The Implications of Greenhouse Gas Stabilisation for International Tourism

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Abstract

This poster presents for the first time the possible impacts of greenhouse gas stabilisation policies on the major international tourism flows. Tourism is one of the largest industries in the world and a vital component for the economy of many countries. Implementation of pro-active policies at the national and international level that will attempt to stabilise the atmospheric concentrations of greenhouse gases in the atmosphere will require substantial cuts in anthropogenic greenhouse gas emissions. But even then, the climate system will have changed, and so will the climatic conditions of tourist destinations. The Mieczkowski Tourism Climatic Index (MTCI), constructed from observed climate data is used as an analogy for a region's potential for tourism. The results from a range of General Circulation Model (GCM) integrations forced with greenhouse gas stabilisation scenarios are then used to construct the MCTI for the future. A comparative analysis is undertaken to assess how different levels of GHG stabilisation will impact upon the major international tourism flows and to identify the critical responses.

Background

Tourism is globally the largest, and one of the fastest growing economic sectors. Its emission of greenhouse gases (GHG) is considerable, with aviation emissions estimated to be the fastest growing source. Being a transport-intensive industry, tourism is highly dependent on fossil fuels and vulnerable to GHG mitigation policies.

Climate change as such will also impact on the tourism industry. It will have a range of direct impacts by changing the environment of resorts (e.g., sea-level rise, temperature, etc.) and it will increase the vulnerability of the tourism industry to other environmental changes (Agnew and Viner, 1998). There will also be a range of indirect impacts, for example: raising conflicts in water resources; health effects; impacts on the built environment; and detrimental impacts on the local environment. The interactions between climate change and tourism have to date not been examined on a large scale.

The Mieczkowski Tourism Climatic Index (MTCI)

The Tourism Climatic Index, first developed by Mieczkowski (1985), allows quantitative evaluation of the climate for the purpose of tourism activity. Mieczkowski's TCI (MTCI) consists of five sub-indices (maximum value: 5), each of which is constituted by one or two monthly climate variables, these are: (i) daytime comfort (maximum daily temperature, minimum daily relative humidity); (ii) daily comfort (mean daily temperature, mean daily relative humidity); (iii) precipitation (total precipitation); (iv) sunshine (total hours of sunshine); and (iv) wind (wind speed). A location's suitability for tourism is then rated on a scale from -30 to 100 with the help of the following formula:

TCI = 2 x (4 x DaytimeComfort + DailyComfort + 2 x Precipitation + 2 x Sunshine + Wind)

The scale itself is divided into ten categories, from "ideal" (90 to 100), "excellent" (80 to 89) and "very good" (70 to79) to "extremely unfavourable" (10-19) and "impossible" (9 to -30). In this study, a TCI value of 70 or higher is considered attractive to the "typical" tourist engaged in relatively light activities.

