

Climate Change and Its Impacts on Tourism Industry

H. Shojaee Siuki, KPM Consulting Engineers Co, geo21kpm@yahoo.com

A. Deiminiat, KPM Consulting Engineers Co, bdeyminiat@gmail.com

Paper Reference Number: 512-183

Name of the Presenter: Hassan Shojaee Siuki

Abstract

In many destinations, tourism is closely linked with the natural environment. Climate affects a wide range of the environmental resources that are critical attractions for tourism, such as snow conditions, wildlife productivity, biodiversity, water supply and the length and quality of tourism seasons. Climate also has an important influence on environmental conditions that can deter tourists, including infectious disease, bushfires, insect, water-borne pests and extreme weather events such as tropical cyclones. With climate, a number of researchers have lamented that the vulnerability of individual tourism industries and tourism destinations to climate variability has not been adequately assessed. Butler and Jones in 2001 indicated that Climate change could have greater effect on tomorrow's world and tourism and hospitality in particular than anything else we have discussed. The most worrying aspect is that to all intents and purposes the tourism and hospitality industries seem intent on ignoring what could be the major problem of the century (original emphasis). Now a day, a broad range of potential climate change impact on the tourism sector was identified. This paper indicates the consequences of climate change for tourism within the context of existing knowledge about the relationship between tourism and climate and weather. The importance of local-regional scale climate analysis for tourism is presented. It also provides a brief overview of recent advances in our understanding of global climate change.

Keywords: Climate change, Tourism, Vulnerability, Environmental condition

1. Introduction

Climate change refers to a statistically significant variation in either the mean state of the climate or in its spatial or temporal variability, persisting for an extended period. Tourism depends not only on average, but also on detailed characteristics of climate: the duration of showers or the number of hours with clouds is probably more important for this activity than the absolute amount of rain. Climate change may be due to natural internal processes or external forcing (e.g., fluctuation in solar energy), or to persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC, 2007).

International tourism is the largest and most rapidly expanding economic activity in the world today. As reported by the World Tourism Organization, travel and tourism involved 625 million people internationally and generated \$US 445 billion in receipts in 1998. Tourism is an important contributor to the economies of most countries and in some can represent up to one fifth of GDP (Gross Domestic Product). The global tourism industry is expected to grow significantly in the future as personal incomes and leisure time increase, and transportation networks improve.

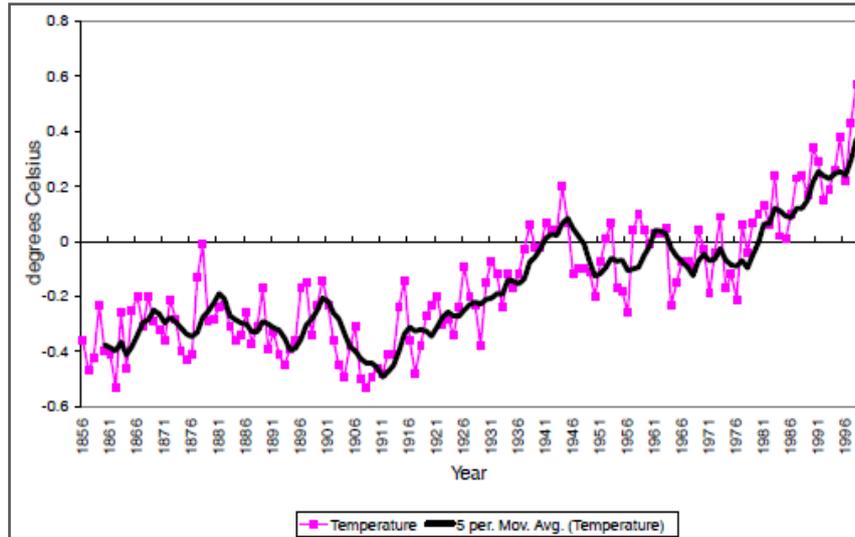


Fig. 1 Global mean temperature anomalies 1860-1998 with respect to 1961-90 (WTO, 2008)

The climate system is dynamic and varies on all time scales. However, Global and regional temperatures are rising. 1998 was the hottest year of the millennium and the 1990s the warmest decade. The four warmest years globally – in decreasing order of magnitude – are 1998, 1997, 1995 and 1990. Climate models suggest a future warming of 0.2 - 0.3°C per decade and sea levels are expected to rise at a rate of 4 to 10cm per decade. Figure 2 shows increasing in global temperature in the 21st century.

