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Climate Change & Global Warming Impacts in Tourism Destinations

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Abstract

Climate change and global warming have become a significant issue showing its impacts visible even to the naked eye which we can observe all around the world. One consequence of global warming is the damaging impacts it may have on tourism and the destinations it occurs in. The nature and intensity of these impacts will depend on the location, activity, geographic scale. In this case, researchers studied touristic destinations and specifically put Mediterranean Region and Turkey under the scope. For Mediterranean countries, the climate is the main assets, a pull factor attracting tourists, however the future scenarios forecast that the Mediterranean basin in particular would become hotter and drier which could turn preferred touristic destinations into less popular places especially in their peak periods. Turkey also faces global warming issue in the destinations located in the southern part of the country. Boniface and Cooper (2009, p. 68) underlined the fact that the most tourism destinations have to rethink and reevaluate the products that they will offer in the future and effectively reposition themselves in the market place to cope with the changing climate. Scientific reports about climate change projections and the literature encompassing the related scenarios have been analyzed by the researchers in order to determine conceivable compulsory solutions.

Keywords: Climate change, Global warming, Impacts on Touristic Destinations, Mediterranean Basin, Temperature Rise

Introduction

Sustainability, climate change and tourism can be seen as three distinct but complex, interrelated and contested constructs (Moscardo, 2013, p. 24). Climate change is incredibly complex and possibly the greatest impending threat to global tourism (Cook et al, p. 349). Tourism and climate is highly associated especially in pre-travel decisions and the satisfaction level throughout travel and tourism experience. Climate is a conclusive tourism means and plays a key role in the attractiveness of tourist destinations and the seasonality in tourism demand. The appropriateness of climate for general tourism purposes (i.e., sightseeing, shopping, and other light outdoor activities) is most frequently expressed by the Tourism Climatic Index (TCI) developed by Mieczkowski (1985) and known as a comfort scale suitable to tourism activities, which merges several tourism-related climatic elements (Kovacs and Unger, 2013, p. 147).

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Sustainability of destinations can be achieved in the long run by observing the projected possible effects and taking countless necessary measures; in this case measures for climate change generates the prime topic .Long-term observations confirm that our climate is now changing at a rapid rate and the science indicated that the warming in the 21st century will be significantly larger than in the 20st century (National Assessment Synthesis Team, 2000, p. 6).

Since the nineteenth century, the scientific community has debated global warming and climate change, which are linked to the greenhouse gases (GHG) effect and the increasing amount of carbon dioxide in the atmosphere (Presidency's Directorate of Communications, 2021, p. 33). Countries have signed agreements and protocols with the intention of minimizing the influences of climate change to prevent these conversions as the central objective. So far the journey from the 1997 Kyoto Protocol to the Paris 2015 Agreement has been problematic and more work remains on the implementation of binding agreements (Galdies, 2018, p.19). The Paris Agreement's mitigation obligation differs from Kyoto, which is based on strict rules and sanctions. China is the largest emitter of carbon dioxide gas in the world, followed by USA. Theoretically Milne (1996, p. 146) defines greenhouse effect as the possibility of heat retention in the lower atmosphere as a result of absorption and re-radiation by clouds and gases including water vapor, CO_2, methane and chlorofluorocarbons. According to Pearce-Higgins et al, (2022) impacts of climate change on natural and human systems will become increasingly severe as the magnitude of climate change increases.

Climate Change Impacts

Climate change impacts on tourism have been classified mainly under 4 categories as, direct climatic, indirect environmental change, mitigation policies, indirect societal change impacts by the United Nations Environment Program. Furthermore, some researchers (Forsyth, et al. 2007; Ehmer&Heyman, 2008) have enhanced and increased this classification up to 5 categories adding attitudinal and behavioral change impacts as Marshall et al, (2009, p. 3-4) stated and clarified with the following explanation of these impacts:

1. Direct climatic impacts: Changes to climate could result in both negative and positive impacts (e.g. more/less 'sunny days'), depending on the location and nature of activities undertaken at a tourism destination.

2. Indirect environmental change impacts: Many tourism activities are dependent on environmental assets; such as beaches or coral reefs. Climate change is expected to alter many aspects of the natural and built environment, creating a range of indirect impacts for tourism, most of which are likely to be negative.

