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Repositioning of Romanian Seaside Tourism as an Effect of Climate Change

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Abstract: The present paper examines the evolution of Romanian seaside tourism between 2008–2018 to find the connection between climate change and the number of total tourist arrivals. The vicious cycle of greenhouse gas emissions and climate change has become one of the most critical topics discussed due to its negative effect on the wellbeing of the planet and its impact on sustainable economic development in the long run. Various economic activities, including tourism, could be subject to dramatic changes due to global warming. Depending on the geographical location of tourist destinations, and the degree of fluctuation in climate indicators, there have been dramatic shifts in visitor flow. This situation has been aggravated as countries that were once famous for their summer season and seaside holidays are now affected by high temperatures. Such temperatures can hardly be tolerated by tourists, particularly those from the Nordic countries. By comparison, there are countries that have been known to have only two or three full summer months suitable for tourism at the seaside and which in the last years have had a more extended summer season. This situation could turn into a significant competitive regional economic advantage for countries such as Romania, at least in the short- and medium-term. In this context, we aim to investigate whether there are climatic conditions, such as the extension of the tourist season on the coast (in the case of destinations that have four seasons and are known for having a shorter number of summer days), that can be turned into advantages. In this regard, we have conducted exploratory research to analyse if there is a statistically significant correlation between the indicators regarding climate change and tourism arrivals on the Romanian seaside, namely Constanta county. For our study, we used secondary data, provided by the Romanian National Meteorological Administration and the National Institute of Statistics, and accumulated a detailed profile of Romanian seaside summer tourism in the context of actual climate changes and challenges. Climate change may have significant consequences on the tourism industry and economic growth as well. Information on the direct effects higher temperatures could have on tourism is lacking. Improving policy analysis is necessary to reduce uncertainties, further understanding, assess implications and enable the tourism industry to adapt to changing circumstances.

Keywords: climate change; tourism; seaside tourism; Romanian seaside tourism; global warming; temperature increase; global warming Romania

1. Introduction

Climate change is one of the main challenges facing humanity today, and it has severe effects on the tourism industry [1], due to the destination attractiveness. Climate change and tourism are interconnected [2], each influencing the other, causing a wide range of socioeconomic consequences. Changes in temperature patterns and an increase in extreme weather phenomena impact tourism and resources involved, and have a strong influence on the environment and socioeconomic development of the affected destinations. In this context, tourists can take into consideration not only popular and famous destinations, but also other places with increased tourism potential. This evolution would determine the

mitigation of local income in the destinations affected by this shift, due to the well-known multiplier effect of tourism activity. In such a scenario, weather can turn from an asset into a threat and vice-versa, depending on its impact on a specific country or region.

The tourism industry puts high pressure on the environment and local resources, causing social, cultural and economic problems. The sector is responsible for up to 5–8% [3,4] of global emissions of greenhouse gases, particularly CO_2, generating high consumption of fossil fuels, water and energy [5–7]. Besides the negative impact on the environment, a higher carbon tax would negatively influence the prices of the tourism industry and decrease the competitiveness of certain regions as well. Tourist flow can be diverted to other friendlier locations [8]. The most evident impact of climate change on tourism is visible in the coastal areas, targeted as holiday destinations during the summer [9]. In Europe, the Mediterranean coast is endangered by climate change [10]. In this context, tourism stakeholders have become interested in finding how to reduce the negative influence of climate change on tourist arrivals and its effects on the natural and anthropic cultural heritage [11,12].

Although the effects of climate change on tourism were studied in various research papers, most of the studies focused specifically on the impact it had on famous summer destinations [13], mostly in terms of physical impacts of climate change on tourism [14] or on the benefits of lower temperatures during the summer for touristic cities [15]. Also, most research investigated the effect of climate change on touristic destinations from Southern Europe, highlighting the negative impact on tourism activity in that region and less on countries in Central and Eastern Europe. In this context, we noticed a gap in the literature regarding global warming as an opportunity for the less promoted countries that benefit from a coastline and a climate conducive to attracting tourists for seaside holidays. These countries can prolong their summer season due to the temperature increase. Also, few authors focused their research on the impact of the increasing temperatures in the East European seaside destinations, where countries like Romania, without a long tradition in coastal tourism [16], recently became more visible on the European tourist market [17].

Romania could have significant socioeconomic benefits from both horizontal and vertical linked activities due to rising tourism arrivals [18]. Stressing its advantage in climate terms, global warming would represent a benefit for Romania since the warmer temperatures during the summer and fall are connected with higher spending by tourists [19].

This paper focuses on the global warming impact on Romanian seaside tourism. It investigates the advantages that Romania can provide to increase the visibility of its tourist resources and how Romania could promote its summer season as a tourist asset, by extending the summer season according to the increased number of summer days. The research is based on an exploratory study of the literature in the field to design a brief description of Romanian seaside tourism and a quantitative research that investigates the link between the number of summer days and the arrival of tourists to the Romanian seaside. The study also approaches how Romania could focus more on climate resources to gain a competitive advantage in the European tourism market and how it could use the increased period of the summer season to target new tourists.

2. Climate Factors Impact on Seaside Tourism

Tourism represents a complex phenomenon, being that it is the third-largest economic activity in the European Union [20]. Due to the importance of natural resources for tourists and people's desire to spend their free time in places that also have a temperate climate, tourism activity is directly dependent on weather conditions. Any change in the profile of a destination can affect the tourist's interest. The tourist's decision to choose one destination over another is very often influenced by both internal and external factors that are highly interconnected [21]. In the context of global warming acceleration [22], climate change can represent an impediment for countries that rely on tourism, since climate factors are considered one of the main motivations for travellers [23] and in many destinations are considered valuable tourist resources.

There are also other variables that tourists take into consideration when targeting a summer destination. Among the most important are prices, distance, transport connectivity and social media influence [24]. However, the weather pattern, which is considered one of the primary natural resources of a tourism venue, remains the main influence on tourist flows in general and those from coastal areas in particular [25]. Any change in this pattern may affect the perception of tourists, making them consider other possible destinations, as is the case of countries by the Mediterranean Sea [26]. Since the climate started to change in southern EU Mediterranean countries, the scientists pointed out that by 2100, global warming could reduce by 0.45% per year the tourism contribution to GDP in the case of coastal Mediterranean EU countries [27], affecting their economic viability [28].

