

## Article

# Winter Tourism in Croatia: Is It Possible?

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**Abstract:** Tourism in Croatia primarily relies on the “sun and sea” product as the main asset of its offering. The current lack of adequate infrastructure, an underdeveloped winter tourism offering and the lack of stakeholders’ interest in developing winter tourism products are only some of the problems facing winter tourism development in Croatia. Winter tourism development does not include only snow-related activities but all outdoor activities, where weather and climate play a significant role. This paper analyzes the relationship between average monthly climate indicators in summer and winter periods and the number of overnight stays in Croatia from 1977 to 2014. In the regression analysis, we used a multivariate model with first difference specification and ordinary least square (OLS) estimation, in which past period of the dependent variable was also included. Seasonality was controlled by using quarterly dummy variable. The analyses for coastal and continental Croatia were made separately. Using regression and correlation analyses, we prove that Croatian tourism in the coastal part is strongly related to climate parameters while that influence in the continental part is less significant. The main hypothesis of the paper is that, with the increase in temperature, the tourism season will be prolonged in both the coastal and continental part of the Republic of Croatia. However, other interventions in tourism (such as raising the quality, expanding the offering etc.) can also increase tourism results since climate parameters do not have the same effect on the continental and coastal part of the Republic of Croatia. The impending climate change will cause climate indicators to change, thus unlocking the potential for winter tourism development in areas not related to the sea, but also requiring the development of various forms of special-interest tourism. Winter tourism in Croatia represents a big potential not only because climate change will potentially make winters in Croatia milder but also because, with the right policies, there is a huge potential to develop the undeveloped region of continental Croatia with products that would diversify the Croatian tourism offerings.

**Keywords:** climate change; winter tourism; extending the tourism season; Croatia

## 1. Introduction

There is no question that world travel trends are undergoing major changes. These changes are reflected in the growing spatial concentration of tourism, mass international tourism, the growing number of tourists traveling several times a year, and the fact that free time is being increasingly spent in a “tourist” way. Modern tourists are becoming more demanding, as witnessed not only by service providers (travel agents, organizers of holiday events, and owners of hotels and guest houses), but also by regional authorities for which tourism is an additional source of revenue [1]. It can be said that tourism is both a potential victim of, and a significant contributor to, climate change [2].

Recent surveys show that Croatia is mostly recognized as a summer destination. Its main product is “sun and sea” with July and August accounting for about 60% of the total number of overnight stays [3]. Tourism in winter months is not developed and, apart from an increase in the number of

overnight stays in the period around Christmas and New Year, the winter tourism offering is modest and underdeveloped. The reason for such a situation is the lack of products that could be offered in both the coastal and continental parts of Croatia. Climate projections suggest that all seasons, including winter, will be warmer, allowing tourism flows to intensify [4]. As winter-sports tourism based on artificial snow is not developed in Croatia, an increase in temperature would have no negative effects. With climate change becoming more pronounced and climate-induced extreme events more frequent, grassroots action undertaken at the community level will not be enough in reducing vulnerability to current and projected climate change. This paper focuses on the potential of winter tourism development related to outdoor activities, such as hiking, mountaineering, Nordic walking, hunting and fishing, speleological research, etc., especially in the continental part of Croatia [5].

Neighboring countries such as Austria, Slovenia and Italy are able to develop their winter tourism offerings because they are located in the Alps while Croatia has lower altitudes. However, due to climate change and global warming, these neighboring countries will have to design new tourism products. Therefore, the aim of this paper is to prove the hypothesis that climate parameters have an impact on overnight stays in Croatia. This claim is very important for Croatian tourism, because Croatia is a distinctive summer destination and its tourism industry is mostly concentrated in the coastal part of the country. The authors raise the question of whether an increase in air temperature and changes in other climate indicators could result in Croatia becoming a destination with increased tourist flows even in the winter period. The data analyzed so far show that the number of tourists is largest in the summer months when temperatures are the highest. However, other parts of the country that are not sea-related, as well as other seasons (including winter), have great potential for tourism development. The statistical analysis conducted in this paper proves that climate indicators have a lower impact on continental Croatia than on coastal Croatia.

