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Implications of 2 °C global warming in European summer tourism

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ABSTRACT

Tourism is highly dependent on the climatic conditions of a given destination. This study examines the impact of two degrees global warming on European summer tourism from a climate comfort perspective. The changes in summer tourism climate comfort are realized with the aid of the Tourism Climatic Index (TCI). Four ENSEMBLES Regional Climate Models (RCMs) provided the data for Europe under the A1B emission scenario that are used in the analysis of potential changes in tourism favorability. Results show that the change in climate will positively affect central and northern Europe, increasing the potential of further economic development in this direction. Mediterranean countries are likely to lose in favorability during the hot summer months whereas will tend to become more favorable in the early and late summer seasons. Considering that the two degrees period is focused between 2031 and 2060, the estimated shifts in the climate favorability of Mediterranean countries indicate a need in early adaptation strategies.

Practical implications

Climate consists of a necessary resource of summer outdoor tourism. Subsequently, changes in climate could possibly affect tourism flows. The conducted study quantified the possible effects of the +2 °C global warming to the European summer tourism. The projected increase in temperature and sunshine may positively influence the comfort related to summer tourism in the central and northern European countries by making it warmer compared to the present-day climate. However, in the southernmost European countries the already favorable or almost favorable climate will become warmer than the ideal, mainly in the present-day peak summer season of June to August. This may alter the long term tourism flows by redirecting visitors of southern European countries to northern European countries. Nevertheless, the same negatively affected countries are expected to become more appealing during pre and post summer periods, creating new opportunities for the tourism industry and the related players. The analyzed data showed that on average, the projected changes will occur between 2031 and 2060.

Projected changes in the tourism climate favorability point the directions of adaptation measures that tourism policy makers should take into consideration for long term planning. The adaptation capacity of the tourism sector is high due to the dynamic nature of the sector, and therefore there will be important opportunities to reduce climate change induced vulnerability. For the Southern European countries, policy makers should plan changes based on the prospect that the seasonality of climate favorability could slightly decrease in the mid-summer while spring and autumn become more susceptible for tourism, and thus invest on infrastructures and activities to this direction. For the central and northern European countries, the climate for the entire summer season is projected to become more appealing to a wider range of different summer tourism activities. Key players of the tourism sector should take advantage of this climate opportunity to extend the capacity of existing facilities and invest on related tourism activities in their long term plans.

While the methods used in this work do not provide quantification in strict financial terms, they provide comparative results about which countries and in which degree will be affected by changes in climate. It was found that the most negatively affected areas in June to August tourism climate favorability are 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 (Fig. 6). At the same time, some of the

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most visited areas of the same period of the year belong to the most affected regions, with the Mediterranean coastal areas from Portugal to Liguria Sea, Balearic Islands, parts of Italy and Greece, and Cyprus to have over 2 million overnight stays per prefecture in the June to August period (Fig. 6). Adaptation measures for Portugal, Spain and France should consider the lengthening of tourism season in the southern parts that will be negatively affected. Moreover, a further development of the tourism industry at the northern Portugal and the coastal areas of Biscay Bay might be possible as more favorable conditions for summer tourism activities are projected in the future. 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. Coastal areas of UK, Denmark and south Sweden (Fig. 6) already have a large number of visitors in the summer. It is projected though that they will be further benefited under +2 °C, which provides the opportunity of expansion of the summer related tourism activities.

Tourism is a dynamic industry with increased adaptation potential. Climate will create both problems and opportunities for the summer destination areas in Europe. The changes should be considered along with the projected timing of occurrence to form an early framework of adaptation and mitigation measurements that will further develop this leading industry of Europe.

Introduction

Tourism is a key factor of global economic growth and development. The World Tourism Organization (UNWTO) estimates that the tourism accounts for the 2–12% of GDP in advanced, diversified economies, up to 40% in developing economies and up to 70% in some small Island economies (Ashley et al., 2007). It is also estimated that tourism offers the 1 in every 11 jobs worldwide (UNWTO, 2014).

Climate has a key influence on tourism activity (Perry, 1997). Good weather conditions favor the outdoor tourist and recreational activities and thus play a key role in the selection of tourism destinations (Gómez Martín, 2005). In fact, Eurobarometer (2012) reports that 50% of the European citizens decide whether to return to the same place for another holiday, based on the weather of the location. Moreover 28% of respondents report that they went on holiday for the sun or the beach.