In this context, global warming could become an impediment to the European Union tourism activity, with severe economic [29] and social consequences. On the one hand, it represents a serious threat for famous destinations that rely on tourism and especially on seaside tourism that is highly vulnerable in the context of climate change. The EU southern coasts represent an important destination for travellers. Seaside tourism is essential for southern European countries that have coastlines and relies on three primary natural resources: water, sand and sun [30], the drivers of the "sun, sea and sand" phenomena. Sun is the most important resource for seaside tourism [31]. According to Scott (2008), the median preferred temperature for a beach is 27 °C [32]. Considering the importance of natural and climate resources for coastal tourism, climate change becomes an issue of great concern for nature-based tourism [33]. In this coastal region, climate change causes heavy rains and floods, forest fires, [34], rising sea-levels and higher frequency of extreme weather conditions such as storms and high waves [35].

On the other hand, climate change could turn into a competitive advantage for less famous but promising tourist destinations that may become attractive due to slightly improved climate conditions [36]. Countries such as Ireland [37] or the Nordic European countries [38] will encourage international tourists to visit more their national attractions due to the increased air and water temperatures.

Due to climate change, seaside tourism is one of the most affected types of tourism in Europe, with the most vulnerable regions located in the Mediterranean region [39]. Global warming determines an increase in the number of summer days in many coastal destinations already affected by heat. Against this background, tourists could reconsider the destination for their summer holidays, and focus on areas with lower and more bearable temperatures. Moreover, depending on the country of origin, tourists may consider hot temperatures as a barrier to visiting specific destinations. For example, it is known that people from the Nordic countries cannot tolerate high temperatures. Therefore, an increase in the average temperature in countries like Greece, Turkey, Spain [40], Portugal [41] could divert tourists to other destinations. Moreover, global warming could even cause the closure of specific destinations in the Mediterranean countries [42], as it has already happened in other parts of the world, like in the Caribbean [43]. Pinar et al. (2016) argue that coastal zones and the small islands are the most affected by unbearable hot temperatures and by the quick rising sea level [44]. All these rapid changes require measures that are effectively and consistently applied to the affected countries. If the EU stakeholders do not invest properly in tourism, then the sector earnings could decrease by 15 billion euros annually in the following years [29].

Climate change impacts tourism demand, as has been proven through various studies. Average sunshine duration and temperatures positively influence domestic tourists to stay longer on the seaside [45]. The climate also affects international tourists and the destinations scores on tourist booking platforms [46], representing the main drivers of the tourist flows, which means that in coastal regions the anthropic tourist resources and cultural heritage are only complementary attractions and cannot replace the natural climate factors. Together with the satisfaction degree, climate factors convince travellers to choose a seaside destination or another [47].

Other studies showed the impact of climate change on a tourist destination and highlighted the effect of temperature increase in countries with a high degree of thermal discomfort. A study in Indonesia revealed that an increase with 1% of temperature would reduce the number of tourists from abroad by 1.37% [48] and another research in South Africa showed that tourist flows already started to be affected, as the drought caused travellers to choose other destinations which led to a decline in tourism revenues [49]. Other research showed that the +2 °C global warming in European destinations is enough to impact the southern European summer destinations and move the tourist interest to the central and northern European destinations [50]. In this context, climate change represents a barrier to achieving economic and sustainable goals [51] in the countries that rely on seaside tourism for revenues. For other countries, increased temperature from famous destinations can become a real opportunity to attract a new segment of tourists that are already educated and can grow the quality level of services as their standards are higher than those of the domestic tourists.

Another impact of climate change on seaside tourism is the rising sea temperature, which leads to a gradual degradation of the marine ecosystem, impacting the local community's socioeconomic activity and tourist impression, as changes in biodiversity may affect activities like snorkelling, scuba diving, bird watching and boat trips. Also, climate change may even transform the seaside destinations as the sea level rise leads to loss of beach area [52] and destroys the natural resources that attract tourist flows. All these impacts of climate change on tourist destinations also create new opportunities for countries with a more balanced summer climate and make room for new destinations to become internationally known.

Climate Change in Romania and Its Impact on Seaside Tourism

Romania is known for its tourism potential due to its wide range of natural and anthropic resources that allow the organization of different types of tourism [53]. The particularities of several categories of resources, like the natural landscapes, the ancestral traditions in rural areas and the large variety of natural healing factors make Romania one of the main European destinations for ecotourism [54] and spa and wellness tourism [55]. The seaside is also an important tourist destination in Romania, due to the Black Sea coastline. In terms of internal demand, it represents the most popular form of tourism in the country. So far, Romanian Seaside tourism has not been fully valorised, mainly because of its climate pattern, characterized by a short summer season, which has not allowed stakeholders to ensure continuity in their activities [56].

The Romanian Black Sea coastal zone measures 245 km [57], between Musura (Ukraine) and Vama Veche representing 5.3% of the total Black Sea coastline, of which 70 km include sandy beaches, attractive for tourists [58]. Constanta, one of the two counties with open access to the Black Sea has a total of 13 resorts (Figure 1), internationally known since the 70s [59,60].

The area's main tourist resources are aerosols [61] salt lakes, therapeutic mud and mineralized waters [62]. The climate pattern is one of the main natural resources of the Romanian Seaside, having a mean multiannual temperature around 11 °C [63]. The marine bio-climate is known not only for its moderate temperatures, but also for considerable thermostability, reduced precipitations, eastward orientation and uniformity in the humidity level [64]. The beaches [65], the cultural heritage and architectural monuments represent other major tourist attractions [42].