## 2. Conceptual Background

Interest in climate change has been growing in recent years, particularly since the United Nations Climate Change Conference in Copenhagen in December 2009 [6]. There are a large number of studies dealing with the impact of climate change on tourism. Some authors have explored the impact of climate change on tourism demand, based on climate change projections by the Intergovernmental Panel on Climate Change [7–11], at the global level, state level, and destination level including coastal areas, islands or ski destinations [12–14]. Tourism depends on a favorable climate, preserved environment and a wealth of flora and fauna [15,16]. Empirical research in Croatia on the level of the Kvarner destination was conducted in three phases: The first phase in 2004, the second in 2007 and the third in 2012 [17–19]. The authors of the studies researched the attitudes of tourists, residents and managers, and the results in all three phases showed that all categories of respondents considered natural factors as being major contributors to tourism. In the opinion of the three groups (tourists, residents and managers), the most valued assets are beauty of the landscape, climate, environmental preservation and cleanliness of the sea. These results indicate that all target groups agree that natural factors—space, resources and environment—must be protected [20].

International tourist flows in Europe are partly determined by climate indicators such as temperature, the number of sunny hours and rainy periods [21]. Bujosa and Rossello investigated the impact of two climate change scenarios on the allocation of domestic tourism within Spain. The findings show that while Spain's northern colder provinces would benefit from rising temperatures, provinces in the south would experience a decrease in the frequency of trips [22]. Hamilton and Tol explored the impact of climate change on regions of Germany, Ireland and the U.K. using an econometric simulation model of domestic tourism in those countries and international tourist flows between 207 countries. They combined the model with subnational datasets of domestic and international tourism and then developed a downscaling method consistent with the assumptions in the country model [23]. In their study, Li, Goh Hung and Chen developed a uniform index under a push–pull framework to gauge the relative climate comfort between the destination and the origin. They empirically tested the

interannual and intra-annual effects of relative climate comfort on seasonal tourism demand, based on a quarterly panel data set of visitor arrivals from Hong Kong to 13 major Chinese cities. The panel data modeling technique is applied in this study, as Hsiao (2003) indicated that the use of panel data has several advantages over time series or cross-section data, including a greater degree of freedom, the mitigation of multicollinearity, and a reduction in omitted variable bias [24]. Li, Song and Li developed a model that links climate and seasonal tourism demand. They examined the effects of home climate, destination climate, and climate differences between destinations and source markets, on seasonal tourism demand. Using the dynamic panel data technique, the study focused on the demand of tourists from Hong Kong for 19 of the major tourism cities in Mainland China [25]. In their study, Ridderstaat, Oduber, Croes, Nijkamp and Martens estimated the effect of seasonal patterns of pull and push climate elements (rainfall, temperature, wind, and cloud coverage) on recurrent fluctuations in tourism demand from the United States (USA) and Venezuela to Aruba [26]. Gomez Martin in his paper considers the influence that climate and weather exert on the geographical space, demand, supply, and market agents of the tourism system. He also underlines the significance of this relationship in the context of climate change [27]. Becken's research shows that seasonality in Westland is largely driven by temperature; however, variability in visitor nights across years does not seem to be influenced by weather conditions. Both the scenic flight operation and visitation to the visitor center are measurably impacted by daily weather [28].

Climate change impacts many key factors important for tourism [29–31]. Rising sea levels, ecosystem adjustment, changes in the water system on Earth, various health impacts, and intensified extreme weather events will affect tourism not only in terms of reducing comfort but also in terms of reduced safety [32]. Tourism is extremely sensitive to climate change and can endure many negative or positive effects [33–35]. However, it must be emphasized that climate change will not have the same effect on different destinations and, consequently, on the economic benefits of tourism. Tourism needs to introduce certain adjustment measures to boost the positive and mitigate the negative effects of future climate change [36].

The World Tourism Organization began to warn about the possible negative effects of climate change on winter tourism and sport as early as 2003 [37]. Thus, the European Alpine region is one of the areas most vulnerable to climate change with regard to winter tourism. The average temperature in the area increased by +2 °C compared to the period 1900–1990, while in other areas it increased by +0.78 °C [38,39]. Since 1850, the glaciers have lost 50% of their volume, while the snow cover has decreased and is lowest in the fall and summer [40]. These data suggest that tourism destinations relying on snow and skiing in the winter will be threatened in the future [41–43]. Contrary to the fact that winter activities will suffer certain losses, climate change will have a positive effect on summer tourism in mountainous areas [44]. It is already noticeable that during the hot summer months, tourists tend to go to the mountains to take advantage of the climate benefits and enjoy outdoor activities. Therefore, winter tourism and mountain tourism do not include only snow-related activities; these areas can offer a variety of other products that could mitigate the adverse effects of climate change.