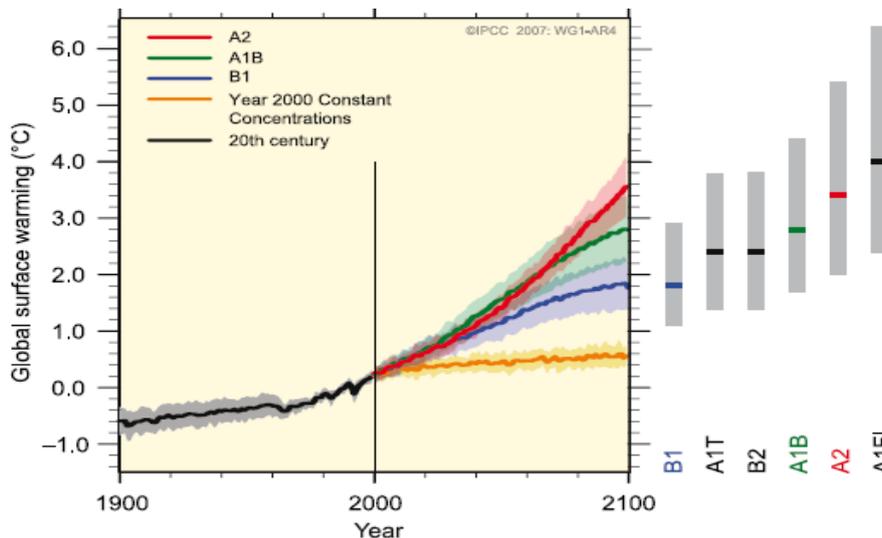


Fig. 2 Scenarios for global temperature in the 21st century (IPCC, 2007).

The impacts of climate change on tourism are likely to manifest themselves in a number of different ways according to local conditions. Many of these impacts will develop indirectly through increased stresses placed on environmental systems. The most serious impacts will result from the effects of sea level rise on small island states (WTO, 2008). This paper examines the extent to which climate change may affect the environmental systems of a range of international tourist destinations worldwide and the potential impacts on tourism. Also, this paper indicates advanced climate change analysis on tourism and solutions.

1.1. Tourism

According to the System of Tourism Statistics (STS), 'Tourism' is defined as the activities of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes not related to the exercise of an activity remunerated from within the place visited. 'Tourism' refers to all activities of visitors, including both 'tourists (overnight visitors)' and 'same-day visitors'. This concept can be applied to different forms of tourism. Depending upon whether a person is travelling to, from or within a certain country the following forms can be distinguished:

- **Inbound Tourism**, involving the non-residents received by a destination country from the point of view of that destination;
 - **Outbound Tourism**, involving residents travelling to another country from the point of view of the country of origin;
 - **Domestic tourism**, involving residents of a given country travelling within that country.
- Therefore, tourism covers not only international travel such as inbound tourism from the point of view of destinations, or outbound tourism from the point of view of generating markets; it also covers tourism inside one's country of residence (WTO, 2008).