3. **Impacts of mitigation policies on tourist mobility**: National or international mitigation policies that seek to reduce the impact of tourism on natural resources or reduce carbon emissions may have an impact on tourist flows (Simpson, et al., 2008; Gossling, et al., 2008).

4. Indirect societal change impacts. Climate change has the potential to cause massive social disturbance as a result of impacts on future economic growth and political stability. Worsening situations of social unrest will make each region even more unpalatable for tourism (Hall, et al., 2004; UNEP, 2009).

5. Awareness and attitudinal impacts. As consensus grows about the imperative to take action on climate change, individuals are adopting new attitudes and behaviors in response to new laws and community expectations ('social norms'). For example, a destination with a poor image for sustainability and climate friendliness could rapidly fall from grace in the perception of growing numbers of travelers with a strong environmental conscience.

Even though global warming and climate change carry different meanings, they can be used interchangeably on occasions. Therefore, both terms need to be clarified and specified with their distinct characteristics. Global warming is basically defined as an increase in average global temperature caused by natural and anthropogenic factors in atmosphere areas close to the earth's surface, whereas climate change is states as the long-term and broader consequences of the world recovering heat such as changing in the precipitation regime and quantity, rising sea levels, melting glaciers and ice sheets, draught or flood as a result of energy budget imbalances (Presidency's Directorate of Communications, 2021, p. 34).

Changes in Observed Climate

With reference to Becken and Hey (2007, p. 121-122), Marshall et al, (2009, p. 3) some of the detected **changes in the observed climate** are listed below:

1. Significantly, tropical ocean temperatures have increased by more than 0.5°C over the past 50 years, a change unprecedented over at least the last 150 years and perhaps the last several 1000 years.
2. Globally dry areas have tended to become drier and are expanding.
3. The rate and duration of the warming of the 20th century was larger than at any other time during the last 1000 years.
4. Glaciers have retreated in many mountain areas around the world, in recent decades there has been a worldwide decrease in the extent of snow cover and depth in spring the former by about 10% in the since the late 1960s; less snow at low altitudes.
5. Increased frequency of heavy precipitation events over land even in areas where the average precipitation has decreased; increased frequency of major floods.
6. As a result of increasing sea water temperatures and ultra-violet (UV) radiation, mass coral bleaching has occurred worldwide, devastating reefs in some regions including the Maldives, Seychelles and Palau and leading some experts to claim that coral reefs are 'in crisis' (referenced from Belwood, et al., 2004; Hoegh-Guldberg, 2007).
7. Global average surface temperature has increased by around 0.8°C since the late 19th century.
8. Between 1993 and 2015, the Mediterranean Sea rose by two to three millimeters per year.

After analyzing temperatures worldwide (see Figure 1.), it could be remarked that 2016 was the warmest year on record, 2020 was the second-warmest, and 2011–2020 was the warmest decade on record. Global average surface temperature has risen at an average rate of 0.17°F per decade since 1901.

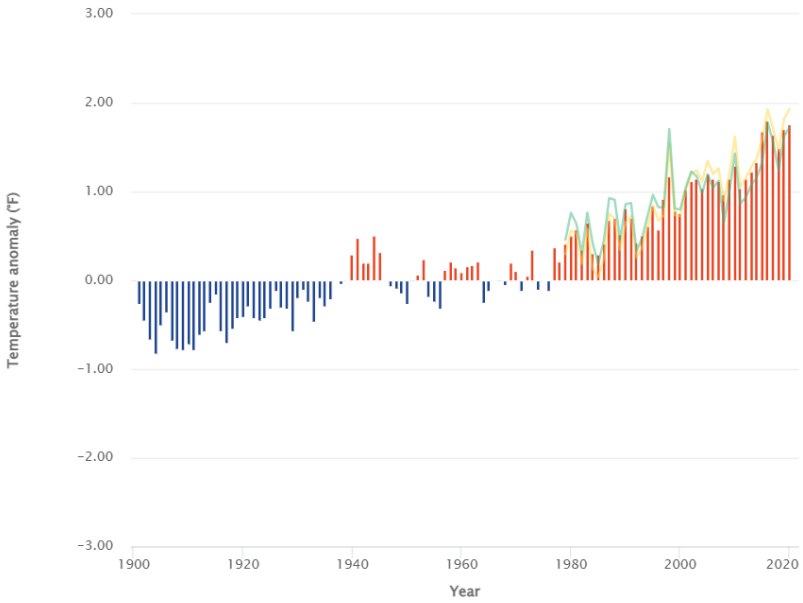

Figure 1. Temperatures Worldwide, 1901–2020(Source: EPA, 2022).