### 3. Study Area, Study Materials and Methods

#### 3.1. Study Area

As a member of the European Union, Croatia is included in the Nomenclature of Territorial Units for Statistics (NUTS). NUTS regions in Croatia, or the National Classification of Territorial Units for Statistics of the Croatian Bureau of Statistics, refer to the territorial division of Croatia for statistical purposes, according to the European Nomenclature of Territorial Units for Statistics (NUTS-fr.: Nomenclature des unites territoriales statistiques).

Pursuant to Article 43 of the Official Statistics Act [45] the Croatian Bureau of Statistics (CBS) determines the national classification of territorial units for statistics [46]. In August 2012, the European Commission accepted the proposed division of the Republic of Croatia into two NUTS 2

regions, namely Continental Croatia and Adriatic Croatia. The use of the new classification for the implementation of Cohesion Policy started when Croatia joined the EU, i.e., on 1 July 2013, what is shown in Figure 1.



**Figure 1.** Statistical division of Croatia into two regions: Continental Croatia and Adriatic Croatia, source: [46].

Continental Croatia covers an area with 2.96 million inhabitants and has a GDP per capita at 64.1% of the EU average. The area covered by Adriatic Croatia has 1.47 million inhabitants and a GDP per capita at 62.1% of the EU average. This shows that both regions belong to the so-called less-developed regions, whose GDP per capita is lower than 75% of the EU average [47]. Continental Croatia includes fourteen continental counties, while the Adriatic region includes seven coastal counties. In order to better recognize the development potential of both regions, activities with comparative advantages, and natural resources, the following part of the paper analyzes both regions' potentials that contribute to tourism and economic power.

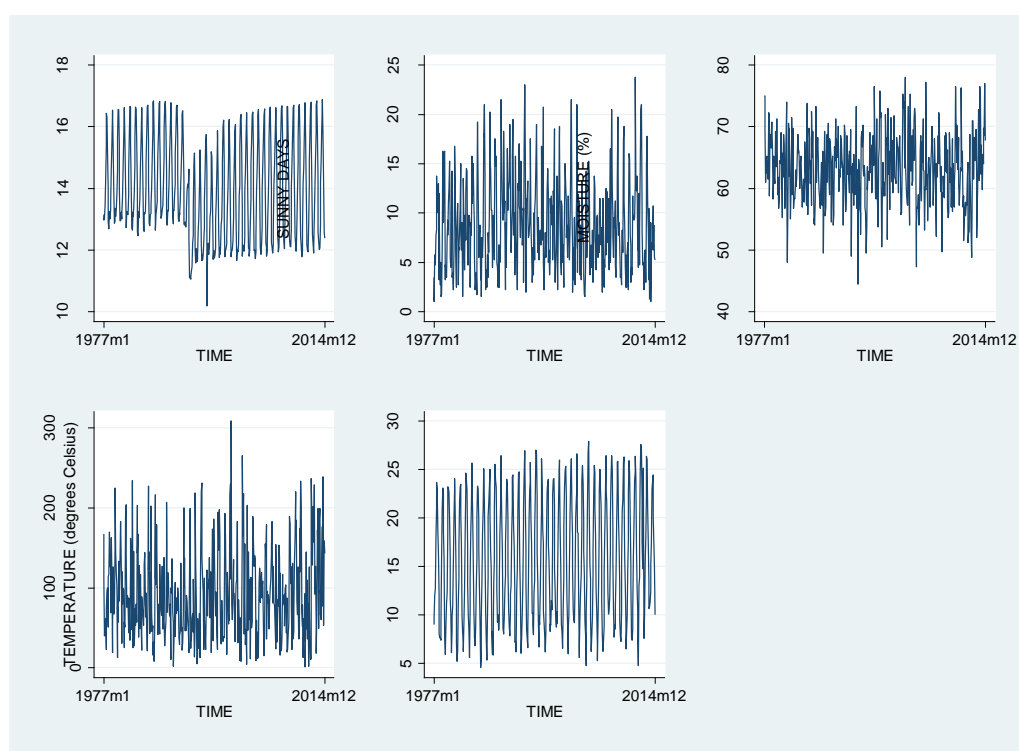
The coastal part of Croatia (Adriatic Croatia) is the area comprising the islands, the coast and the sub-Mediterranean hinterland from Cape Savudrija in the north to Prevlaka in the south. The total length of the Croatian coast is 5790 km<sup>2</sup>, due to its highly indented coastline. With a 10.2 indentation coefficient, Croatia has the second most indented coastline in Europe (after Norway). The Croatian part of the Adriatic has 1185 islands, rocks and ridges [48]. The area of the Adriatic tourist macro-region has a Mediterranean climate, so precipitation (rain) is more frequent in winter months, whereas summers are mostly dry and clear. Humidity is relatively low, the result of the constant circulation of air. The winter is marked by the winds bora and sirocco, and the summer months mainly by mistral, which refreshes, reduces sultriness and purifies the atmosphere. The waves do not exceed two meters in the winter, and about half a meter in the summer [49]. The specificity of the reef, plant and animal life and other characteristics of particular areas led to the creation of five specific environmental areas, i.e., the national parks Mljet, Kornati, Brijuni, Paklenica on Velebit and Krka Waterfalls and several nature parks and reserves that attract a significant number of tourists or transit visitors [50]. Due to its abovementioned characteristics, natural environment and highly attractive anthropogenic assets, this region is the most important tourist destination in Croatia. There are particularly good conditions for swimming, water skiing, windsurfing, diving, water polo, navigation and sailing on various types of vessels and, in winter months, there are natural conditions for the development of health tourism with specific forms of sports and recreational activities. Most beaches are suitable for activities such as aerobics and water exercise, while a significant part of the coast is also suitable for the construction of water parks [51]. The importance of this region is evidenced by tourism performance in the period 2007–2016 (Table 1).