1.2. Relationships between climate, weather and tourism

The relationship between tourism and climate has been studied for a long time (Scott et al., 2005). In the 1970s, applied climatologists examined the climatic thresholds that defined the season length for a wide range of tourism activities (Besancenot et al., 1978, Yapp et al., 1978). In the 1980s, bio meteorologists and others studied how climatic variables affected the physical comfort of tourists and developed rating systems to evaluate and compare the climates of tourism destinations (Harlfinger, 1991). More recent work has focused on validating climate rating systems for tourism in the marketplace (Gómez, 2006). The suitability of a given climate (and weather) varies for different types of tourism, as does the satisfaction of an individual tourist depending on country of origin, age or other factors (Scott et al., 2008). Some types of tourism require very specific climate conditions, for example beach tourism, winter sports, or health-wellness tourism. Climatic conditions and their suitability to tourism can differ at a micro scale from one side of the mountain to the other, within a range of a few kilometers according to altitude or even at a smaller scale under the influence of human developments (e.g., urban heat island) or tourism infrastructure (e.g., tourist resorts – both new [La grande Motte in Languedoc, France] and old [on the French Riviera] – have been designed to reduce wind speeds to enhance tourist comfort). More recent work has focused on the role of weather and climate in travel motivation, destination choice, and holiday satisfaction for tourists as well as the range of uses of weather and climate information by tourism operators and other tourism stakeholders (investors, insurers, regulators). Figure 2 shows the climate change impacts on tourist destination choose (Gössling et al., 2006; Hamilton et al., 2005).

2. The Climate Change Impacts on Tourism

The tourism industry and destinations are clearly sensitive to climate variability and change (Scott, 2006). Climate defines the length and quality of multi-billion dollar tourism seasons and plays a major role in destination choice and tourist spending. In many destinations tourism is closely linked with the natural environment. Climate affects a wide range of the environmental resources that are critical to tourism, such as snow conditions, wildlife productivity and biodiversity, water levels and quality. It also influences various facets of tourism operations. The major types of climate change impacts projected by the

IPCC that have the greatest potential significance for the tourism sector are outlined in Table 1 (IPCC, 2007).

Impact	Implications of tourism
Warmer temperatures	Altered seasonality, heat stress of tourists, cooling costs, change in plant-wildlife-Insect populations and distribution, Infectious diseases ranges.
Decreasing snow cover and shrinking glaciers	Lack of snow in winter sport destinations, Increased snow making costs, Shorter winter sports seasons and aesthetics of landscape reduced.
Increasing frequency and intensity of extreme storms	Risk for tourism facilities, increased insurance costs/loss of insurability, business interruption costs
Reduced precipitation and increased evaporation in some region	Water shortages, competition over water between tourism and other sectors, desertification, increase wildfires threatening infrastructure and affecting demand
Increased frequency of heavy precipitation in some regions	Flooding damage to historic architectural and cultural assets, damage to tourism infrastructure, altered seasonality.
Sea level rise	Coastal erosion, Loss of beach area, higher costs to protect and maintain waterfronts
Sea surface temperature rise	Increased coral bleaching and marine resource and aesthetic degradation in dive and snorkel destinations
Changes in terrestrial and marine biodiversity	Loss of natural attractions and species from destinations, higher risk of disease in tropical-subtropical countries
More frequent and larger forest fires	Loss of natural attractions, increase of flooding risk, damage to tourism infrastructures
Soil changes(e.g. moisture levels, erosion and acidity)	Loss of archaeological assets and other natural resources, with impacts on destination attractions.

Table 1. Major climate change impacts and implications for tourism destinations.

Climate change will have both negative and positive impacts on the tourism sector and these impacts will vary substantially by market segment and geographic region consequently, there will be winners and losers at the business, destination and nation level. Importantly, all tourism businesses and destinations will need to adapt to climate change in order to minimize associated risks and capitalize upon new opportunities, in an economically, socially and environmentally sustainable manner. The vulnerability of tourism is particularly concerning in those areas where tourism constitutes the major livelihood of local communities, as it is the case in many developing countries and Small Island Developing States. Figs. 3 ~ 4 show some climate change effect on environmental areas.



Fig. 3 Erosion of shoreline and damage to tourism infrastructure due to hurricane IVAN in Tobago



Fig. 4 Coastal erosion and sea wall protection on a beach in Tiji

There are four broad categories of climate change impacts that could affect tourism destinations, their competitiveness and sustainability.