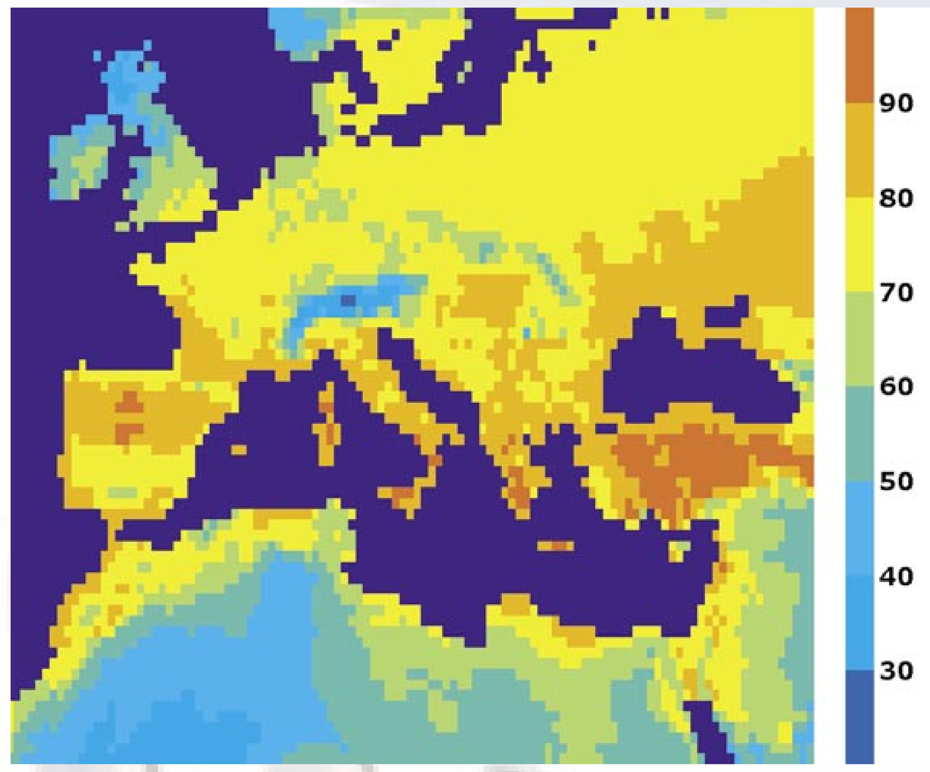

Figure 1. Europe's summer (JJA) MTCI pattern for 1961-90 (observed data).

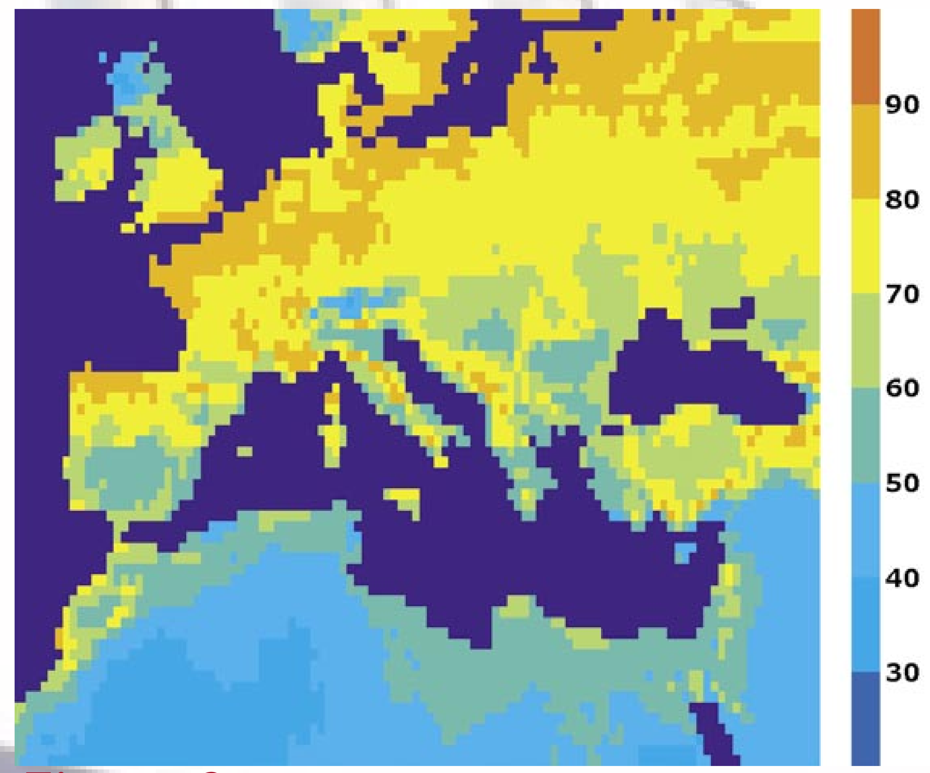

Figure 2. Europe's summer (JJA) MTCI pattern for 2040-2069, HadCM3A1F integration.

