

Predicting tourism flows under climate change

An editorial comment on Gössling and Hall (2006)

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1 Introduction

Tourism has played a minor role in the climate change literature, which is surprising, as tourism not only affects climate change through carbon dioxide emissions but it is also climate sensitive. Some particular markets, such as sun, sea and sand mass tourism or winter sports tourism are obviously very sensitive to climate change. For other markets, climate may have an effect too. Although tourism is a much more important economic activity than, for example, agriculture, the climate change research effort on the latter has been massive, while research on the climate change impact on tourism has only recently been expanding (see Scott et al. 2005, and Hamilton and Tol 2006, for literature reviews).

As in other impact areas, two groups of researchers are working on climate change impacts on tourism – those who were initially interested in tourism, and those who were initially interested in climate change – and, as in other impact areas, there is some tension between the two. Such tension should be channeled to creativity, rather than to conflict. Gössling and Hall

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(2006) approach climate change impacts from a background of tourism geography. Their commentary may be seen as critical of our work. We approach tourism from a background of climate change and economics. This exchange should be seen as a means to build a common understanding of what is known and what needs to be investigated.

2 Response to the criticism of Gössling and Hall

Gössling and Hall (2006) list four major weaknesses¹ of current models, particularly the Hamburg Tourism Model (Hamilton et al. 2005a, b), in predicting tourism flows and their response to climate change.

2.1 Databases

Gössling and Hall's first criticism is that the data used for predictions are weak. In particular, data are not homogenous between countries and over time; in national statistics, such as those compiled by the WTO (2000) different types of travel are grouped together,² although some are more sensitive to weather and climate (e.g., skiing holidays) than are others (e.g., family visits); and the data is too coarse geographically (national) and temporally (annual). There also are national tourist surveys that provide detailed information on holidays taken as well as on the tourists themselves. In fact, Maddison (2001), Lise and Tol (2002) and Hamilton (2003) are based on such surveys, while the parameters and data used in Hamilton et al. (2005a, b) were cross-checked with these studies. Unfortunately, detailed surveys are carried out for a limited number of countries only. Moreover, the cost of purchasing these data is often beyond academic budgets.

Such database problems are not unique to climate and tourism demand studies: they are endemic in industry forecasts (for example WTO 2001) as well as in traditional academic research into tourism demand forecasting, which make up a considerable share of the publications in the tourism field (for reviews see Lim 1997; Song and Witt 2006; Witt and Witt 1995.)

That the available tourism data are of poor data quality is surprising, as tourism is so important in the economy. Tourism satellite accounts and the system of tourism statistics should improve on this. However, waiting for the perfect dataset to arrive is not an option; indeed, in Bigano et al. (2004), we extend the WTO (2003) data to domestic tourism and to a sub-national resolution. As these data are still under review, they have yet to be applied. New and improved data are undoubtedly important, and using existing data could help to prioritize database development. However, primary data collection at the necessary scale is beyond the means of any university-based research project. We are at the mercy of statistical offices.

¹ Note that we have grouped together the weaknesses that they list.

² Gössling and Hall (2006) argue that mixing business and leisure travel would not only bias the estimation of climate preferences, but also of such things as poverty aversion. They claim that Hamilton (2003) made this mistake, but her data are in fact on leisure travel only.

2.2 Climate, weather and decision-making

A second point raised by Gössling and Hall is that temperature is used to estimate demand even though the effect of weather on human comfort, and thus on the perception of a favorable climate, is more complex.³ In addition, there is the effect of extreme weather events on the attractiveness of destinations.