Future Influences of Climate Change

Most estimate that the global temperature will rise between 2°and 6° Fahrenheit by the year 2050 (Cook et al, 2018, p. 349). Gössling (2011, p. 24); Referring to Becken and Hey (2007, p. 124, 134), WTO (2003, p.19, 33) and McKinsey Global Institute (2020, p.10) the ***future influences of climate change*** have been itemized below.

1. Global means air surface temperatures are projected to increase by +2°C to 7°C above pre-industrial levels by 2100. If current emission trends continue, temperatures will exceed 2°C average global warning by 2100.
2. Over the period 1990-2100, global average sea-level is projected to rise between 0.09 and 0.88m; this is because of the expansion of sea water as a result of the increase in oceanic temperatures, and of the continued melting of mountain glaciers and small ice caps.

3. Sea level rises are predicted for the world's oceans, with a central estimate of 48 centimeters. Even if emissions could be held at current levels, sea levels will rise as a result of past emissions for at least the next 1,000 years, ultimately by as much as four meters. The Greenland and Antarctic ice sheets contain enough water to raise global sea levels by 70 meters if they were to melt; thus only a small fractional change in their volume would have a significant effect.
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5. Heavy precipitation is perhaps the most devastating climate-related events in the Alps not only because of the associated flood hazard but also because heavy rain triggers a wide range of geomorphologic hazards that lead to loss of life and costly damage to infrastructure.
6. Precipitation will generally increase in the humid tropics and high latitudes but will typically decrease in the subtropics where conditions over land are already dry on average.
7. As the Earth warms, Northern Hemisphere snow cover and sea-ice extent will decrease and glaciers and ice caps will lose mass.
8. The greatest increases in intensity of heat will occur in Western Europe, The Mediterranean and South East and Western USA.
9. The snow line is receding due to warmer winters (for every 1°C increase, the snowline recedes by 150 meters), the ski season is becoming shorter, and there is greater precipitation – which means more snow at higher altitudes – during the winter months.
10. The rising of the Mediterranean Sea is projected to accelerate, resulting in a further increase of about 25 centimeters from its current level by 2050.The higher mean sea level, combined with tidal forces and storms, will result in more frequent and/or severe coastal flooding.

Climate Change Impacts on Touristic Destinations

The ***prospected impacts on touristic destinations*** which are estimated by Cook et al (2018, p.350) and WTO (2003, p. 19, 25, 29) are recorded as follows:

1. Certain destinations are more seasonal than others, but the potential threat of climate change will force most destinations to begin implementing adaptations to what attractions they offer and during what time of year.
2. Ski resorts may start to experience shorter seasons and be required to move their base areas to higher elevations where the snow is less likely to melt. There will be a 10-45% reduction in the duration of winter snow, shortening the Alpine skiing season.
3. Greater demand for high altitude resorts for skiing and greater risk of avalanches; extended season for non-ski mountain activities and possibly less overall demand for skiing
4. Beach resorts closer to the equator may at first experience longer tourism seasons, but uncomfortably hot temperatures may eventually turn tourists away.
5. Even non-seasonal attractions found in big cities are threatened because many are positioned along coastlines and need to be concerned with sea level rise that could eliminate their existing locations.
6. Northern Asia (mainly the northern latitudes of Russia) and the Tibetan plateau will see the greatest rises, but northern Europe, the Mediterranean, and North America will also see above-average increases.
7. For Mediterranean region, the temperatures may become too hot, tropical diseases may become prevalent, there may be water shortages, the landscape may become arid, and freak events in the form of flash floods and forest fires may become more frequent.
8. The Mediterranean coast may become eroded and low lying coastal amenities such as resort complexes and golf course inundated.
9. Northern Europeans may prefer to travel either domestically or at least increasingly within northern Europe. Correspondingly, southern Europeans may choose north to escape uncomfortable summer conditions at home country. Coastal areas of UK, Denmark and south Sweden at present receive a large number of visitors in the summer. Though it is anticipated that they will further benefit under +2°C, which provides the prospect of expansion of the summer related tourism activities.