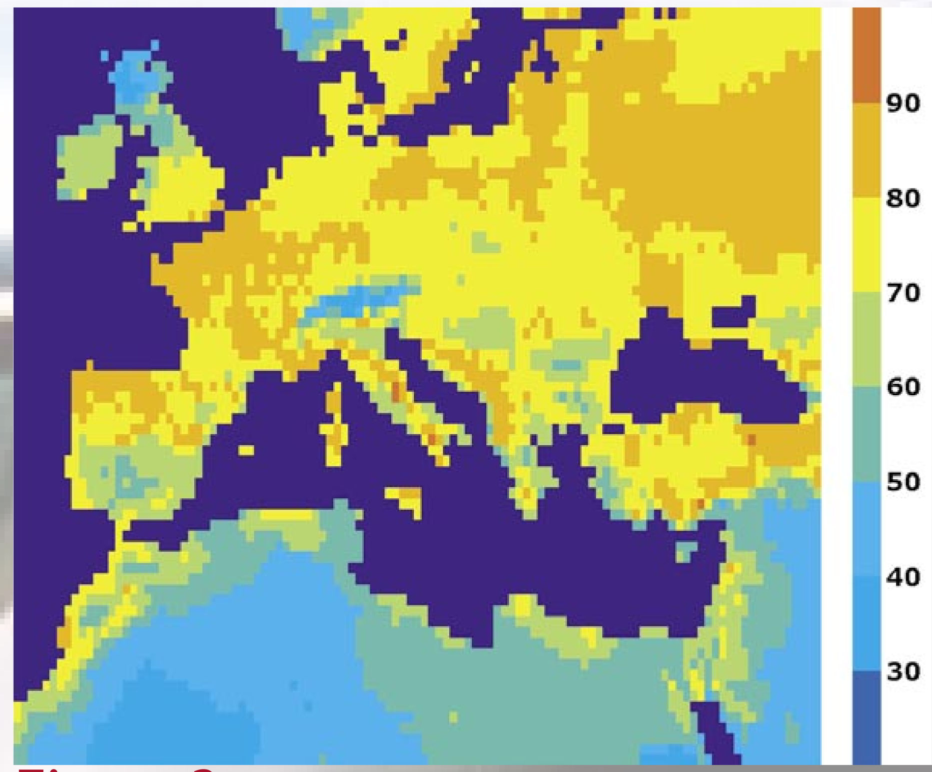

Figure 3. Europe's summer (JJA) MTCI pattern for 2040-2069 (HadCM3B1A integration; surrogate for CO2 stabilisation at 550 ppmv)

The Implications of Climate Change Mitigation Policies

The major driver of international tourism is the search for Sun, Sea, Sand, and (increasingly) Security. A dominant flow of tourists is the movement of people from Northern European countries to those in Southern Europe (the Mediterranean Region). Figure 1 shows the summer (JJA) MTCI constructed for the 1961-90 period. It confirms the excellent conditions of the Mediterranean region for tourism, and simultaneously shows the lower MTCI in the source countries (e.g. UK, Germany, Sweden, Norway).

Whilst the direct impacts of climate change on tourism and the environment can (with further research) be quantified, it is likely to be far more difficult to quantify the impacts of climate change mitigation policies upon major international tourism flows (Viner and Amelung, 2003). The work presented here attempts to do this for the first time. General Circulation Model (GCM) experiments are forced with several SRES baseline scenarios, representing different levels of greenhouse gas stabilisation. More specifically, the SRES A1F scenario is used to represent a scenario in which few mitigation measures are taken. While this scenario is at the high end of the SRES baselines, it resembles the emission pathway that, since 1990, the global society is currently following. The B1A scenario is used as a surrogate scenario for stabilisation at 550 ppmv, as suggested by Swart *et al.* (2002).