Temperature is often the only climate variable included in statistical and simulation models, although levels and frequency of precipitation are included in some studies. There are three reasons for the focus on temperature. Firstly, many climate parameters are strongly correlated to temperature, so that switching variables would not change much, as statistical procedure cannot distinguish one effect from the other. This is particularly the case for temperature extremes, but also for such things as cloudiness, humidity, and weather variability and predictability. Secondly, temperature is the only climate variable for which there are reliable data and future projections with a large spatial coverage. Precipitation, particularly, has a high spatial variability, and climate models strongly disagree on future projections of precipitation. Thirdly, of all the climate variables, information about monthly temperature, along with rainfall, almost always appears in guide books, brochures and online destination information. In such information sources temperature is often presented in several ways – average, average maximum, average minimum, highest recorded etc. In a study by Hamilton and Lau (2005),⁴ tourists were asked what climate attributes were the most important to them. The respondents chose on average three climate attributes, and only 12% of all respondents did not chose any temperature attribute. Furthermore, maximum temperature was chosen by two thirds of all respondents. From the results of this case study, temperature is quite clearly the most important of all of the climate variables, at least for German tourists. Furthermore, other approaches to examining the impact of climate change on tourism also rely heavily on temperature data. For example some studies use the Tourism Climate Index, which is a biometeorological approach to assessing the climate of

³ Note that Gössling and Hall (2006, p. 4) state that Maddison (2001) investigates perceived temperatures. This is not the case. Maddison (2001) relates objective temperatures (and other climate variables) to numbers of tourist arrivals. He finds that there is climate optimum at which the market share in British tourists would be maximum. Countries that are, for example, too hot or too cold attract less visitors from the UK. Note that Gössling and Hall (2006) claim that “there is [assumed] a linear relationship between increasing temperatures and changing travel flows...” (Gössling and Hall, 2006, p. 5). The relationship is non-linear in Hamilton (2003), Lise and Tol (2002), Maddison (2001), Bigano et al. (2004) and Hamilton et al. (2005a, b). Linear relationships are decidedly rejected in the statistical analyses, and would lead to very peculiar behaviour of the simulation models.

⁴ Gössling and Hall (2006, p. 4) use Hamilton and Lau (2005) to support the view that “a substantial share of tourists does not gather information on weather conditions before booking a vacation.” Hamilton and Lau examined climate information and weather information separately. German tourists were asked, shortly before departing for their holiday destination, if they had informed themselves about the climate of their destination. Almost two thirds of the respondents said that they had, and almost two thirds of those said that they had informed themselves about climate before they had actually booked their holiday. One cannot assume that the tourists who did not search for information on their destination’s climate were not interested in climate, or did not know about it. It merely means that they did not *actively* acquire information about it. They may already have been well informed about the climate through a previous visit – 65% of those who did not acquire climate information had been to their destination before and almost half of them had been to exactly the same place. Moreover, tourists may feel that they are well enough informed about the particular climate through knowledge that they have gained passively. In addition to the questions about climate information, tourists were asked if they knew about weather conditions at their destination in the week previous to their holiday. Fifty-nine percent of the respondents had been following the weather. The results reported here are from an evaluation, carried out specifically for this article, of the survey data reported in Hamilton and Lau (2005).

destinations (Amelung et al. 2006; Scott et al. 2004). Although the Tourism Climate Index is calculated using several climate variables, temperature makes up the bulk of the index.

Gössling and Hall (2006) overlook that climate variables in demand equations do not solely pick up the direct effect that climate has on demand through expectations about comfort or enjoyable weather. For de Freitas (2003) there are three aspects of climate that are relevant to tourism: thermal, physical and aesthetic aspects. Hamilton and Tol (2006) suggest the inclusion of the neurological aspect as well. Currently there is no evidence about the extent of each of these aspects in determining tourism demand or the attractiveness of a particular climate, but this would be an interesting topic for future research.

Not only is the role of the different aspects unclear, the role of weather and climate information in decision-making is also unclear. While this is true in detail, empirical studies (Maddison 2001; Lise and Tol 2002; Hamilton 2003; Bigano et al., 2005) show that climate has explanatory power for tourist destination choice. The studies of Mansfeld et al. (2003) and Gössling et al. (2006) do not contradict this: first, the study by Mansfeld et al. has nothing to do with tourism demand or destination choice as it focuses on the actual weather experienced by tourists. It examines the relationship between weather perceptions at a particular point in time and compares them to observed weather data. The study is restricted to a certain tourism activity (beach recreation), to a certain place (Eilat, Israel) and to a limited timeframe (four days in March), and so is limited in its usefulness for informing demand studies. Therefore we are rather puzzled that Gössling and Hall cite this unpublished study to support their arguments, as it does not confirm anything about the role of climate in destination choice as Gössling and Hall claim. This is not to say that studies that examine the perception of comfort under different weather conditions could not provide useful information for tourism demand or destination choice studies; however, there is still no research on how the weather experienced during a holiday is translated into a destination image. The exact formation of holiday destination decisions is not known. So, although it is unclear *how* the British, say, know that it is warmer on Ibiza than it is on the Isle of Man, it is clear *that* they do and flock to Ibiza partly for this reason; of course, Ibiza has other attractions as well, and the Isle of Man is lovely too.

