

Weather, Climate and Tourism

A Literature Review

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Becken, S. 2005. Harmonising climate change adaptation and mitigation: the case of tourist resorts in Fiji. *Global Environmental Change Part A. Vol. 15, pp. 381-393*

The purpose of this paper is to analyze adaptation to climate change by tourist resorts in Fiji as well as their potential to reduce climate change through reductions in carbon dioxide emissions. The data used for the study were collected from three sources: stakeholder and expert interviews, tourist operator interviews, and an accommodation survey. The stakeholder and expert interviews were informal and notes were taken. The results and background information obtained accompanied the accommodation survey and industry interviews. The private-sector interviews were conducted at the resorts and included site visits. Interviews were semi-structured and designed to enhance or confirm knowledge gained in the accommodation survey. The interviews covered the operators' attitudes towards climate change, adaptation, and mitigation measures currently in place. The questionnaire sought information on energy consumption, climate change mitigation, adaptation measures, and environmental management. The survey was undertaken with the support of the Department of Energy and the Ministry of Tourism. The questionnaire was posted to all tourism accommodation providers in Suva, the Coral Coast, the Mamanuca Islands, and Nadi.

Bigano, A. F. Bosello, R. Roson & R. S. J. Tol. 2008. Economy-wide impacts of climate change: a joint analysis for sea level rise and tourism. *Mitig Adapt Strateg Glob Change, Vol. 13, pp. 765–791.*

This study follows a joint analysis of climate change impacts on tourism and sea level. Combining the two impact studies into a single, integrated analysis provides two main advantages: i) the possibility of highlighting the complex interactions between the two adjustment processes; and ii) the potential for considering a direct effect of sea level rise on tourism destination choices. The study focuses on the economic assessment of two specific climate change impacts: sea-level rise and changes in tourism flows. The main source of information for this study came from the Global Vulnerability Analysis (Hoozemans et al. 1993), complemented with the estimates of Bijlsma et al. (1996), and the model of coastal protection of Fankhauser (1994). Combined as described in Tol (2002), these data specify, per country, the amount of land lost due to a sea level rise of 1 m. This study uses a CGE model to evaluate the economic implications of two specific consequences of climate change: sea level rise and change in tourism flows. In addition to the economic evaluation, this exercise aims first to highlight the economic adjustments triggered by the initial shocks, key in driving the final result and second, to disentangle the role of possible interactions originated by the coexistence of different impacts. In addition, different land intensities in production systems, different degrees of ability in substituting the land lost with other production factors and capital outflows driven by reduced rate of returns, re-rank countries in terms of experienced losses. The authors showed a penalisation of warmer countries and an advantage for regions at the higher latitudes like Western Europe or Japan and Korea where tourism demand increases by 1.3 and 8%, respectively.

Brommer, M.B, and L.M-B Burgh, 2009. Sustainable coastal zone management: a concept for forecasting long-term and large-scale coastal evolution. *Journal of Coastal Research*, Vol. 25, pp. 181-188.

The paper illustrates the importance of integrating scientific information in forecasting long-term coastal physical processes for sustainable coastal zone management. The authors illustrate how geologic information from the (sub) surface combined with the quantification of sediment budgets helps in assessing the long-term trend of the coastal system. In order to prepare a long-term vision that incorporates the natural dynamics of the sediment dispersal system the study's propose is to attempt to i) better understand sources and sinks in the sediment dispersal system on different spatial and temporal scales; ii) quantify within the coastal zone the actual need for sediments to determine the sediment budget of the sediment dispersal system; and iii) link the sediment budget to (decadal) shoreline behavior. The paper linked human impacts to natural coastal dynamics in time and space. The study used temporal and spatial scales for illustrating and identifying the sediment dynamics for coastal evolution. In this regard the paper combined the use of numerical models and stratigraphic information for estimating sediment budget for forecasting coastal development for the sustainable coastal zone management. The paper emphasized the social and natural components of sustainable integrated coastal zone management.

Chan, W.W., L.M. Mak, Y.M. Chen, Y.H. Wang, H.R. Xie, G.Q. Hou, and D.Li. 2008. Energy saving and tourism sustainability: solar control window film in hotel rooms. *Journal of Sustainable Tourism*, Vol. 26, pp. 563-574.