Climate elements that have a direct impact on the human perception are temperature, humidity, sunshine, radiation, precipitation and wind (Gómez Martín, 2005; Hamilton and Lau, 2005; Stern et al., 1999) and thus determine a large share of international tourism flows. Several statistical analyses in literature have shown the relevance of climate components as determinants of touristic demand (Hamilton, 2004; Lise and Tol, 2002; Maddison, 2001). Gössling et al. (2012) state that the role of perceptions is insufficiently understood due to their complexity and might even result in abrupt changes and longer-term modification in travel behavior. Additionally, it is difficult to quantify the effect of climate change on tourism due to its relatively slow pace compared to other socioeconomic factors such as political stability, the economic environment, and fashion trends, which make the quantification difficult. Although climatic effect on tourism might not be directly measurable, its underlying effect and the long term changes are certain in a changing climate world (Amelung and Viner, 2006).

The assessment of climate resources for tourism activities is mainly based on the evaluation of climatic variables related to the human comfort. Common variables used for climate favorability estimation are air temperature, humidity, precipitation, wind and sunshine duration (Matzarakis and de Freitas, 2001; Mieczkowski, 1985). The climatic variables are often considered in monthly averages (Mieczkowski, 1985) or in daily time step (Matzarakis, 2007). The Tourism Climatic Index (TCI) (Mieczkowski, 1985) proposed an index that correlates the general findings of human comfort to the specific activities related to recreation and tourism (Amelung and Moreno, 2009). It summarizes and combines seven climate variables that affect climate favorability for outdoor tourism. It has been used in a number of studies (Amelung and Nicholls, 2014; Clark et al., 2011; Goh, 2012; Rosselló-Nadal, 2014; Scott and Schwartzentruber, 2008) to quantify the effect of climate in tourist destination favorability and determine ideal climatic coefficients. The TCI is favored as an index because it comprises one of the most comprehensive metrics that integrate all three essential climate facets relevant to tourism. These facets are thermal comfort, physical aspects such as rain and wind, and the aesthetical facet of sunshine/cloudiness (de Freitas, 2003). At the same time it makes use of climate variables that are commonly available from weather stations or climate models, making data provision simple. Evidently, different tourism activities impose different climatic requirements, i.e. sunbathing, skiing and surfing, all require quite specific and different conditions, making widely accepted the fact that there is not a single index that can rate the climate for all these specific activities together. However the TCI focuses on the common and general tourism activities of sightseeing and similar light outdoor activities.

The TCI exhibits a number of shortcomings. While Mieczkowski (1985) initially was based on extensive previous literature of climate classification for common tourism activities (Crowe, 1976) and other biometeorological literature dealing with human comfort (Kandror et al., 1974), the final weighing of the different sub-indices was ultimately based on his expert judgment rather than empirical verification (Perch-Nielsen et al., 2010). Nonetheless, a later survey of de Freitas et al. (2008) on beach activities showed that temperature and sunshine were tied as the most important climate components, followed by the absence of rain and the absence of wind, which verifies the (Mieczkowski, 1985) rank of the different climate variables used in TCI. Moreover, the non-specialization of TCI to a specific type of activity is appropriate for a macroscopic level analysis of potential shifts in climatic favorability, due to changes in climate conditions (Amelung et al., 2007). Rosselló-Nadal (2014) notes that TCI is a good predictor of tourist arrivals, as it shows strong correlation with the currently popular destinations. Other works in literature focused on the specification of TCI to specific types of activity. Morgan et al. (2000) attempted a calibration procedure using on site surveys in beach environments in Wales, Malta and Turkey, in order to modify the TCI index to better describe specifically the sun-sand-sea (3S) tourism. Similarly, Scott et al. (2008) modified the optimum effective temperature from 20 °C–27 °C to 24 °C–31 °C to better describe the beach oriented tourism.

In 2009, G8 world leader Summit agreed on the upper limit of +2 °C global warming above preindustrial levels. Many experts believe that this target has become unrealistic as we are currently on the 4 °C path (Betts et al., 2010, 2015; Sanderson et al., 2011); however the global community has committed itself to holding warming below 2 °C to prevent “dangerous” climate change. The best available methods are being utilized by the scientific community to quantify the effect of a 2 °C warming on different social and economic sectors. The EU FP7 project IMPACT2C (http://www.impact2c.eu) aims to enhance the knowledge and quantify the climate change impacts, vulnerabilities and economic cost in pan European scale, from a 2 °C global warming. The present study attempts the impact assessment of a 2 °C warming to the summer tourism of Europe.