At the same time there are factors that negatively influence the Romanian seaside that are due to climate change. This area is prone to seasonal droughts [66], heat and unbearable temperatures, heavy precipitation and coastal erosion [67,68] which have been much more persistent in the last decade. Due to the natural and anthropogenic activities, there are variations from one year to another, but overall, the mean summer temperature trends upward [69]. In Romania, 37 percent of the coastline is affected by erosion [70].
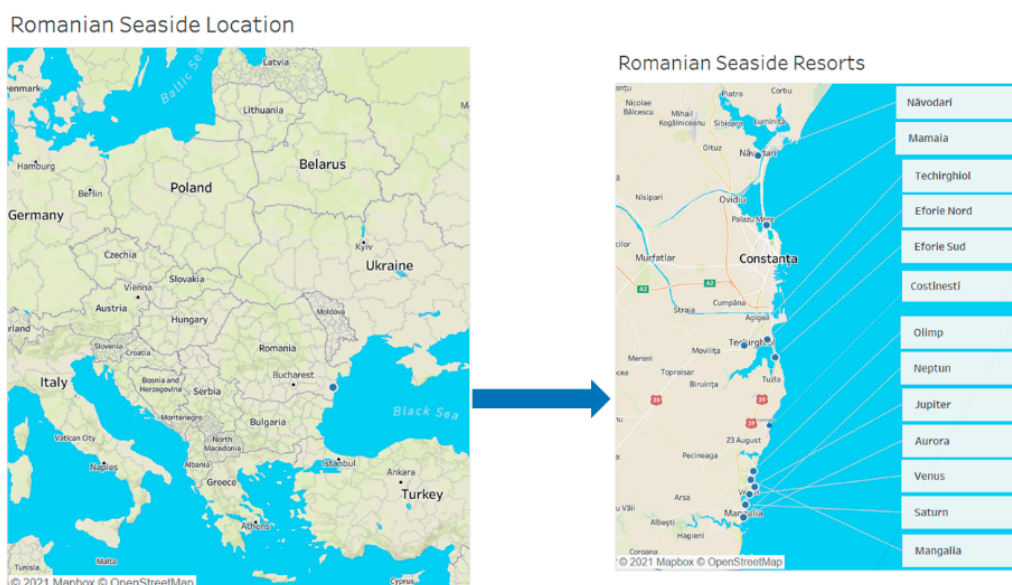
Figure 1. Romanian Seaside Map. Source: [60] Developed by the authors in Tableau Public software.

According to the European Climate Assessment & Dataset [71] (Figure 2), the summer season in Romania has been increasing constantly since 1960. The daily mean temperature during the summer, the number of the summer days and the maximum number of consecutive summer days have gone up in the past four decades. Also, the maximum number of consecutive wet days remained constant, which could represent an advantage for Romanian seaside tourism.
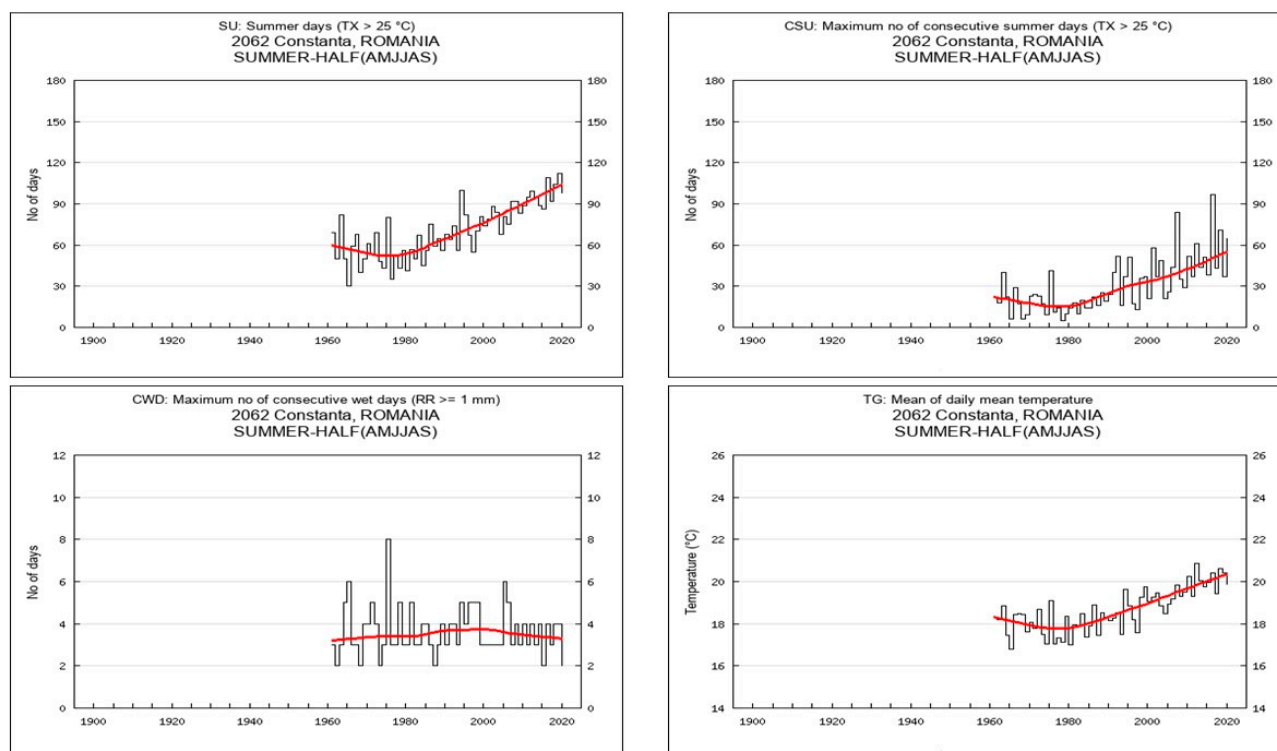

Figure 2. The main weather summer indicator in Constanta. Source: [71].

Between 1970 and 2020, the number of summer days with a temperature greater than 25 °C went up every year, from around 60 days at the beginning of the period to almost 110 days in 2020. The maximum number of consecutive summer days (t > 25 °C) increased by almost 40 from less than 20 in 1980 to almost 60 in 2020. However, despite the daily mean temperature increasing from around 18 °C to around 22 °C in the last 40 years, it did not reach levels that could not be tolerated by the tourists.