10. Cities such as Rome and Florence could become too hot during the summer peak and therefore for southern Europe there could be a greater change to shoulder season travel. Likewise, more favorable summer weather conditions in northern Europe could mean greater congestion in cities such as London, Paris and Stratford-upon-Avon, during the summer peak. It is expected that a dramatic rise in the number of "too hot" days in a given region could discourage tourism in peak season.
11. In USA summer travel to East Coast cities such as New York, and to California's Los Angeles and San Francisco are likely to shift to Spring and Autumn as a result of increasing temperatures.
12. The Caribbean is especially exposed to climate change as rising sea levels make the islands especially vulnerable, damaging beaches and causing infrastructural damage to the predominantly low lying coastal regions.

According to Hamilton, Maddison &Tol (2005, p. 253), in order to estimate the implications of climate change for a particular tourist destination, one would need to know how climate change affects the attractiveness of that place relative to its competitors. To exemplify from the same research, if Switzerland loses half of its snow, but other European skiing destinations lose all then Switzerland's position may well be strengthened as the only place in Europe with natural snow (p. 253). Maddison, in one of his research (2001) indicated that British tourists were attracted to climates which deviate little from an average daytime maximum of 29°C. Lise and Tol, (2002) in one of their study analyzing the impact of climate change on the impacts of OECD countries pointed out that OECD tourists prefer a temperature of 21ºC (average of the hottest month of the year) at their choice of holiday destination. According to this study, under a scenario of gradual warming, tourists would spend their holidays in different places than they currently do (p. 429).

Case of Mediterranean: Analyzing and Comparing

According to McKinsey Global Institute (2020, p. 9) the mean temperature in the Mediterranean basin has increased 1.4 degrees Celsius since the late 19th century, compared with the global average of 1.1 degrees and absent targeted decarbonization, temperatures are **rising approximately 0.5 degree** projected to increase by an additional **1.5 degrees** by **2050**.Climate projections indicate that the annual number of days with a **maximum temperature above 37 degrees** will increase everywhere in the Mediterranean region, with a doubling in **North Africa**, **southern Spain**, and **Turkey from 30 to 60** by **2050.**