Figure 2 shows a map of MCTI scores constructed for the summer (JJA) of the 2050s according to the SRES A1F scenario. In comparison with Figure 1 it shows a strong decline in the suitability of the Mediterranean region for tourism, whilst at the same time the source countries of Northern Europe move into optimum conditions for tourism. Figure 3 shows the same map for the SRES B1A scenario, a proxy scenario for stabilisation of CO_2 concentrations at 550 ppmv (Swart, 2002). This figure makes clear that following a pathway leading to stabilisation at 550 ppmv (rather than at levels exceeding 750 ppmv) slows down the changes in Europe's suitability pattern considerably, even though these changes are far from halted.

Besides spatial consequences for MTCI performance, climate change will have seasonal consequences. Figures 4 and 5 represent the MTCI distributions for a typical Mediterranean destination (the Balearics) and a typical northern European destination (Brighton) respectively. Both locations have their MTCI peak in summer, which for the Balearics can be shown to coincide with actual visitation levels: for MTCI < 70, visitation is very low. The Balearics (representing the Mediterranean) are projected to develop into a destination with a bimodal MTCI distribution: good conditions in spring and autumn, poor conditions in summer. This trend is much slower, however, in the case of stabilisation at 550 ppmv, in particular for the eastern Mediterranean. For Brighton (representative of northern Europe), the holiday season is projected to get much longer, encompassing the full half-year from May to October, rather than just July and August. Stabilisation of greenhouse gas concentrations at lower levels seems to slow down rather than stop this transition.

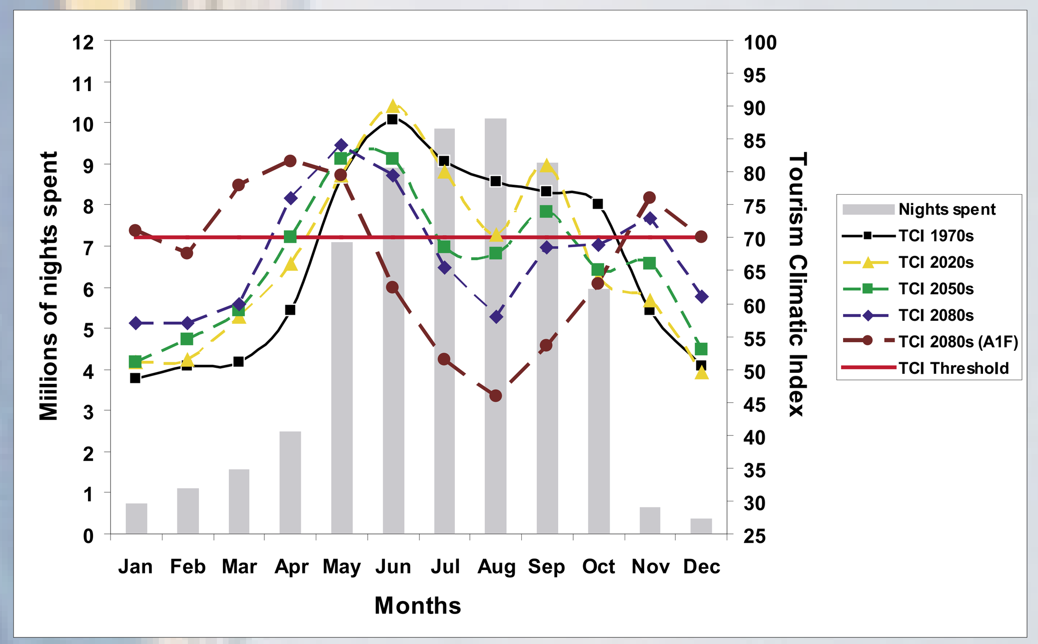

Figure 4. TMTCI distributions for the Balearics (Spain), for 1961-1990 (observed data), 2010-2039, 2040-2069, 2070-2099 (HadCM3B1A integration, stabilisation at 550 ppmv) and 2070-2099 (HadCM3A1F, stabilisation at >750 ppmv), confronted with historical visitation levels (2000-2003).