3. Materials and Methods

Romanian seaside tourism represents one of the most popular forms of tourism in the country, and the demand for tourist services has continuously grown over the last few years. Despite the high interest of Romanian tourists in the domestic seaside resorts, and its wide range of natural and anthropic tourist resources, the international attraction for Romanian seaside destinations is by far below the expectation, because of its reduced competitiveness. One of the main reasons for this lack of foreign popularity is the short summer season. Compared to other EU destinations (ex: Greece), the limited number of summer days affect Romanian competitiveness and affect stakeholders, foreign and domestic, who limit their investment in the Romanian seaside resorts because of the low ratio of return on investment. Considering the extension of the summer season in Romania due to climate change, we aim to determine whether this factor alone could be a strong impetus for adapting the Romanian seaside tourism strategy to extend the summer season officially and create investment stimulus to increase tourism potential. Based on the importance of weather patterns for seaside resorts, we have investigated the link between the change in temperature patterns by the Romanian seaside and tourist arrivals to perceive what extent Romania could reap the advantages of extending the seaside summer season and attract more tourists accordingly. In our study, we started from the particularities of Romanian seaside tourism. In this regard, we have formulated two main objectives to help us answer the present research question: How could Romanian coastal tourism boost its attractiveness to take advantage of the increasing trend in the number of summer days?

(i) design a brief profile of the Romanian seaside based on an exploratory literature review of research articles, published in national and international academic journals;

(ii) investigate if there is a statistically significant linear correlation between the number of summer days and tourist arrivals by the Romanian seaside, taking into account total arrivals of tourists in the coastal resorts and both Romanian and foreigner tourist arrivals in this area in the period between 2008–2018.

To accomplish our first objective (i), we surveyed the scientific articles published in national and international languages available on Google Scholar. We have chosen this approach because our preliminary research revealed that only a few articles about the Romanian seaside were published in international academic journals. We extended our research by using Romanian journals, published in the local language, to design a more complex Romanian seaside tourism profile. We searched on Google Scholar for scientific articles, including in the title the following keywords together: Romanian, Black Sea and tourism, in both English and Romanian. From our exploratory research, we excluded patents and citations. We found a total of 15 relevant papers for our study. The articles' content was interpreted using Qualitative Content Analysis considering the keywords related to the characteristics [72] of the Romanian seaside tourism and was divided into two main categories: characteristics that can be influenced by global warming and characteristics related to tourism activity.

To accomplish the second (ii) objective, we used Microsoft Excel Tool pack which provides the statistical tools needed for such research, widely used in statistical studies in the tourism field [73,74]. To investigate the relationship and the linearity between the total arrivals at the Romanian seaside (total arrivals and the arrivals depending on the tourist origin) and the number of summer days, we conducted a quantitative study.

The weather data is provided by the Romanian National Meteorological Administration [75], Constanta weather station. The data set contains information on the annual

number of summer days, defined as the number of days with a maximum temperature of 25 degrees Celsius or above, between 2008–2018. The yearly data regarding tourist arrivals in Constanta (total tourist arrivals, Romanian tourist arrivals, foreign tourist arrivals) were drawn from the National Institute of Statistics of Romania.

We use correlation and regression as statistical concepts to identify whether the selected paired groupings of data are related to one another to perform our analysis. First, we plot the data into a scatter chart using Excel, where the number of summer days is the independent variable, and tourist arrivals in Constanta (total, Romanian and foreign) is the dependent variable. Our analysis investigates the relationship and linearity between the mentioned variables. Falk (2015) found a positive relationship between sunshine hours and domestic German overnight stays measured as percentage changes. To illustrate some correlations, Falk provided scatterplots between changes in temperatures and sunshine hours and German and domestic overnight stays [76]. Secondly, we calculate the Pearson correlation coefficient (r) to identify if there is a correlation between the dependent and the independent variables to establish its nature, regarding linearity and slope. Using Pearson's correlation coefficient, Falk (2014) showed a positive correlation between sunshine and temperature and domestic tourist arrivals in Austria [77]. Applying the same method Serquet and Rebetez (2011) demonstrated a correlation between domestic tourist demand and summer temperatures in the Swiss Alps [78].

We test at a 95% level of confidence to see if there are statistically significant linear relationships between the number of summer days and the tourist arrivals in Constanta (in total, Romanian and foreign). In this regard, we use hypotheses testing, where the null hypothesis (H0) implies there is no statistically significant linear relationship between the number of summer days and tourist arrivals in Constanta. To test the hypotheses, we use the t-distribution and its test statistic, a method also applied by Agnew and Palutikof (2006). They calculated correlation coefficients (r) for unadjusted international tourism series annual number of trips abroad (INT) and a selection of economic indices [79].

The study refers to the 2008–2018 period, which is relevant in this context because it relates to the first decade after Romania became a full member of the EU. Then, Foreign tourists' access to Romania became easier, and the same applies to Romanian tourist' departures. In this context, we believe the decade included in the present study is also relevant for tourism stakeholders. We have focused our analysis on the county of Constanta because it is the most representative area in Romania for seaside tourism, almost all the seaside resorts being located there. In this regard, the data included in the research refers to tourism and weather indicators from Constanta county.

4. Results

4.1. Profile of the Romanian Seaside Tourism

Romanian seaside particularities are influenced by the country's geographical location, its natural resources, and the historical legacy that created different stereotypes in terms of quality of services. We grouped them into two main groups that allow stakeholders to design action plans, namely the ones influenced by global warming and the particularities related to tourism. Regarding the characteristics that can be influenced by global warming, Romanian seaside tourism has a pronounced seasonality, being open mainly between the middle of May and middle of September [80] with a peak season in July and August [66]. This represents a major issue for investors, because it influences their income [81] and creates difficulties in training and keeping staff [57]. The geographical position can favor the seaside attractiveness in terms of weekend tourism. The short distance from the country's capital, Bucharest (220 km), assures a high flux of tourists every summer [82]. The average number of hours of sun is almost 10 during the summer [62] and the natural resources and climate factors have made the Romanian seaside a destination for hydro tourism activity since 1878 [83]. From the 13 seaside resorts, 5 are destinated for cures and treatment [84].

