319,6	23,1	2,67	303,	22,1	1,97	292,8	20,7	2,9
Chilia	262,	16,6	3,02	285,8	20,7	2,84	330,1	22,8	2,36	300,	22	1,94	294,9	20,5	2,54

- ICT distribution in May in Romanian coast of the Black Sea. Based on the data in table 3, we could calculate and represent (for Romanian coast of the Black Sea) the climatic-tourism index for May (Figure 3).

This representation shows that the highest values of this index are in the east and north-east of Dobruja, on the littoral and in the Danube Delta (55.1 in St. George; 52.88 in Chilia Veche; 52.59 in Mangalia; 52.17 in Constanţa and 51.58 in Sulina), as well as in the west, in the Danube (51.49 in Hârşova) everglades because of the moderating effect of the sea and the Danube.
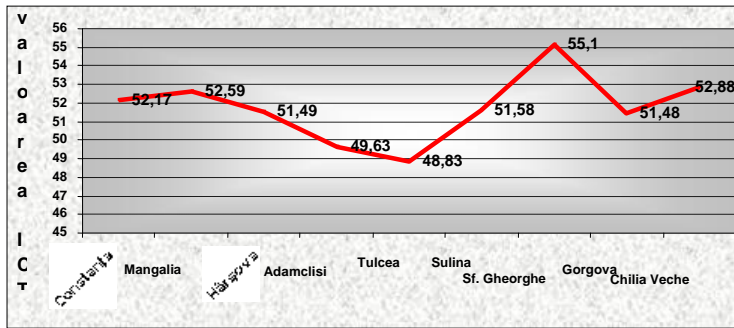
Figure 3: The climatic-tourism index (I.C.T) in May, in Dobruja (1965-2005)

- ICT distribution in June in Romanian coast of the Black Sea. A higher value of the climatic-tourism index is noticed in this month at all the analysed meteorological stations. Similarly to the previous month, the area influenced by the sea is distinguished clearly (62.24 in St. George; 61.3 in Mangalia and over 58 in Constanța, Chilia Veche and Gorgova) in contrast with the high regions or with those with strong continental character (56.02 in Adamclisi or even 48.88 in Tulcea) (Figure 4).
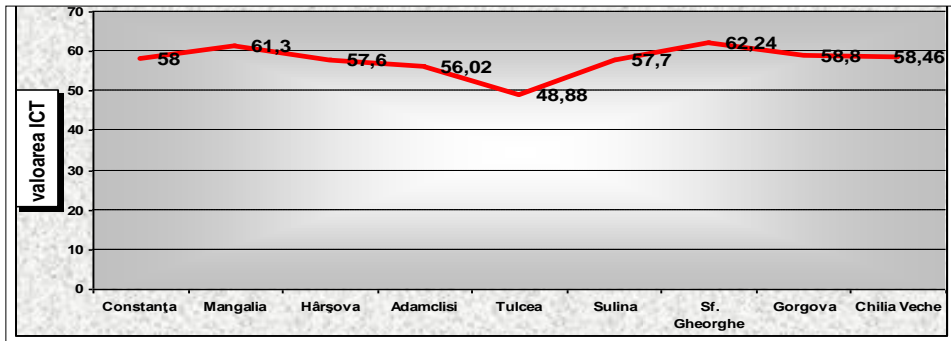

Figure 4: The climatic-tourism index (I.C.T) in June, in Dobruja (1965-2005)

- ICT distribution in July in Romanian coast of the Black Sea. As July is the hottest month, the index had its maximum value at all the stations (in all locations its value exceeded 62), which shows the highest degree of favourability for heliotherapy (Figure 5).
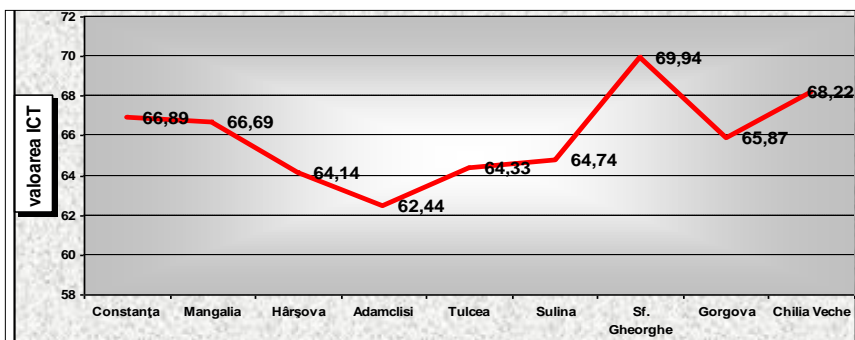