**Table 1.** Tourism performance in the coastal area in the period 2007–2016, source [3].

Year	Numerical Indicators (in 000)		Realized Overnight Stays		The Share of Coastal Tourism in Overall Results		The Share of Summer Tourism in Overnight Stays (in %)	The Share of Winter Tourism in Overnight Stays (in %)
	Arrivals	Overnight Stays	Domestic	Foreign	Arrivals	Overnight Stays (in %)		
2007	9586	48,776	5054	47,595	86	94	92.6	7.4
2008	9608	53,573	5025	48,548	85	94	93	7
2009	9406	52,911	4517	48,394	86	94	93.3	6.7
2010	9030	52,869	4219	48,650	85	94	93.6	6.4
2011	9749	56,439	4374	52,065	85	93	93.4	6.6
2012	9978	58,102	4026	54,076	84	93	93.1	6.9
2013	10,557	61,242	3981	56,181	85	94	93.2	6.8
2014	11,078	62,585	3983	58,576	84	94	93	7
2015	12,053	67,239	4469	62,613	84	94	93.2	6.8
2016	13,073	73,039	4516	68,271	84	94	93.1	6.9

As can be seen in Table 1, in the period 2008–2016 the number of arrivals and the number of overnight stays grew at an average annual rate of 3.9%. The number of domestic overnight stays increased at an average annual rate of 3.5%, while the number of nights spent by foreign tourists showed a positive annual growth rate of 4.3%.

Figure 2 shows climate parameters in the coastal area in the period 1977–2014, which are been used in regression model.

**Figure 2.** Climate parameters in the coastal area in the period 1977–2014.

The continental part of Croatia consists of the mountainous regions of Lika and Gorski Kotar and the Pannonian and Peripannonian part that includes the city of Zagreb, Hrvatsko Zagorje and lowland eastern Croatia. The mountainous region stretches from the border to Slovenia in the west to the Bosnia-Herzegovina border in the southeast, covering 7913 km<sup>2</sup> or about 14% of the total Croatian territory, with about 144,000 inhabitants or about 3% of the total Croatian population [52]. The main

reason for the depopulation of this region is the underdeveloped economy. One of the comparative advantages of the mountainous area is certainly its proximity to the sea, creating an opportunity for developing various forms and types of tourism (excursion, transit, combined, etc.). The climate is typically continental with fresh summers, cold winters and relatively high precipitation (snow). Due to the proximity to the Mediterranean and the mixing of the continental and Mediterranean climates, snow mostly remains on the ground for a relatively short time, which is one of the main constraints for the development of winter tourism. Gorski Kotar has tourism resources that are a good basis for hunting and fishing tourism, health tourism, various winter sports, and excursions, recreational and transit tourism [52]. The climate in Gorski Kotar is continental, with very short and fresh summers and long and sharp winters with abundant snow. Lika has the same or similar environmental characteristics, but what makes it so special is the specificity of its karstic composition and geomorphological forms. The Panonian-peripannonian area has a surface of 30,776 km<sup>2</sup> or 54.4% of Croatian territory, with about 3.17 million inhabitants or 66.4% of the total [47]. Although its natural tourism resources are relatively modest, this area has certain comparative advantages in the development of sports and recreational activities and tourism development in general, since it includes the largest Croatian cities of multi-functional significance with a great wealth of highly attractive anthropogenic tourism resources and the potential for the development of excursion or business tourism (Zagreb, Varaždin and Osijek). City tourism and congress tourism is independent of weather. Urban tourists are more weather resilient, as neither actual nor perceived weather affects behavior to any great extent [53].