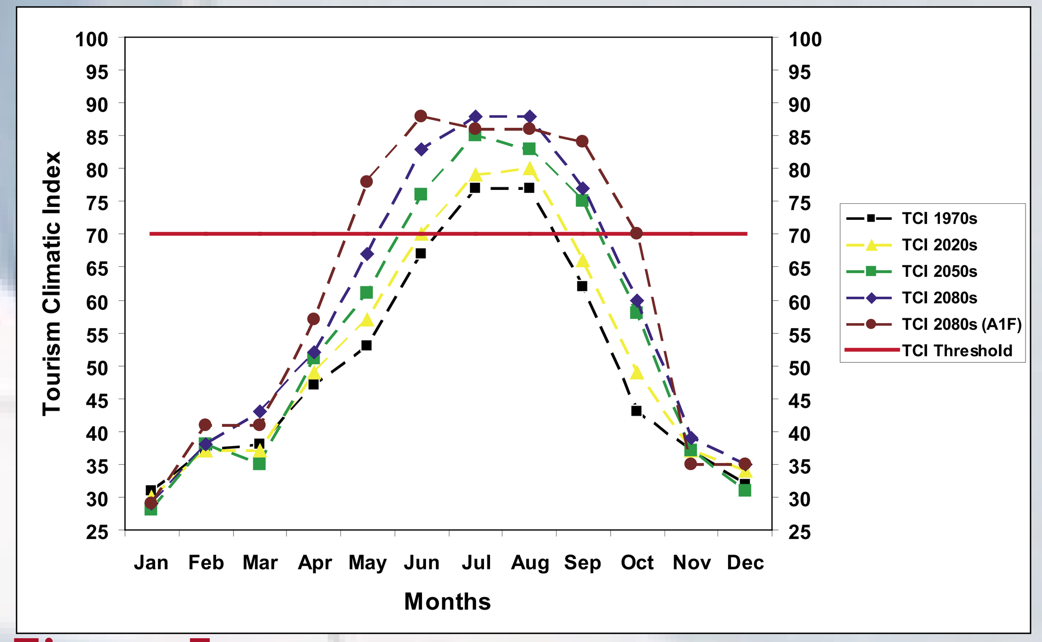

Figure 5. MTCI distributions for Brighton (UK), for 1961-1990 (observed data), 2010-2039, 2040-2069, 2070-2099 (HadCM3B1A integration, stabilisation at 550 ppmv) and 2070-2099 (HadCM3A1F, stabilisation at >750 ppmv).

Discussion

The change in suitability of differing regions is likely to impact on the flows of numbers of tourists visiting the Mediterranean and other regions. Different emissions pathways are unlikely to substantially alter the direction of MTCI change for regions: e.g. summer conditions will improve in the UK and deteriorate in the Mediterranean region. In contrast, the rate of change in the MCTI can be significantly altered. By slowing down the changes in suitability patterns, mitigation policies would give destinations more time to adapt to the inevitable consequences of climate change.

References

Agnew, M. D. and Viner, D. (2001). "Potential impacts of climate change on international tourism." International Journal of Tourism and Hospitality Research, 3(1): 37-60.

Mieczkowski, Z. (1985). "The Tourism Climatic Index: A Method of Evaluating World Climates for Tourism." The Canadian Geographer, 29(3): 220-233.

Swart, R., Mitchell, J., Morita, T. and Raper, S. (2002), "Stabilisation scenarios for climate impact assessment." Global Environmental Change, 12(3): 155-165.

Viner, D. and Amelung, B. (2003). "Climate change, the Environment and Tourism: The Interactions. Proceedings of the ESF-LESC Workshop." Climate change, the Environment and Tourism: The Interactions, Milan 4-6th June.

Further details of the éCLAT Community can be found on the website. The website contains information about on-going activities, for example, workshops, papers and current projects that are relevant to the aims of éCLAT. Reports from workshops are included, as is the detailed Science Plan for Climate Change and Tourism Research that was prepared at the ESF Workshop in Milan, June 2003.

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