Figure 5 The climatic-tourism index (I.C.T) in July, in Dobruja (1965-2005)

- ICT distribution in August in Romanian coast of the Black Sea. After the summer solstice, the climatic-tourism index has a gradually lower value and in August its value goes below 64 in almost all the stations, except the south-east of the Danube Delta (66.19 in St. George) and even below 60 in the centre of the Southern Dobruja Plateau, where, in Adamclisi between 1965-2005, its value had an average of only 58.99 (Figure 6).
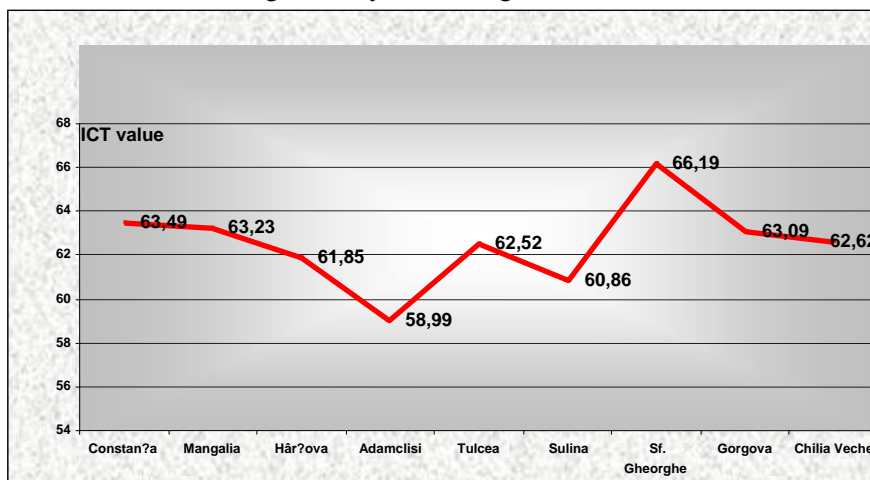

Figure 6: The climatic-tourism index (I.C.T) in August, in Dobruja (1965-2005)

4.3. The reoccurrence of ICT in the summer on the territory of Romanian coast of the Black Sea.

In the summer, Romanian coast of the Black Sea has a high climatic-tourism potential (over 50 in all directions), with values of over 60 in the littoral area (63.37 in St. George; 60.95 in Mangalia; 60.54 in Chilia Veche and 60.14 in Constanța), which is where the best conditions exist for its development. Apart from this area, even though the premises are optimal, the potential is reduced, reaching the value of 56.14 in Tulcea (Figure 7).

Figure 7: The tourism potential from the summer season evaluated by the climatic-tourism index (ICT), in Romanian coast of the Black Sea (1965-2005)

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Conclusions

The tourism potential resulted from the spatial association of the tourism fund with the corresponding technical and material basis is an indicator of maximum importance, being synonymous to the tourism offer. This is included, through its components, in a similar number of premises for the promotion of the phenomenon itself: to locate and accomplish. One of the determining factors for the development of tourism services in the analysed territory is the climate, a factor analysed in a subchapter of this paper.

Considering the elements mentioned above, we can say that in the Romanian coast of the Black Sea, especially the littoral and the Danube Delta, the particularly high balneary and recreational potential (regardless of the climatic and tourism indexes used for its evaluation) have led to a strong development of tourism and the accommodation business. The high climatic and tourism potential of the littoral is also emphasized by the thermal comfort, for which the following case study was accomplished.

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