When Croatian tourism performance in the continental part is compared with that of the coastal area, it is evident that the former has great potential for increasing the number of arrivals and overnight stays, even more so because air temperature on the coast is rising and tourists want to spend their time in comfortable climate conditions. Table 2 shows tourism performance in the continental area in the period 2007–2016.

**Table 2.** Tourism performance in the continental area in the period 2007–2016, source [3].

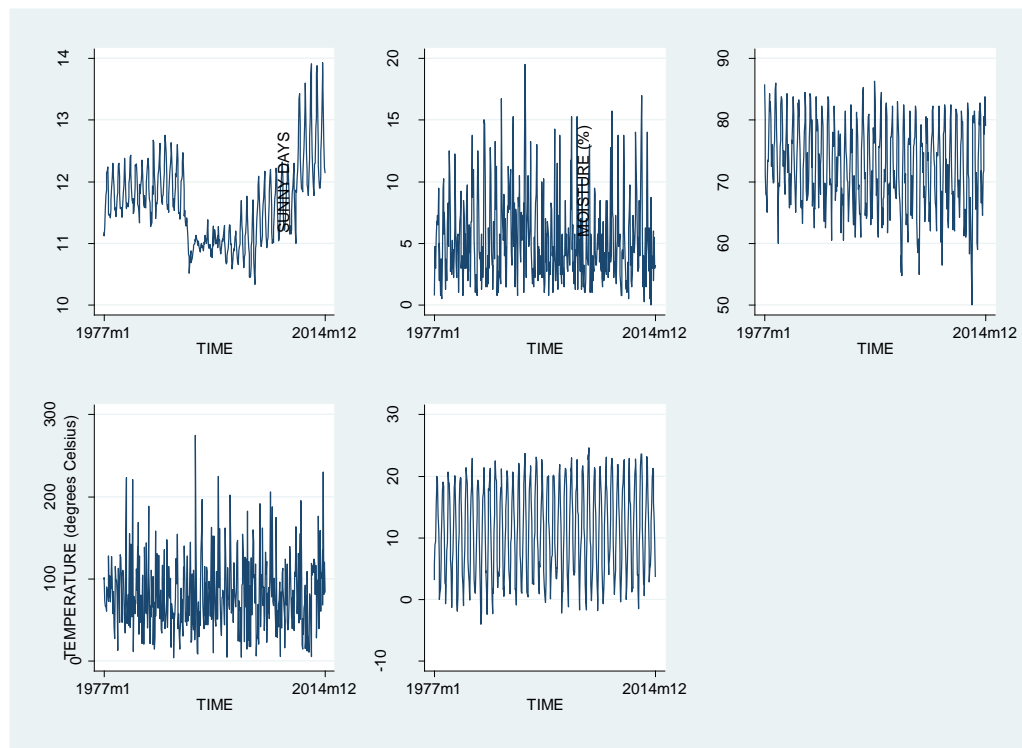
Year	Numerical Indicators (in 000)		Realized Overnight Stays (in 000)		The Share of Continental Tourism in Overall Results		The Share of Summer Tourism in Overnight Stays (in %)	The Share of Winter Tourism in Overnight Stays (in %)
	Arrivals	Overnight Stays	Domestic	Foreign	Arrivals	Overnight Stays (in %)		
2007	1576	3356	1377	1979	14	6	59.7	40.3
2008	1653	3530	1453	2077	15	6	58	42
2009	1529	3390	1283	2107	14	6	59	41
2010	1574	3547	1205	2342	15	6	65.6	34.4
2011	1707	3915	1229	2686	15	7	66.9	33.1
2012	1857	4641	1195	3446	16	7	71.8	28.2
2013	1877	3576	1157	2419	15	6	71	29
2014	2050	3925	1177	2748	16	6	70	30
2015	2290	4366	1273	3093	16	6	70.5	29.5
2016	2521	5011	1341	3670	16	6	71.2	28.8

An analysis of the above data indicates that there is great potential for tourism development in the continental part of Croatia, which is further evidenced by the average annual growth rate of foreign tourist overnight stays of 7.1%. As this paper analyzes climate parameters and proves the hypothesis that air temperature has a strong influence on the number of overnight stays, it is obvious that with further temperature rise and climate change, tourists will start seeking climatically more comfortable parts of Croatia, not just coastal areas. The next figure illustrates trends in climate parameters of the continental part of Croatia in the period 1977–2014.