Second, the study by Gössling et al. (2006), which again was carried out at a single time (October) in a single location (Zanzibar, Tanzania), concludes that while climate is an important consideration in travel decisions, there are many tourists who make travel decisions irrespective of climate. Again this does not contradict with the results of the national and global demand studies. It must be remembered that such studies are predicting changes in demand from and for countries as a whole and *not* for individuals. As mentioned above climate, represented through temperature (and in some cases other variables), has been found to be a significant determinant of demand at a national level. This does not exclude the fact that there will be some tourists for whom climate may be of no relevance. It is often forgotten that climate, while not necessarily being the main motive, will still be a decisive factor in the timing of a holiday. Even those visiting friends and relatives may consider climate in the timing of their holiday; it may affect the frequency of their trips to family and friends; and it may affect who visits whom.⁵

⁵ We are not aware of any study on this. However, all four authors have extensive first-hand experience with international travel for visiting friends and family.

2.3 Future drivers of demand

Future drivers of tourism demand are uncertain, such as disposable income, time budget for holidays, and travel costs. This problem is intrinsic in all predictions. Extensive sensitivity analyses are needed (and indeed reported in Hamilton et al. 2005a, b). Smaller scale studies that examine demand from a single country could be extended to include such aspects, if the data were available. Then it would be possible to develop scenarios that examine changes in disposable income, leisure time or in increases in the costs of mobility.

2.4 Random events

Besides the uncertainty about the trends, there is stochasticity as well. Natural disasters, terrorism, and sport events are examples. Such events may wreck short-term predictions, but their effect on long-term trends is much smaller. There is empirical evidence that tourism is more robust in adjusting to such shocks in the medium run than has been previously thought (Coshall 2005).

Of course the last two points of criticism mentioned above are valid in that there is uncertainty about the trends and the effect of random events is unknown. But Gössling and Hall forget that what is of interest is the impact of the scenarios of climate change compared to the respective baselines. Then the random event is missing from both the baseline and the scenario situation and likewise for the unknown development in other trends. Therefore, the general trend is important and the impact caused by climate change can be examined without considering possible random events with unknown outcomes or the extent of unknown trends.

3 Further research

The criticism of Gössling and Hall (2006) does call for further research. The first, crude studies show that climate change would have a substantial effect on tourism flows (Hamilton et al. 2005a, b) and on the economy (Berritella et al. 2006). This implies that the shortcomings of current studies need to be overcome. Besides the points mentioned above, it would be particularly interesting to know:

- (1) whether summer tourists would shift their holidays in time (to spring or autumn) rather than in space (up mountain or poleward);
- (2) the relative importance of winter holidays and summer holidays in mountainous areas;
- (3) the relative importance of climate and climate-sensitive determinants of holiday destination choice, such as temperature, precipitation, humidity, weather stability, air and water quality, vegetation, and landscape;
- (4) the connection between climate and coast – for example, will central France become more popular or will people switch from the Costa Brava to the Baltic Riviera directly?;
- (5) the effect of climate on business trips and visits to friends and relatives – are such trips made without any consideration of climate? Or could it be friends and family visits, take place more often when the friends and family live in climatically more attractive places? Conference tourism may also not be completely independent of climate; and
- (6) the effect of climate on decisions on the location of holiday homes and retirement location; and
- (7) whether the relationships between climate and tourist destination choice are constant over time.

These issues are best studied through Strategic Cyclical Scaling (Root and Schneider 1995), with small-scale, detailed case studies informing and being informed by large-scale, comprehensive statistical and simulation studies.

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