The analysis of the Romanian seaside characteristics related to the tourism activity revealed that the Romanian seaside does not have a good quality-price ratio [85] compared with the neighbouring countries, and the accommodation infrastructure is considered outdated by tourists [86]. The interest of the Romanian tourism operators to attract international tourists is low. The accommodation units are very diverse in terms of comfort, covering the entire range of classification (from 1-star to 5-stars) and having the highest rate of 1-star accommodation from Romanian tourist areas [59]. The resorts have different typologies that influence the duration of stay. For example, in Saturn resort, that is also a balneo medical destination, the average duration of stay is 18 days and in Mamaia, it is 7 days [78]. Depending on the profile of the tourists, the Romanian seaside is perceived differently. For instance, the young generation associates the seaside with entertainment and clubbing, and the adults with relaxation [87].

Based on these results, there are two main issues that Romanian stakeholders should consider to improve their competitiveness: firstly, to keep domestic tourists that already take advantage of climate change and secondly, to attract more foreign tourists by increasing their awareness regarding the more extended summer season. For both tourist categories, there are risks that stakeholders should take into account. One is the proximity of other EU summer destinations that can be reached from Romania by car or by plane, like Greece, Italy, Spain and Bulgaria that have very competitive prices regarding quality/price ratio. The attractiveness of foreign summer destinations for Romanian tourists has become more evident since 2007 when Romania joined the EU, and travel became more accessible than ever. An opportunity for the Romanian stakeholders in tourism is provided by the fact that countries like Greece or Turkey, that are very popular among Romanian tourists, register very high and uncomfortable temperatures in summer. For families with children that book their holidays based on school vacations, the Romanian seaside proved to be a better choice, especially on the weekends. Despite the long summer season in other countries, where it lasts from May to the end of October (i.e.,: Greece), families with children cannot go on holiday at the beginning or at the end of the season, when temperatures are lower, and children are still in school. In addition, the number of Romanian seniors that travel has also increased lately. For this age range, the median summer temperature is important because the heat poses health risks. A senior tourist from Romania prefers short-haul destinations with a temperate climate. That is an advantage for Romanian seaside tourism. Besides, this group of tourists can travel at the beginning and the end of the summer season when temperatures and prices are more accessible. Stakeholders should focus more on tourists who can go on holiday without too many limitations. They should promote the beginning and the end of the summer season more to seniors, single people and families without children. In this regard, a social initiative has already been implemented, but more actions should be taken, since not all accommodation providers prefer to partake in such programs. To ensure a constant flow of tourists in the beginning and the end of the extended summer season, stakeholders should address not only the people who prefer to go on holiday on social programs, but also people with a better income. In this way, the tourist arrivals by the seaside would increase, and the entrepreneurs could invest more on the Romanian seaside.

4.2. The Correlation and Linearity between the Number of Summer Days and the Arrival of Tourists by the Romanian Seaside

Intuitively we believe there is a direct correlation between the number of summer days and tourist arrivals at the Romanian seaside. We included in our analysis both domestic and international tourists that have preferred the Romanian seaside as a destination for their holiday between 2008 and 2018. Since the last decade, the county of Constanta has become a more approachable destination due to the transportation connections that have increased. Transport connectivity has improved significantly in the past decade, after joining the EU. Important to say that one of the TEN-T core transportation corridors, namely Rhine-Danube, will bring the flow of trade and travellers from western Europe and all over the

world to the Romanian Black Sea coast via all known transportation modes (air, land, by rail and highway, and water, via Danube River and Black Sea transportation corridors).

In this respect, we have investigated whether there is a linear relationship between the mentioned indicators and we have calculated the correlation strength. The first step in analysing the relationship between chosen variables has been to draw the scatter plots of linearity. The nearer the scatter points are to a straight line, the higher the association between the variables. To this end, we use the data in Table 1.

Table 1. Synoptic table of the analysed indicators from Constanta, Romania. Source: [75,88].

Year	Number of Summer Days between (SD) * 01.05–30.09 Independent Variable	Total Tourist Arrivals (TTA) Dependent Variable	Romanian Tourist Arrivals (RTA) Dependent Variable	Foreign Tourist Arrivals (FTA) Dependent Variable
2008	92	977,975	912,923	65,052
2009	83	897,677	847,586	50,091
2010	90	803,096	755,376	47,720
2011	97	844,802	799,091	45,711
2012	99	953,008	898,211	54,797
2013	93	859,634	811,210	48,424
2014	93	883,947	832,988	50,959
2015	87	1,021,475	962,723	58,752
2016	105	1,162,958	1,102,050	60,908
2017	95	1,235,542	1,173,084	62,458
2018	106	1,312,418	1,249,667	62,751

* The number of days with a maximum temperature of 25 degrees Celsius or above.

Considering the proportion of the international and domestic tourist arrivals in the total tourist arrivals, we notice the Romanian seaside is not such a frequented destination by foreign tourists. The share of foreign tourist arrivals in the total tourist arrivals varied in a narrow band ranging between the 6.65 and 4.78 per cent in the 2008–2018 period showing the Romanian seaside total tourist arrivals were highly dominated by domestic tourism for the entire period. However, it is noted that the highest flow of foreign tourists was reached in 2008, one year after the country's EU admission. The time of admission to the EU and advertising to attract tourists increased temporarily the interest in visiting Romania.

Using Excel, we drew the scatter plots of the relationships between our selected pairs of variables (charts 1–6 in Figure 3) and the ones regarding their residuals (charts 4–6 in Figure 3). The residual plots display somewhat random patterns that indicate that a linear model provides a decent fit to the data (Figure 3).