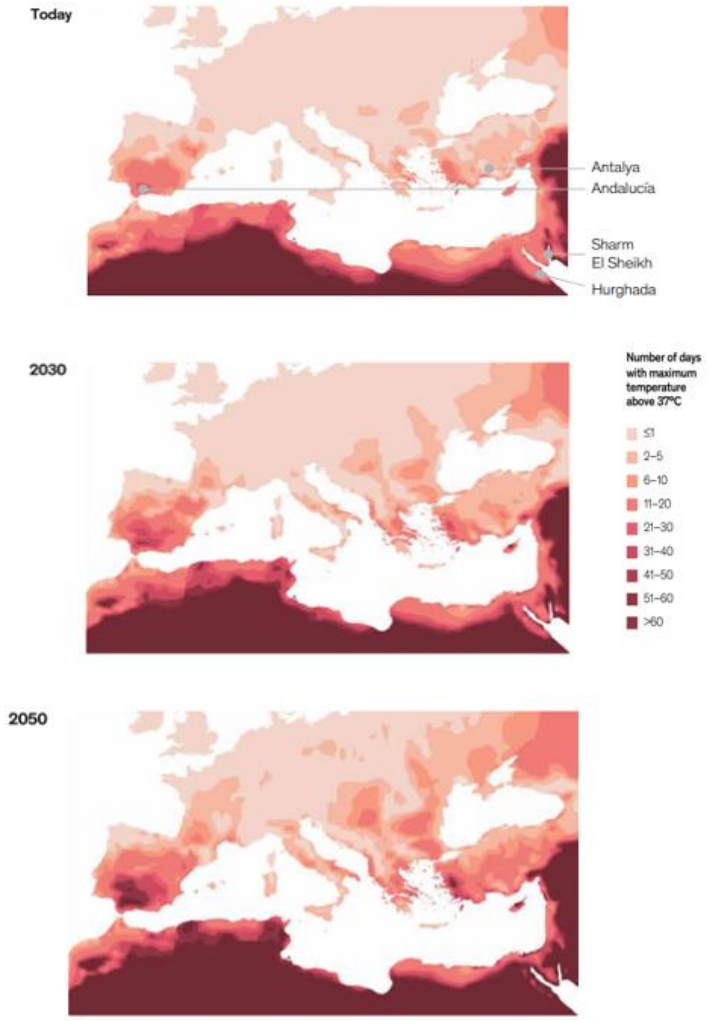

Figure 2. The number of days above 37°C in southern Spain, Turkey, and Egypt (Source: McKinsey Global Institute, 2020, p. 12).

Future Climate Change and Global Warming Impacts in Mediterranean Basin

The future climate change prospects for Mediterranean countries are gathered and listed below (WTO, 2003, p. 25; McKinsey Global Institute, 2020, p. 12; Page and Connell, 2006, p. 385).

1. In Italy, Portugal, Spain, and parts of Greece and Turkey, rainfall during the warm, dry season of April through September is projected to decrease by as much as 10 percent by 2030 and as much as 20 percent by 2050. By 2050, drought conditions could prevail for at least six months out of every year in these areas.
2. The Mediterranean coast may become eroded and low lying coastal amenities such as resort complexes and golf course inundated.
3. There will be a decline in European sun, sea and sand holidays in the Mediterranean due to the increased temperatures.
4. Rising temperatures are expected to raise hydrological variability, increasing the risk of drought, water stress, wildfires, and floods.
5. Each year between 1998 and 2017, wildfires destroyed an average of 150,000 hectares in Portugal and 120,000 hectares in Spain. By 2030, wildfires are expected to burn 50 percent more of those countries' forestland each year, and by 2050 the burned area is projected to double.

6. Most Mediterranean countries will see a decline in International tourist arrivals, up to 52% for Algeria, but 13 countries will see a drop in visitors of more than 20%. Turkey among the other Mediterranean countries seem to be less effected. Bosnia & Herzegovina and Slovenia are the two exceptions – these countries are cool compared to the rest of the Mediterranean, and even pick up some of the tourists who would have gone to other countries. (See Figure 3.)

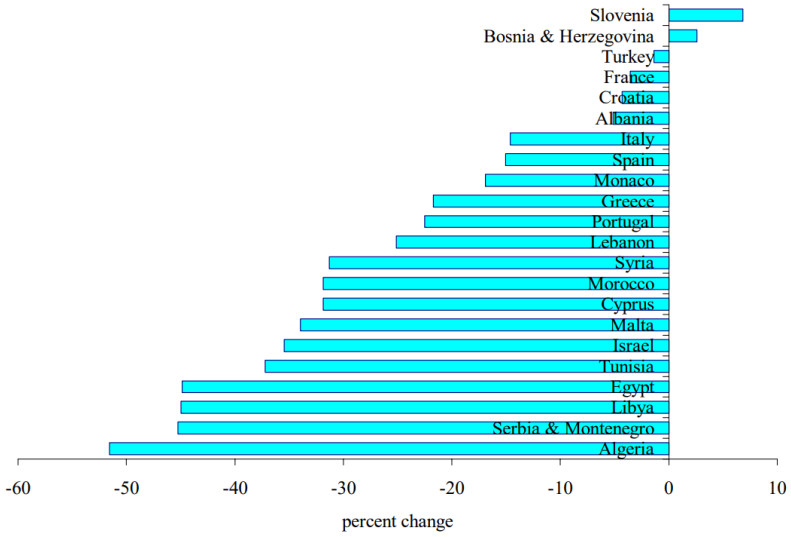

Figure 3. The effect of climate change on international arrivals in 2100, for the countries on the Mediterranean(Source: Bigano et al, 2008).