- **Direct climatic impacts** – including geographic and seasonal redistribution of climate resources for tourism, and changes in operating costs such as heating-cooling degree days, insurance premiums, precipitation changes, and increased extreme event.
- **Indirect environmental change impacts** – including climate induced-environmental changes such as water shortages, biodiversity loss, decline of landscape aesthetic, increase in vector borne disease, and damage to infrastructure.
- **Impacts of mitigation policies on tourist mobility** – including changes in tourist flow due to increased prices; alterations to aviation routes; changes in the proportions of short-haul and long haul flights.
- **Indirect societal change impacts** – including the consequences of the broader impacts of climate change on societies, such as changes in economic growth, development patterns, social political stability and personal safety in some regions. These will have ‘knock-on’ effects on operations, employment and security issues in tourism and related sectors.

2.1. Key Impacts of climate change on tourism

Key impacts of climate change on the tourism sector range from direct impacts on the climate resources of destinations, to indirect environmental impacts (e.g., biodiversity, water resources, landscapes), and to the potential for societal change and political destabilization of some nations. Exploratory studies indicate that a shift of attractive climatic conditions for tourism towards higher latitudes and altitudes is highly probable. As a result, the competitive position of some popular holiday areas is anticipated to decline, whereas other areas are expected to improve. The geographic and seasonal redistribution of climate resources for tourism would have significant impacts at the regional and local scale, producing both ‘losers and winners’ in terms of visitor flows, but are not anticipated to adversely affect global tourism demand. Conversely, the indirect effects of climate change induced environmental and social change are likely to be largely negative. Impacts such as decreasing natural snow reliability, increasing water shortages, loss of attractive landscapes and biodiversity, and beach erosion will affect many destinations around the world. Like the direct impacts of changing climate conditions, indirect environmental effects are anticipated to have an important impact on tourist demand for specific destinations, but they are not expected to affect overall tourism demand. In contrast, societal changes that may result from climate change, including political and economic instability in some regions, mitigation policies, and changes in

consumer patterns and lifestyles, are more likely to adversely affect overall tourism demand as well as demand for particular destinations.

The cumulative effect of direct and indirect impacts of climate change on tourism demand patterns is anticipated to lead to wider impacts on many areas of economic and social policy in destinations, such as employment and labor demand, housing, transport, and social infrastructure. Impacts on the tourism sector would have implications for other economic sectors, such as agriculture supplying tourism demand, handicraft industries and local small business networks that rely on tourism (WTO, 2008).

2.2. Tourism – part of the problem

Tourism is not just a potential victim of global warming; it also contributes to the causes of climate change. For example, air travel is the fastest growing source of greenhouse gas emissions and therefore increases the risk of continued global warming. From 594 million international travelers in 1996, numbers are forecast to leap to 702 million by next year, 1,018 million by 2010 and 1,600 million in 2020. As a consequence, the role of air travel within the industry is also likely to expand and cause considerable environmental damage.