The sample Pearson's *r* or the correlation coefficient was calculated using the following formula:

$$r = \frac{n \sum xy - \sum x \sum y}{\sqrt{n \sum x^2 - (\sum x)^2} \sqrt{n \sum y^2 - (\sum y)^2}} \tag{1}$$

Using Microsoft Excel, we calculated the value of Pearson's r for the analysed data. The results are displayed in Table 2.
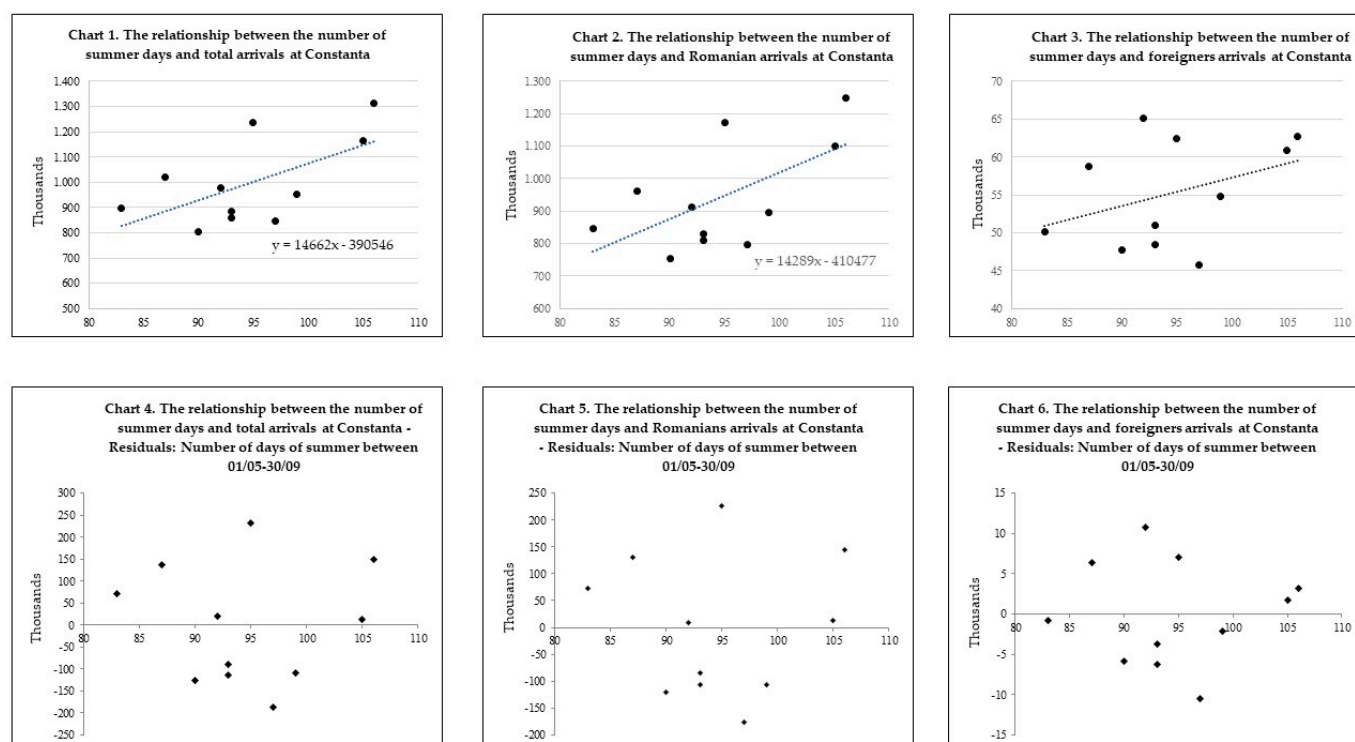
Figure 3. Relationships between the analysed groupings and their residuals. Source: developed by the authors based on the data provided by the Romanian National Meteorological Administration and National Institute of Statistics.

Table 2. Correlation coefficient (*r*) and coefficients of determination (*r²*) between the number of days of summer and total tourist arrivals, Romanian tourist arrivals and foreigner tourist arrivals in Constanta.

Indicator	TTA	RTA	FTA
Correlation coefficient	0.602854789	0.607917688	0.373687536
Coefficient of determination	0.363433896	0.369563915	0.139642375

The values of *r* coefficient (Table 2) indicate that there are two high uphill linear relationships (0.6 < *r* < 0.8) between the number of summer days and total tourist arrivals and Romanian tourist arrivals in Constanta on the one hand and a weak positive linear relationship between the number of summer days and foreigner tourist arrivals in Constanta, on the other hand. The dependent and independent variables increase together.

The coefficients of determination (*r²*) vary from 0.369563915 to 0.139642375. That means that the relationship between the analysed variables explains between 36.95% (Romanians) and 13.96% (foreigners) of the variation in arrivals. It does not mean that one variable causes the other in any relationship, but they move together in the same direction.

We have tested at a 95% level of confidence to see if the linear relationship between the analysed indicators is statistically significant. The null hypothesis (H0) implies there is no statistically significant linear relationship by the Romanian seaside between the number of days of summer (SD) and tourist arrivals (TTA, RTA, FTA). Our alternate hypothesis (Ha) is that we believe there is a statistically significant linear relationship between the mentioned variables. We need to find the critical value of *t* that gives the area of 0.025 to the right tail of the *t*-distribution, namely $t_{\frac{\alpha}{2}}$.

For that we use the *t*-distribution table to find the value of $t_{0.025}$. Taking into consideration the degree of freedom and the level of significance α. Since the *t*-distribution

is symmetrical, $-t_{\frac{\alpha}{2}} = -t_{0.025}$ (the value of t that gives the area of 0.025 to the left of t-distribution). We calculate the test statistic t using the formula:

$$t = \frac{r}{\sqrt{\frac{1-r^2}{n-2}}} \tag{2}$$

Since the relationships of two pairs of variables are statistically significant, we proceed at finding the equations of the linear regression line, or "the least-squares regression line", which minimises the squares of the distances between the data points and the line (See Figure 3). To this end, we calculate the regression statistics with Excel (Tables 3 and 4).

Table 3. *T*-Distribution indicators for our analysed pairs of variables.