In this paper summer period refers to the period from May to September, and the winter period from October to April. This is also the official division of tourist season in the Republic of Croatia [17].



Figure 3 shows climate parameters in the continental area in the period 1977–2014, which are been used in regression model.



**Figure 3.** Climate parameters in the continental area in the period 1977–2014.

### 3.2. Study Materials and Methods

The analyzed data cover the period from 1977 to 2014. In this model, we used quarterly average data for all the below-mentioned climate variables in the period from 1977 to 2014. For the coastal part of Croatia, we used quarterly averages of all climate variables in meteorological stations in the towns of Rijeka, Zadar, Split and Dubrovnik. For continental Croatia we used quarterly averages of all climate variables in meteorological stations in Zagreb, Osijek, Knin and Gospić. Data on climate parameters were obtained from the Croatian National Meteorological and Hydrological Service, while the data relating to the number of tourist overnight stays were obtained from the Croatian Bureau of Statistics. For the purposes of the research, the following variables (i.e., logarithms of their values) were used:

- Logarithm of the number of overnight stays, as a dependent variable, and
- the following climate parameters, as independent variables:
  - temperature,
  - humidity,
  - precipitation,
  - number of sunny days.

In order to establish the correlation of the observed elements, data analysis was performed for coastal Croatia and continental Croatia. The statistical analyses were conducted using the STATA 12.0 program package (StataCorp, LLC, USA), and apart from the basic descriptive statistics methodology, correlation and regression analyses were used. The correlation analysis uses the Pearson coefficient of correlation. In the regression analysis, we used a multivariate model with first difference specification and OLS estimation, in which past period of the dependent variable was also included. Seasonality

was controlled by using quarterly dummy variable. In all tests, the statistical significance is  $p = 0.05$ . The analyses for coastal and continental Croatia were made separately.

#### 4. Results

The following section presents the results of our analysis. Table 3 shows Correlation analysis of the number of overnight stays and the independent variables for coastal Croatia in the period 1977–2014—winter period.

**Table 3.** Correlation analysis of the number of overnight stays and the independent variables for coastal Croatia in the period 1977–2014—winter period.

Variable	Sunny Days	Humidity	Precipitation	Temperature
Pearson coefficient of correlation	−0.016	0.143	0.125	0.277
<i>p</i>	0.893	0.217	0.284	0.015

Correlation analysis of coastal Croatia in the winter period shows a significant correlation between the number of overnight stays and temperature, while other parameters are not correlated with number of overnight stays. Table 4 shows Correlation analysis of the number of overnight stays and the independent variables for coastal Croatia in the period 1977–2014—summer period.

**Table 4.** Correlation analysis of the number of overnight stays and the independent variables for coastal Croatia in the period 1977–2014—summer period.

Variable	Sunny Days	Humidity	Precipitation	Temperature
Pearson coefficient of correlation	0.608	−0.432	0.009	0.705
<i>p</i>	<0.001	<0.001	0.938	<0.001

Correlation analysis of coastal Croatia in the summer period shows that all the observed parameters except precipitation are significantly related to the number of overnight stays, with the number of sunny days and temperature having a positive correlation, while humidity is negatively correlated with the number of overnight stays. This means that an increase in the number of overnight stays is to be expected in the future, given that climate change forecasts in the Republic of Croatia say that there will be higher average temperatures and more sunny days [4]. It should be emphasized that the correlation coefficient between temperature and the number of overnight stays is high. Correlation between sunny days and the number of overnight stays is moderate, as well as the correlation between humidity and the number of overnight stays. It can be seen that the correlation in the winter period is statistically significantly less significant than in the summer period, which implies that winter tourism in Croatia is far less dependent on climate parameters. Tables 5 and 6 show multivariate regression analysis for the coastal part of Croatia in winter and summer period 1977–2014.

**Table 5.** Multivariate regression analysis for the coastal part of Croatia in the period 1977–2014 (Ftest:  $p < 0.001$ ,  $R^2 = 0.9544$ , No of obs = 75)—winter period.

Variable	Regression Coefficient	Beta Coefficient	<i>p</i>
log overnight stays $t - 1$	−0.019	−0.031	0.898
sunny days	0.026	0.037	0.419
humidity	0.026	0.059	0.148
precipitation	−0.002	−0.056	0.309
temperature	−0.067	−0.089	0.107
quarterly dummy	−0.041	−0.051	0.809



**Table 6.** Multivariate regression analysis for the coastal part of Croatia in the period 1977–2014 (Ftest:  $p < 0.001$ ,  $R^2 = 0.7304$ , No of obs = 75)—summer period.