The objectives of this study were to calculate the amount of energy saved, estimate the reduction in emissions and to appraise the investment in the application of solar control film application for hotels. The paper investigates saving solar energy in the fast growing hotel sector. The study was conducted in a subtropical summer climate, monsoonal humidity, with cooler winters and plentiful precipitation. It uses two guest rooms that have the same area and the results indicated that sticking solar control film to the guestroom windows would be beneficial both financially and environmentally. The authors revealed that given the rapid tourism and hotel development, these findings could have wide implications for energy saving and sustainable development in the region. It was found that about 155 kWh could be saved per room annually. The savings in energy, per room, can also indirectly reduce some 920 g of SO₂ and 131 kg of CO₂ emissions per year. The study concluded that by limiting solar control the window film helps limit tourism's impact on global warming and climate change.

Coombes, E.G., A.P. Jones., and W.L. Southerland. 2008. The biodiversity implications of changes in coastal tourism due to climate change. *Environmental Conservations*, Vol. 35, pp. 319-330.

This paper highlights the biodiversity implications on tourism due to climate change. The climate change impacts on tourism will heighten due to deterioration of coastal vegetation and disturbance of nested birds. This study finds that overall levels of vegetation and diversity are likely to decline; although only by a small amount, if future visitor numbers increase due to warmer and drier weather conditions. The study was conducted in three stages in order to evaluate the biodiversity implications of changes in visitor use due to climate change. First, it assessed levels of visitor use across the different habitats at Holkham and Cley. Second, the authors reviewed the literature to determine the impacts that visitors have on biodiversity for different intensities of use. Finally, the study combined visitor impacts with information regarding the levels of use that habitats receive to assess visitors' current and future impacts on biodiversity. The paper anticipated that the lower levels of trampling observed in saltmarsh protect it from the reduction in biodiversity seen in dunes. It is revealed that greater visitor numbers are likely to increase levels of noise which further disturb shorebirds even if visitors do not directly pass through areas where plover are present.

Daniel, S., J. Dawson and B. Jones. 2008. Climate change vulnerability of the US Northeast winter recreation– tourism sector. *Mitig Adapt Strat Glob Change*, Vol. 13, pp. 577–596.

The objective of this study was to provide a broad perspective on the potential vulnerability of the Northeast winter recreation and tourism sector to climate change by examining whether a reliable snow-based recreation product remained viable under a range of climate change scenarios. It examined the vulnerability of the two largest winter recreation industries, snowmobiling and alpine skiing, to four climate change scenarios in the twenty-first century. The majority of the 15 locations examined in this study were projected to have marginal or non-existent snowmobile seasons in 2040–2069 under both lower and higher emission scenarios. Consequently, the loss of snowmobiling activity and related tourism would appear unavoidable in the following locations if the climate change scenarios projected for 2040–2069 were realized: western New York, north– central Pennsylvania, southeastern New York, south–central Pennsylvania, eastern Pennsylvania, western Massachusetts, southern New Hampshire, and northeastern New York.

The findings of this study suggest that the adaptive capacity offered by advanced snowmaking substantially reduces the climate change risk of the Northeast ski industry. Through to 2040–2069, only seven of the study areas examined (Connecticut, western New York, southeastern New York, western Pennsylvania, southeastern Maine, eastern Pennsylvania, and eastern Massachusetts) were projected to have average ski seasons shorter than 100 days and have a lower than 75% probability of being open for the entire Christmas–New Year's holiday period, and thus be considered at risk economically. Even under the higher emission scenario for the 2070–2099, four study areas (southern Vermont, northeastern New Hampshire, northeastern New York, and western Maine) did not reach these two economic risk criteria, albeit with large

increases in snowmaking requirements and the need to withstand occasional seasons as short as 75 days under new extreme conditions. The study focused only on the supply-side impacts of climate change and the implications for winter recreation. Demand remains an important area for future research if the economic implications of climate change for this important economic sector are to be fully understood.

De Freitas, C. R. 2003. Tourism climatology: evaluating environmental information for decision making and business planning in the recreation and tourism sector. *International Journal of Biometeorology*, Vol. 48, pp. 45-54.

This paper reviews the current state of knowledge on tourism climatology and explores areas and priorities for future work. It proposes that a fundamental “driver” of tourism climatology is the identification and evaluation of environmental information for business planning and decision-making in the recreation and tourism industry. The paper integrates all facets of climate, uses standard data and is objectively tested and verified, in order to develop a better understanding of what climate-related information is required by both tourists and the tourism industry. This paper explores the distinction between the impact of climate on tourists and the tourism industry, setting a standard approach to tourism climate assessment. This paper also focuses on assessing the role of weather forecasts and long-term expectations of climate on choices made by tourists, the risks to tourism caused by extreme atmospheric events, what climate-related criteria people use to make decisions about tourism and recreational choices, how products giving information about weather and climate are currently used by the recreation and tourism industry and what are the existing and future requirements for this climate information. The paper uses two methods for assembling data on the human response to climate and thus the demand for the climate resource: assessing conditional behavior by using questionnaires and images to determine how people react or think which includes assessing the influence or role of weather or climate forecasts and examine on-site experience.