	SD/TTA	SD/RTA	SD/FTA
Number of observations (n)	11	11	11
Degree of freedom (Dof)	9	9	9
$t_{0.025}$	2.262	2.262	2.262
$-t_{0.025}$	-2.262	-2.262	-2.262
Test statistic t	2.266	2.296	1.208
$t < -t_{0.025}$ or $t > t_{0.025}$	Yes	yes	no
Statistical significance	We reject (H0). We are 95% confident that there is a statistically significant linear relationship between the number of summer days and total arrivals of tourists in Constanta.	We reject (H0). We are 95% confident that there is a statistically significant linear relationship between the number of summer days and Romanians arrivals in Constanta.	We fail to reject (H0). There is no statistically significant relationship between the number of summer days and foreigners' arrivals in Constanta.

Table 4. Summary output for total arrivals.

	Coefficients	Lower 95%	Upper 95%
b_0 (intercept)	$-390,546$	$-1,777,374$	996,282.4
b_1 (slope)	14,662.06	29.99736	29,294.11

The formula for the least-squares regression line is:

$$y = b_0 + b_1 x \tag{3}$$

where:

$$b_1 = \frac{n \sum xy - \sum x \sum y}{\sqrt{n \sum x^2 - (\sum x)^2}} \text{ (slope)} \tag{4}$$

$$b_0 = \frac{\sum y}{n} - b_1 \frac{\sum x}{n} \text{ } (y - \text{intercept}) \tag{5}$$

Therefore, the equation of the regression line for the sample regarding total arrivals is $y = -390546 + 14662.06x$, as displayed by Excel. Now we can find out how much additional y we get for one additional unit of x. According to the model, for one additional day of summer, the Romanian seaside could register an increase of 14,662 tourists from Romania and abroad.

The equation of the population regression line is:

$$Y = \beta_0 + \beta_1 x \tag{6}$$

We can construct a confidence interval for the slope (β_1) and y-intercept (β_0), of the population regression line, based on the data provided by Table 5. Thus, if we would know

the population data, and draw a regression line through it, we are 95% confident that the equation will have $\beta_0 \in [-1{,}777{,}374, 996{,}282.4]$ and $\beta_1 \in [29.99736, 29{,}294.11]$.

Table 5. Summary output for Romanians arrivals.

	Coefficients	Lower 95%	Upper 95%
b_0 (intercept)	−410,477	−1,744,258	923,304.2
b_1 (slope)	14,288.61	216.2397	28,360.98

The equation of the regression line for the sample regarding Romanians arrivals is $y = -410{,}477 + 14{,}288.61x$. According to the model, for one additional day of summer, the Romanian seaside could register an increase of 14,289 tourists from Romania.

Considering the data displayed in Table 5, if we could know all the population data, and draw a regression line through it, we could be 95% confident that the regression line involving Romanians arrivals will have $\in [-1{,}744{,}258, 923{,}304.2]$ and $\beta_1 \in [216.2397, 28{,}360.98]$.

5. Discussion and Conclusions

The findings of the paper confirm that information is widely backed up by available statistical data. When analysing the Romanian seaside tourism patterns, it is of utmost importance to bear in mind that it is growing from a very low base. The communist system left Romania with major structural imbalances and a strictly low activity tourism sector. In the highly centralized economies, with non-existent private investment and a non-competitive environment, with robust controlling positions of state-owned enterprises, absence of entrepreneurship and separation from global and European markets, the room for evolving tourism and business activities has been drastically restricted. Furthermore, the paper highlights the seaside Romanian capabilities to cope with the challenges raised by the increasingly competitive European and global landscape, as measured by tourism indicators.

According to the statistical analysis conducted to see the correlation and linearity between the number of summer days and the arrival of tourists, we conclude there is a high positive and statistically significant linear correlation at a level of confidence of 95%, between the number of summer days in the considered interval and total arrivals and also Romanian arrivals at Constanta. It seems that Romanians are more sensitive to the number of summer days when they plan their trips to the domestic seaside than foreigners. Therefore, at least at a local level, climate change has a positive impact on Romanian tourist preferences to visit the local seaside. The relationship between this pair of variables explains almost 40% of the variation in Romanian arrivals at Constanta. On the other hand, the lack of statistical significance between the number of foreign tourists' arrivals and the number of summer days suggests there is room for more investment flows oriented to the Romanian seaside tourism. Therefore, the upward trend of increased summer days could be conducive to a gradual growth in number of foreign and domestic tourist arrivals.

Seasonality in the seaside tourist arrivals is a factor that strongly places its mark on the number tourists for Romania due to large disproportion between the temperatures during summer and the rest of the year. Diminishing the influence of this factor by involving other complementary elements is a challenge both for authorities and the tourist sector in a way to increase the total number of seaside tourism. The increasing attraction of international and domestic tourists for spending more holidays at the Romanian seaside can be assessed by modernising the travel infrastructures, generating interest in regional attraction and building capacity in connexion to the tourist expectations.

Climate change is one of the main factors affecting tourism activity. The changes in temperature and extreme weather conditions can cause a dramatic shift in tourist flows in terms of preferences. Moreover, in seniors or people who suffer from heart conditions, an increase in temperatures during the summer season can represent a risk that tourists from these categories cannot take. Against this background, Romania could attract more

international tourists through its favorable climate and tourist resources. Therefore, the Romanian seaside's tourist strategies should make the best of this alarming situation and focus on the tourist flows diverted by climate change from more popular summer destinations. These policies should also target tourists from Northern Europe and elderly tourists, catering to their needs. According to the results of this study, the link between tourist arrivals at the Romanian seaside and the increase in the number of summer days reveals the opportunity to extend the summer season and promote the Romanian Black Sea from May until September. In this way, stakeholders would be more prone to invest and change tourists' opinion regarding service quality. Increased attention on promoting the natural resources and favorable climate condition could improve the image of Romanian seaside tourism. The development of the coastal region has become prominent in the last few years, and now there is a wide diversity of modern accommodation facilities. The temperate-continental climate makes Romania attractive to tourists despite the global warming issues, hot weather not affecting tourism as it does in Greece or Spain, where the tourists cannot spend too much time on the beach.