With reference to a study of Grillakis et al (2016, p. 30) the findings have indicated that the change in climate will absolutely alter central and northern Europe, multiplying the potential of further economic development in this direction. Mediterranean countries will probably lose in favorability during the hot summer months whereas will tend to become more favorable in the early and late summer seasons. For instance, in summer, Southern Europe could experience climate conditions that could be less favorable to tourism than the current climate, while countries in the North could enjoy better conditions (Amelung and Moreno, 2012, p. 83).

Amelung and Moreno (2012, p. 98) for the projection of year 2080, forecasted that Austria and the UK would enjoy significant gains in relative terms, whereas Italy and Spain could face the largest losses. Further in detail it was depicted by Grillakis et al, (2016), that the most negatively affected areas in June to August tourism climate favorability would be likely the southern Iberian Peninsula, Balearic Islands, the coastal region of Lion gulf, a significant part of coastal Italy, Sicily and Sardinia, central and southern Greece and Cyprus (p. 30).

Case of Turkey

The aim of the study is to analyze temperature level in Turkey's tourism destinations by detecting noteworthy changing trends, to reveal the situation of climate change in the touristic destinations.

Turkey's Climate and Future Prospects

For the first time, in Turkey a detailed section has been devoted to climate change in the10thFive-Year Development Plan encompassing years 2014-2018; rapidly increasing population, urbanization, economic activities, diversified consumption habits, problems related to environmental pollution, climate change, desertification, deforestation, water scarcity and global warming were discussed. The concept of "green growth" gained importance with the search for a new growth model initiated on a global scale in achieving sustainable development goals with this plan (Paksoy Çavuşoğlu, 2021, p. 255). A major Turkish policy that includes elements of environmental protection is the country's Tenth Development Plan (2014-2018).Turkey's Tenth Development Plan (2014-2018) puts sustainability at the core of its development endeavors.

According to European Environment Agency (2015; 2020) the Fourth Assessment Report of the IPCC (Intergovernmental Panel On Climate Change), future climate change could critically undermine efforts for sustainable development throughout the world and especially in the Mediterranean Basin.

Turkey is located in the eastern Mediterranean region where countries are in the highest risk group. Thus, Turkey is bound to instantly adapt itself to the negative impacts of climate change. Turkey has the lowest levels of per-capita GHG emissions among the OECD countries. Likewise, Turkey's emissions per unit of GDP is below the OECD and world average. Turkey intends to increase its efforts through not only domestic measures but also bilateral and multilateral cooperation and support. The Turkish government has set forth its own climate action plans which intend to restraint greenhouse gas emissions by at least 21 percent before 2030, while increasing the share of renewable energy sources feeding its electrical grid.

As can be observed from the Figure 4, upward trend in annual temperature has been observed from 1994 onwards, except for 1997 and 2011.

Regarding the study of General Directorate of Meteorology through HadGEM2-ES, MPI-ESM-MR, GFDL-ESM2M global model datasets using RegCM4.3.4 Regional Model and with dynamic downscaling method RCP4.5 and RCP8.5 scenarios with the 1971-2000 reference period and 2016-2040, 2041-2070 and 2071-2099 future projected periods have been made. According to the projections of the 3 global models, the average temperature for the period 2016-2099 the temperature is expected to rise as 1.5- 2.6 °C in RCP4.5 scenarios. According to the RCP8.5 scenarios, it is expected that the annual average temperatures of Turkey will increase in the range of 2.5 - 3.7 °C on average in the period of 2016-2099.

Especially between 2013-2040 an increase of 2-3 °C is expected in our North-West and South-East Regions in summer, in winter the increase amount is generally 1-1.5 °C in the season. In the 2041-2070 period temperatures will increase by 1 °C in all seasons.

Although a decrease is expected in precipitation in general, it is seen that there is no continuous increase or decrease trend, and precipitation irregularities tend to increase.