Variable	Regression Coefficient	Beta Coefficient	$p$
log overnight stays $t - 1$	−0.384	−0.914	<0.001
sunny days	−0.035	−0.179	0.289
humidity	−0.034	−0.158	0.147
precipitation	0.005	0.170	0.060
temperature	0.268	1.010	<0.001
quarterly dummy	−0.821	−0.720	0.008

The analyses in Table 5 show that climate parameter has no significant effect in the winter period. In the summer period (Table 6) the temperature is the only parameter with a significant effect. From these results we can conclude that an increase of temperature by 1 degree would increase the number of overnight stays in the summer period by approximately 0.27%, while an increase of 3 degrees would increase that number by approximately 0.81%. Tables 7 and 8 show correlation analysis of the number of overnight stays and independent variables for continental Croatia in winter and summer period 1977–2014.

**Table 7.** Correlation analysis of the number of overnight stays and independent variables for continental Croatia in the period 1977–2014—winter period.

Variable	Sunny Days	Humidity	Precipitation	Temperature
Pearson coefficient of correlation	0.002	0.299	0.080	0.113
$p$	0.984	0.009	0.491	0.329

Correlation analysis for the winter period in continental Croatia shows significant but low correlation between the number of overnight stays and temperature, as well as humidity.

**Table 8.** Correlation analysis of the number of overnight stays and independent variables for continental Croatia in the period 1977–2014—summer period.

Variable	Sunny Days	Humidity	Precipitation	Temperature
Pearson coefficient of correlation	0.227	−0.004	−0.053	0.256
$p$	0.048	0.974	0.651	0.026

In the summer period, the number of sunny days is correlated with the number of overnight stays as well as temperature, but we can see that these correlations are low, especially comparing to the coastal area. This analysis suggests that tourism in continental Croatia is far less dependent on climate parameters than tourism in coastal Croatia. Tables 9 and 10 show multivariate regression analysis for the continental part of Croatia in winter and summer period 1977–2014.

**Table 9.** Multivariate regression analysis for the continental part of Croatia in the period 1977–2014 (Ftest:  $p < 0.001$ ,  $R^2 = 0.5440$ , No of obs = 75)—winter period.

Variable	Regression Coefficient	Beta Coefficient	$p$
log overnight stays $t - 1$	−0.385	−0.572	<0.001
sunny days	0.029	0.095	0.451
humidity	−0.003	−0.018	0.906
precipitation	0.003	0.176	0.216
temperature	−0.078	−0.328	0.013
quarterly dummy	2.351	0.001	0.866

**Table 10.** Multivariate regression analysis for the continental of Croatia in the period 1977–2014 (Ftest:  $p = 0.008$ ,  $R^2 = 0.2213$ , No of obs = 75)—summer period.

Variable	Regression Coefficient	Beta Coefficient	<i>p</i>
log overnight stays t-1	0.472	0.631	0.001
sunny days	−0.007	−0.061	0.797
humidity	−0.001	−0.010	0.957
precipitation	0.001	0.068	0.698
temperature	0.062	0.417	0.156
quarterly dummy	−0.446	−0.860	0.018

The analyses in Tables 9 and 10 show that in the continental part, climate parameters have no significant effect in the summer period, while in the winter period temperature has a significant effect. It is interesting to see that in the coastal part, temperature has significant impact in summer, while in the continental part it has a significant impact in winter. Here, during the winter an increase of temperature by 1 degree will decrease the number of overnight stays by approximately 0.08%.

## 5. Discussion

Generally speaking, the correlation between climate parameters and the number of overnight stays is more pronounced in coastal Croatia than in continental Croatia. It can be seen that the correlation in the winter period is statistically significantly less significant than in the summer period, which implies that winter tourism in Croatia is far less dependent on climate parameters. The fact is that average weather in one quarter of the year is similar, and there is strong seasonality, but from year to year we have a lot of variation regarding particular months. Croatia is a small country with expressed differences between regions and what is more important inside the regions.