3. The Importance of Weather Forecasts and Climate Prediction for the Tourism Sector

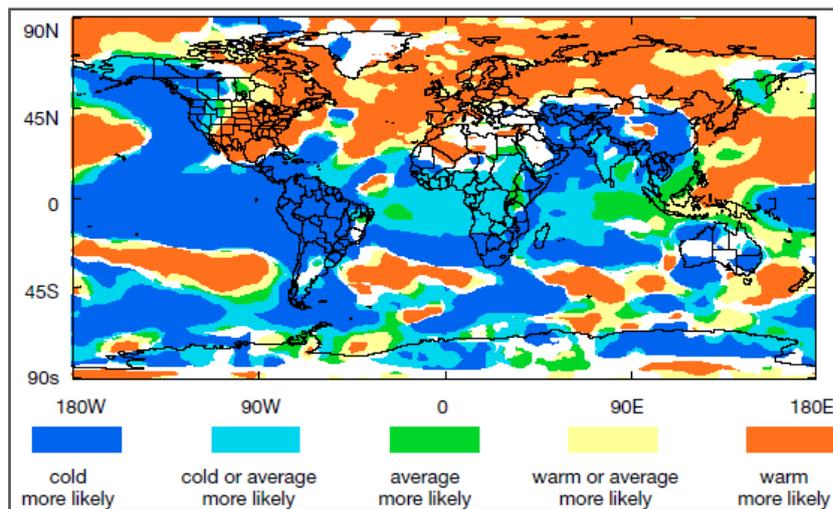
Weather, in many regions of the world, can be forecast now for up to a week with good reliability and it is expected that similarly reliable forecasts will be extended to upwards of ten days over the next 10–15 years. Weather forecasts are improving at a local scale, though some extreme phenomena such as tornadoes cannot be predicted with sufficient lead time for effective response to the risk. Improvements to weather forecasts and the development of early warning systems are of particular interest to the tourism sector. Improvements in weather forecasting benefit tourists in their short term decision-making related to travel planning (i.e., departure time-date and destination choice) and activities. Early warning systems also reduce the safety risks associated with extreme events, such as storms, cyclones, or avalanches (UNWTO-WMO, 1998). The improved accuracy of weather forecasts is also important for tourism operators. Improved forecasts benefit operational decisions, such as irrigation, snowmaking, activities programming, maintenance and staff scheduling, and route planning. Improved forecasting is also desirable because inaccurate forecasts can be detrimental to the tourist experience and tourism demand, for example when people go on ski, beach or camping trip and do not find the expected good weather, or do not go because of the forecast of poor weather that does not actually materialize.

Seasonal climate prediction covers periods from one month, to several years, but typically is for three month periods. The availability of seasonal predictions is expanding, following upon recent advances in the understanding and modeling of climatic processes. Through the analysis of the global or regional phenomena affecting regional and local climate and weather, meteorologists combine global forecasting methods and statistics, to determine probabilities for a given season (e.g., probability the next summer will be warmer or dryer than average – (see Figure 3) or the number of intense tropical storms expected in a region). Some Meteorological services, such as US National Oceanic and Atmospheric Administration (NOAA), issue seasonal forecasts more than one year in advance, for parameters such as temperature and precipitation. The use of seasonal prediction has been limited in the tourism sector thus far, although there are a number of potential uses that are anticipated to increase as seasonal prediction improve further: fuel supply procurement, marketing, setting insurance premiums, inventory management, or cruise line destination planning (UNWTO-WMO, 1998).

One of the reasons for the slow integration of weather and climate information into decision making is the uncertainty associated with the forecasts or predictions. Uncertainty is an unavoidable fact in any climate projection, prediction, or assessment, but uncertainty is very different from no information.

Weather and climate experts strive to help users understand inherent uncertainty, and to learn how to handle it, and thereby to be fully aware of the risks and benefits when making decisions regarding a climate-sensitive activity. In a Climate Risk Management approach, decisions are never based on a single scenario. Rather, risks and benefits are assessed over the range of possible scenarios, in such a way that catastrophic loss is minimized, and over time, the best outcomes are realized. The challenge is for the meteorological and tourism communities to work together to find the decisions and policies that are amenable to such an approach, and to seize upon them.

In recent years, new partnerships between meteorological institutions and tourism stakeholders have developed. This cooperation has taken multiple forms, from new forecasts for tourism destinations, improved media training and cooperation to deliver forecasts related to tourism, to specific contracts between meteorological services and destinations, tour operators and other stakeholders. UNWTO (World Tourism Organization) and WMO (World Meteorological Organization) have begun new collaborations to improve the availability and use of weather and climate information in the tourism sector (WMO, 2005). WMO has established a new Expert Team on Climate and Tourism with part of its mandate to work with National Meteorological and Hydrological Services and tourism professionals to develop tailored climate products for application to tourism and develop new information on risk assessment to build on the WMO-UNWTO Handbook on Natural Disaster Reduction in Tourism Areas (WMO, 2007).



Source: UK Met Office

Fig. 3 A global seasonal weather forecast for summer 2007 temperatures (WMO, 2007).