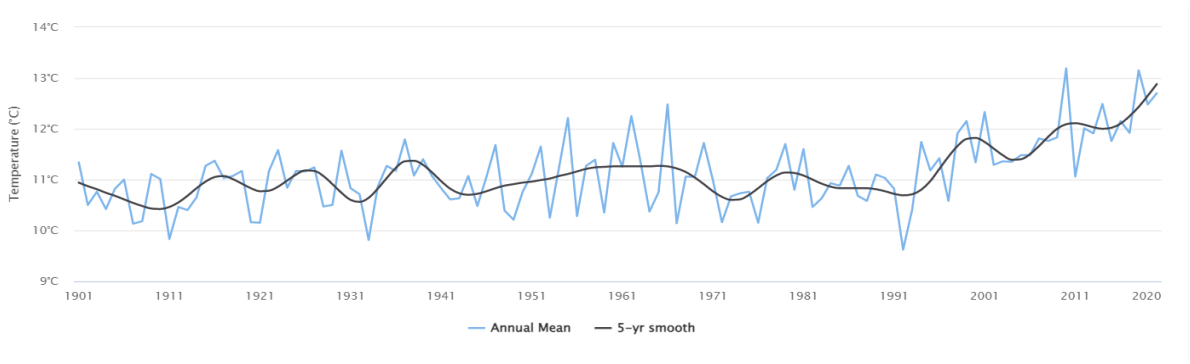

Figure 4. Observed Average Annual Mean-Temperature of Turkey for 1901-2020. (Source: World Bank Climate Change Knowledge Portal, 2022)

Turkey's annual mean temperature in July 2021 was 26.3°C. This value is above 1.8°C from 1981-2010 normal. This value made it the second hottest July in the last fifty years (24.5°C).

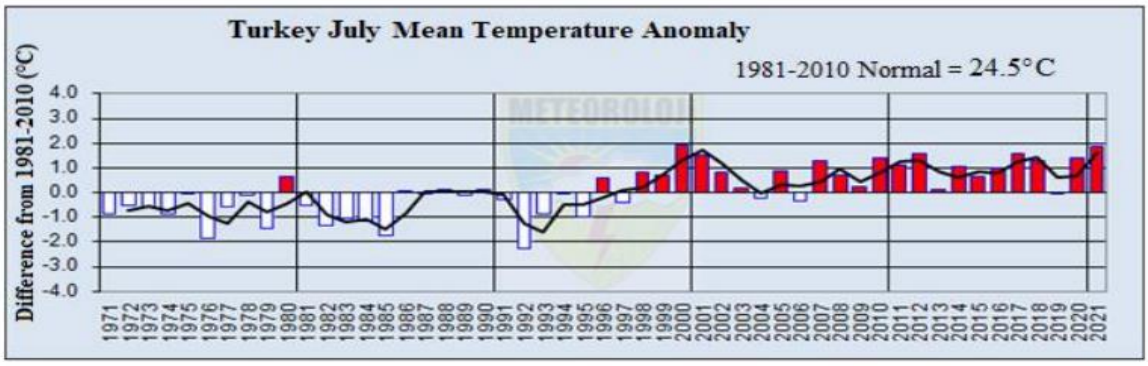

Figure 5. Turkey monthly mean temperature anomalies in July
(Source: Turkish State Meteorological Service, 2021).

Turkey's average temperature in 2021 is 14.9°C, 1.4°C above the 1981-2010 average of 13.5°C has taken place. According to the 1991-2020 normal of 13.9°C, the anomaly is 1°C. There are anomalies in temperatures in Turkey's average temperatures since the 2000s (except 2011). The hottest year was 2010 with 15.5°C and 2021 was the hottest 4th year with 14.9°C. In 2021, monthly average temperatures are 20.5°C in September for many years (1981-2010) equal to the average of March (7.0°C), October (15.1°C) and many years (1981-2010). It was below 0.1°C, above the averages of many years (1981-2010) in other months. In particular, May was the 1st hot month in the last 50 years with a difference of 2.6°C, while January and July has been the second hottest month in its own months. (See Figure 5.)