Our paper emphasizes some of the opportunities and benefits of the Romanian seaside. Seizing them, the authorities and other stakeholders should rethink the marketing strategy for coastal tourism, focusing on tourists who cannot travel to Mediterranean destinations because of the heat. The present study results represent an important base for the stakeholders in the field to align their strategies with the possible opportunities generated by global warming in terms of tourism flows. The possibility to extend the touristic season at the Romanian seaside that traditionally overlaps the summer school holiday would increase the competitiveness of Romanian seaside tourism with high socioeconomic implications. At present, the summer season begins at the Romanian seaside on 1st May, especially in Mamaia resort, known by the young generation as an entertainment destination. However, after the short holiday on 1st May, most of the accommodation units close and open one month later, when the flow of tourists is considerably higher. Moreover, during the season, many facilities, especially clubs, close from Monday to Friday and operate only on weekends, when the number of tourists records a peak. In this way, the hotel and restaurant activity is fragmented and negatively influence the flows of investments.

The increase in the number of summer days and the growth of temperature in destinations from the Mediterranean region create room for new flows of tourists that cannot tolerate the high temperatures and look for new destinations for their summer holiday, like the Romanian seaside resorts. By attracting this category of tourists, the Romanian seaside would benefit in the following years from a constant flow of tourists from abroad that would create enough demand for the entire period of the summer season to determine gradually the majority of accommodation units, restaurants and entertainment facilities to operate starting May and until the end of September.

The present study also offers a starting point to the public authorities to raise awareness within domestic tourists and to create enough internal demand for touristic services starting in May and until the end of September. Seaside tourism represents Romanians' main preferred category, and in the middle of the summer season, the demand for tourist offers often exceeds the supply. It becomes necessary to attract the tourist flows at the beginning and the end of the season. In the last years, the Government has developed a social program addressing this issue, namely Romanian seaside for all. However, this program is connected with low-budget tourists that do not contribute significantly to revenues. A more beneficial long-term strategy would be necessary to supplement the social benefits with the growth of service quality and the extension of specific touristic infrastructure. For example, extending the actual bike trail between the two seaside localities: 2 Mai and Vama Veche in other resorts would attract more tourists from Romania and abroad. Also, organizing more sport competitions would attract other categories of tourists to the Romanian resorts and would also contribute to the seasonality mitigation and focusing on social media campaigns regarding the Romanian seaside target on different types of tourists would increase the international visibility of the Romanian seaside. That requires

investment, but both private and state actors, alongside the local inhabitants, could join efforts to increase the Romanian seaside's appeal amongst the foreigners.

Since the median preferred temperature for a beach is 27 °C, and the number of summer days (with temperatures of 25 °C or above) increases in Romania, the Black Sea's western coast can get more attention from domestic and foreign visitors. This resource could be fructified accordingly by all stakeholders that look at the Romanian Black Sea Coast since no extreme weather conditions affect it, and no fires and other calamities happened in the past decades. Since Romanians are already known for their hospitality and warmth, climate change, with all its disadvantages, can add some logs on the bonfire of people celebrating a new attractive destination. Furthermore, it is worth mentioning the fact that by the Black Sea, there are facilities that can provide both leisure and health services through a variety of treatments, including the ones invented by Ana Aslan and the healing sapropelic mud of Techirghiol, treasures little known worldwide, but famous amongst connoisseurs.

6. Limitations of the Study

The present article also has several limitations, and its results cannot be generalized. First, the research should be completed with qualitative research that would also show the stakeholders' opinion regarding the possible extension of the summer season. In the first years after the change, tourism operators might experience additional costs, making them oppose the change. Investor skepticism could be owed to the delay in the growth of tourist arrivals, which would exert pressure on the return on invested capital in the first years of investment. Besides, a possible extension of the summer season might involve risks of low occupancy rates in the short- and medium-term. In this regard, future research should be conducted to understand in detail the capacity limitations of hotels and restaurants to extend the summer season. Such in-depth analysis would give the Romanian authorities the possibility to act more effectively and constructively to support hotels and restaurants, and other entertainment facilities to take advantage of the increase in temperature and the extension of the seaside summer season. Second, the article considered only the study of the tourist arrivals and the number of summer days. It did not refer to the possibility that extreme weather phenomena may appear more often in Constanta in upcoming years. In this regard, a more comprehensive analysis should be done, and the research should extend to other tourist and weather indicators too. In this context, further research is required to describe the consequences of climate change on the Romanian seaside in terms of opportunities and threats. A more comprehensive analysis, together with the present study results, would help the local authorities align their developing strategy with the current tourism reality in terms of global change implications. It would support hotels and restaurants from the Romanian seaside in marketing their offer following the tourists' profile that indicates that tourists may prefer Romania instead of other famous summer destinations affected by heat.

In the past months, we witnessed how the slowdown in economic activity translated to a decrease in greenhouse gas emissions (GHG), one of the main drivers of climate change. However, this state is not sustainable. Therefore, decision-makers worldwide are designing policies to mitigate GHG emissions and accelerate the circular economy's transition, which is supposed to stop and even reverse this emissions trend, regardless of the pandemic. If the pandemic is here to stay, new research should focus on its effects on climate change in the short- and medium-term since this paper focuses on the relationship between climate change and tourist arrivals on the Romanian seaside.

Another limitation of our study is the lack of analysis related to the COVID-19 impact on tourist behavior. The estimations for tourism evolution have been trending downward since the COVID-19 crisis erupted in March 2020. The pandemic's real impact on the tourism sector is still difficult to calculate due to the ongoing nature of the crisis. The requirement of a PCR test when visiting a foreign country has increased vacation costs by around 100 euro per person; that fact, and the risk of staying in quarantine if the visited

country's epidemic scenario worsened during the vacation, have been among the prime factors which have led to the sharp downward trend of tourism sector activity. These causes have influenced domestic tourists to choose mainly the Romanian seaside and have triggered an unexpected advantage for Romanian resorts to attract domestic tourists. Since the COVID-19 pandemic has had a substantial impact on Romanian seaside tourism, it is required that researchers adapt the research areas which engage with tourism adaptation to the new realities and also study the authorities' efforts for attracting investment opportunities in domestic tourism.

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Data Availability Statement: Publicly available datasets were analyzed in this study. This data can be found here: http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table. Restrictions apply to the availability of the data obtained from Romanian National Meteorological Administration on request.

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