4. Conclusion

Tourism is a multi-billion euro industry that is highly dependent on climate resources. On the other hand, Weather and climate have a strong influence on the tourism and recreation sector, including the environmental resources that are the foundation for tourism and the length and quality of tourism seasons. Climate change represents an important long-term challenge to the tourism industry. It will create new risks and opportunities for different segments of the tourism marketplace and alter the competitive relationship between

tourism destinations. The magnitude of the impact of climate change will depend upon the importance of the tourism industry in the regional economy, the characteristics of climate change and its affect on the natural environment, the adaptive response of tourists, and the capacity of the tourism industry itself to adapt to climate change as well as its interaction with other long-term influencing variables in the tourism sector such as globalization and economic fluctuations, fuel prices, aging populations in industrialized countries, increasing travel safety and health concerns, increased environmental and cultural awareness, advances in information and transportation technology, environmental limitations – water supply and pollution.

The evaluating results show that The development of a strategic research agenda to assess the implications of climate change for sustainable tourism and target the key informational needs of tourism decision makers (both in government and business) in order to weather forecasting and early warning system development is required. Increased collaboration between climate change scientists, government tourism officials and the tourism industry is paramount to developing such a research program.

References

- Besancenot, J. P. et al. (1978). *Les Conditions Climatiques du Tourisme Littoral*, Norois, 99, 357–382.
- Gómez Martín, B. (2006). *Climate Potential and Tourist Demand in Catalonia (Spain) during the summer season*, *Climate Research*, 32, 75–87.
- Gössling, S. & Hall, C.M. (2006). *Uncertainties in Predicting Tourist Travel Flows Based on Models: Editorial Essay*, *Climatic Change*, 79 (3–4), 163–173.
- Hamilton, J.M., & Lau, M. (2005). *The Role of Climate Information in Tourist Destination Choice Decisionmaking*.
- Harlfinger, O. (1991). *Holiday Biometeorology: A Study of Palma de Majorca, Spain*, *Geojournal*, 25, 377–381.
- IPCC. (2007). *Glossary of Terms*, (Online), available: [http://www.ipcc.ch/pdf/glossary/tar-
ipcc-terms-en.pdf](http://www.ipcc.ch/pdf/glossary/tar-
ipcc-terms-en.pdf) .
- IPCC. (2007). *Impacts, Adaptation and Vulnerability*, Summary for Policymakers.
- Scott, D. et al. (2005). *The Evolution of the Climate Change Issue in the Tourism Sector*, in M. Hall and G. Higham (eds.), *Tourism Recreation and Climate Change*, Channelview Press, London, 44–60.
- Scott, D. et al. (2008). *Climate Preferences for Diverse Tourism Environments: Evidence from Canada, New Zealand and Sweden*, *Climate Research*.
- Scott, D. (2006). *Climate Change and Sustainable Tourism in the 21st Century*.
- UNWTO-WMO. (1998). *Handbook on Natural Disaster Reduction in Tourism Areas*.
- WMO. (2005). *Special Issue on Climate and Tourism*, *World Climate News*, 27th edition, (Online),: [http://www.wmo.int/pages/publications/world_climate_news/documents/
wcn27.pdf](http://www.wmo.int/pages/publications/world_climate_news/documents/
wcn27.pdf) (17-12-2007).
- WMO .(2007). *Expert Team on Climate and Tourism*, (Online), available: [http://www.wmo.ch/pages/prog/wcp/
ccl/opags/opag4/et4.3/et4.3_members_tors.htm](http://www.wmo.ch/pages/prog/wcp/
ccl/opags/opag4/et4.3/et4.3_members_tors.htm) (17-12-2007).
- World Tourism Organization and the United Nations Environment Programme. (2008). *Climate Change and Tourism – Responding to Global Challenges*, Printed by the World Tourism Organization, Madrid, Spain.
- Yapp, G., & McDonald, N. (1978). *A Recreation Climate Model*, *Journal of Environmental Management*, 7, 235–252.