Table 1. August 2021 New Extreme Maximum Temperatures

Day	Station	2021Max.Temp. (°C)	Longterm Max. Temp.(°C)	Difference (°C)
3	TEKİRDAĞ	39.4	37.5	1.9
1	ÇANAKKALE	39.7	39.1	0.6
3	AYDIN	45.1	43.8	1.3
3	DATÇA	42.0	41.2	0.8
3	**MARMARİS**	**45.5**	**43.0**	**2.5**
3	BERGAMA	43.6	41.8	1.8
4	MİLAS	44.5	43.6	0.9
3	DALAMAN	45.5	44.0	1.5
3	FETHİYE	44.0	43.7	0.3
3	ANTALYA	44.8	44.6	0.2
4	FİNİKE	43.3	42.4	0.9
3	KAŞ	41.0	40.3	0.7
4	KÖYCEĞİZ	46.1	44.3	1.8
3	MANAVGAT	43.9	43.2	0.7
3	KALE-DEMRE	43.4	42.8	0.6

(Source: Turkish State Meteorological Service, 2021).

In August 2021, the average temperatures in the western and southern coasts and northeastern parts of our country are above the seasonal normal. If we put Antalya under the scope; the destination is a beach and resort city on Turkey's southern coast, attracting more than ten million visitors each year. The city is projected to go through a substantial increase in the number of summer (June to August) days above 37 degrees: about 15 days each summer by 2030, and approximately 30 days (10 days per month) in 2050. These months have a critical role for the tourism industry. They generate 40 percent of each year's visits and bout 20 percent of Antalya's GDP and about 2 percent of Turkey's (McKinsey, 2020, p. 21).

Milas are not located in the Mediterranean Region but experience high temperatures above normal just like Bodrun. The climate in Milas is typical of the southern Mediterranean. August is the driest and hottest month of the year for Milas. The daily average temperature hardly drops below 30°C, with highs of 36°C and above.

Marmaris, a port city in south-west Turkey on the Aegean coast, is blessed with Mediterranean climate. The hottest months in Marmaris are July and August with temperatures regularly getting into the high 40s. Marmaris has scored one of the highest temperature in August of 2021 with the highest temperature change 2.5°C compared to previous year.

Fethiye which is famous with its Blue Lagoon —located in Ölüdeniz to south of Fethiye, with a lagoon separated from open sea by a sandbar. Fethiye, like Köyceğiz summers are extremely hot with temperatures well above 40°C in July and August.

Conclusion

In the Mediterranean region, the likely reduction of tourism because of increased temperature during the hotter summer months may be compensated for by promoting changes in the temporal pattern of seaside tourism, for example by encouraging visitors during the cooler months. The climatic conditions of the Mediterranean are by no means the only attraction in the region. Attractive landscapes, cultural heritage, traditional lifestyles and beaches are among the other factors that have made the Mediterranean basin one of the most popular tourist destinations in the world (Amelung and Viner, 2011, p. 363).

Policy makers and companies in the Mediterranean can take action to reduce the impact of climate change. Tourist destinations may adjust their high seasons and provide incentives to attract travelers, and governments may invest in reducing wildfire risk through enhanced forest management (McKinsey Global Institute, 2020, p. 9). If the summer peak cannot be reduced, and occupancy in the shoulder seasons cannot be increased the Mediterranean tourist industry could be among the main losers.

As stated by Grillakis et al (2016, p. 31) adaptation measures for Portugal, Spain and France should contemplate the lengthening of tourism season in the southern parts that will be undesirably affected. Italy, Greece and Cyprus should point to the lengthening of the tourism season and the development of additional tourism activities that are resilient to higher temperature. Turkey should also take appropriate measures for destinations like Antalya, Marmaris, Milas, Bodrum. Marmaris, Fethiye which would be too hot for the upcoming years. Peak season of the specified destinations in the future might need to be replaced in consideration with the extreme high temperatures. Rising temperatures and strong winds have triggered numerous forest fires in southern and western Turkey in 2021. Precautions and recovery plans should be taken for the wildfires by increasing resources allocated to firefighting and fire prevention and removing fuels, such as dead trees, from forests that are at risk.

Pittock, et al (1998) gave various suggestions for the adaptation process. With reference to awareness issue they proposed that targeted education programs which aim to increase awareness of climatic risks associated with particular hazards, the possibility of increased exposure to them and strategies for coping should be developed and implemented (p. 52). Climate change courses should be instructed widespread at the schools and universities in Turkey. Awareness raising programs about global warming should be publicized.

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