The development of winter and mountain tourism in Croatia is a complex and sensitive process that is much more demanding than the development of coastal tourism. This is one of the reasons why mountain tourism is lagging behind coastal tourism, along with the fact that tourism development in Croatia is predominantly focused on the Adriatic coast. Developing tourism in coastal Croatia was simpler because, in the beginning of tourism development, tourists were not very discerning and required only accommodation and beaches. It was simpler and more profitable to build a hotel by the sea and set up beaches that would attract more tourists who spend more, than to build a hotel and hiking routes somewhere in continental or mountainous Croatia. However, with rising temperatures and climate change, tourist demands are no longer the same. Modern tourists want to spend their time engaged in sports and recreational activities, and continental Croatia has great potential to meet these needs, even in the winter months. In both continental and coastal Croatia, it is necessary to develop selective forms of tourism, such as cultural tourism, urban tourism, health tourism, agrotourism, rural tourism, dark tourism, industrial tourism or ecotourism. Furthermore, temperature dependence is much lower in the continental part of the country, which opens up opportunities for developing winter tourism as well as other forms of special-interest tourism in the winter period. Croatia has all the characteristics of the Mediterranean countries, dominated by the "sun and sea" product and pronounced seasonality. The product "sun and sea" holds the lion's share in all Mediterranean countries and they sell it mainly during the summer period (high season). However, that does not mean a country cannot sell the sun and sea during the winter period (for example: The case of the Canary Islands in Spain). Good, stable weather is the main motivation for tourist arrivals at summer destinations during the summer season [54]. Baron (1975) also draws attention to the economic importance of seasonality and to methods of improving seasonal patterns to increase the utilization of facilities, with special reference to tourism and hotel accommodation [55]. The negative environmental effects of summer tourism, such as overcrowding and the accumulation of waste in the high season, can also be observed and has an adverse impact on service quality and consumer satisfaction. Thus, there is potential for tourism growth in the winter season.

The presented model is not without limitations. In addition to climate parameters, there are many others that also affect tourist stays in a country. However, the aim of this paper was to investigate only the impact of climate parameters on tourism. The second limitation is that the analysis involved only two regions. Although each region is different in its own way, it was considered that a general image could be obtained from the model.

## 6. Conclusions

This paper highlights the close relationship between climate, weather and tourism, and shows that tourism in the coastal area is dependent on all climate parameters. Hence, it is recommended for key stakeholders in tourism to adapt to new climate conditions. Furthermore, it is necessary to create new tourism products and attract travelers to Croatia outside the main season. Outdoor tourism products are vulnerable to air temperature, so stakeholders in the coastal area are advised to adapt to new conditions, and continental stakeholders to develop and supply tourism products related to winter and mountain tourism. It can be concluded that the correlation in the winter period is statistically significantly less significant than in the summer period, which implies that winter tourism in Croatia is far less dependent on climate parameters.

Climate change will certainly increase the consumption of sun and sea in the fall and winter periods. Winter tourism in Croatia represents a big potential not only because climate change will potentially make winters in Croatia milder but also because, with the right policies, there is a huge potential to develop the undeveloped region of continental Croatia with products that would diversify the Croatian tourism offerings. Overall, in Croatia, climate parameters are extremely important due to tourism offering dynamics. The conducted analysis has shown that the continental part of Croatia can become attractive throughout the year, especially in the winter months. It can be concluded that in the continental part, climate parameters have no significant effect in the summer period, while in the winter period temperature has a significant effect. It is interesting to see that in the coastal part, temperature has a significant impact in summer, while in the continental part it has significant impact in winter. Therefore, the main conclusion is that winter tourism in Croatia is possible, but it is recommended to develop new tourism products for all parts in Croatia, especially for the continental part.

Due to climate change, new offerings need to be created and developed, with winter and mountain tourism presenting untapped potential, especially in the continental part of Croatia. Despite all the constraints mentioned above, positive qualitative and quantitative changes are taking place that result in increased business activities and raised awareness, across all levels, of Croatia as a modern tourism destination. To facilitate the further development of tourism in Croatia, tourism plans need to include measures enabling adaptation to, and mitigation of, climate change. In the first place, it is necessary to assess climate change impact in specific geographic areas and its effect on different tourism offering segments. This should be followed by concrete guidelines for tourism development in new conditions in accordance with the concept of climate change adaptation. Since tourism partially depends on the available tourism infrastructure, it is necessary to make plans to protect the existing, and build a new, infrastructure that will withstand future unfavorable climate conditions. All this needs to be continuously monitored in order to avoid possible negative impacts. Likewise, tourism should be planned in co-operation with local and state self-government units, and any excuses and delays should be replaced with decisive leadership capable of devising and implementing development strategies and plans with the aim of generating new jobs and creating a positive impact on the gross domestic product.

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