De Freitas, C.R., D. Scott, and G. McBoyle. 2008. A second generation climate index for tourism: specification and verification. *International Journal of Biometeorology*, 52: 399-407.

This paper examined the details of tourists’ climate preferences by ranking of climate conditions, range of climate parameters, and weather thresholds in order to validate a Climate Index for Tourism. It aims to address the deficiencies of past climate indices for tourism by devising a theoretically solid and practically useful climate index called the Climate Index for Tourism(CIT). The paper suggested that a climate index for tourism can be reliably used as an integrated index for beach-based tourism and recreation where the thermal, aesthetic, and physical facets of weather collectively determine climate impacts on tourism. The paper addresses the deficiencies of past indices by developing a theoretically sound and empirically tested method. The study uses CIT model and prototyped questionnaire surveys; controlled settings were used to measure the satisfaction for a range of atmospheric environmental conditions. Six essential characteristics for a new generation climate index were identified as: i) theoretically sound (research must include the results from different disciplines to get more

understanding of tourism-climate relationships); ii) integrates the effects of all facets of climate (tourists respond to the integrated effect of various facets of climate such as air temperature, humidity, wind, sunshine clouds etc); iii) simple to calculate and uses readily available data (the index should be designed so that it can use either standard climate data or, for short-time forecasts, weather variables); iv) easy to use and understand; v) recognize overriding effect of certain weather facets (the combined effect of a given weather or climate condition is not necessarily the sum total of its various facets); and vi) empirically tested (the performance of the index and its thresholds should be validated against measures of tourist satisfaction with weather climate conditions). The paper combines three conceptual attributes of climate for tourism and recreation: the thermal, aesthetic and physical/mechanical.

Erdmann, G. 1997. The impact of tourism on coastal areas. *GeoJournal*, Vol. 42, pp. 39–54.

This paper attempts to analyze the influences of tourism on coastal areas from three perspectives: i) the development of seaside tourism including the changes of socioeconomic and settlement patterns; ii) its cultural impact on the local population; and iii) its environmental aspects. The paper discussed the influence of tourism on coastal society with the help of a model showing four peripheries in space and time: i) the North Sea and Baltic coasts since the 18th century; ii) Southern Europe during the 19th century; iii) the North African shores around 1950; and iv) the tropical oceans after 1965. The paper concludes by stating that large scale tourism in coastal areas of developed and developing countries has positive and negative effects on the regional and national economies, local culture, physical infrastructure and environment. Whether the negative impacts of 'western' societies are greater than those of the local ones remains to be analysed as the study suggested. In the initial phase it is frequently the case while later on, domestic tourism and recreation often have detrimental consequences on the sensitive coastal landscapes. The paper recommended that it is essential for government not only to issue the relevant laws but also install the mechanisms for effective control and monitoring of the activities of investors, tour operators and other private and official actors at all levels. If all the participants cooperate efficiently under the common understanding of an ecologically sustainable development then tourism may provide positive contributions to the future of coastal areas.

Gossling, S. 2003. Market integration and ecosystem degradation: Is sustainable tourism development in rural Communities a contradiction in terms? *Environment, Development and Sustainability*, Vol. 5, pp. 383–400.

The purpose of this paper is to apply the neoclassic economic theory to sustainable tourism development. The article describes tourism development in the village of Kiwengwa on the east coast of Unguja Island (Zanzibar), Tanzania. Kiwengwa was the study area, with 555 inhabitants living in 165 houses and huts. It is shown that changes caused by tourism are far more complex than economic theory suggests. The socio-economic situation of the village was investigated using a written questionnaire, which was provided systematically to local residents with the household as the unit of analysis. The in-depth study of the changes induced by tourism in Zanzibar reveals that turning to a market economy jeopardizes the overall integrity of the ecological and socio-economic system, which is complex beyond the simplistic understanding of

economic theory. The main changes in Kiwengwa caused by tourism can be summarized as i) tourism has given rise to individualism and focuses on personal economic benefit; ii) tourism has encouraged the abandonment of traditional resource-use systems; iii) tourism has contributed to turn local natural resources into commodities; iv) tourism has spread the idea that resources can be replaced by imports; v) tourism has both directly and indirectly imparted a negative effect on the local ecosystems; and vi) tourism has turned the village into an emerging center of resource allocation on an industrial basis.

Gossling, S., P. Peeters, J-P. Ceron, G. Dubois, T. Patterson, R. B. Richardson. 2005. *The eco-efficiency of tourism*. *Ecological Economics*, Vol. 54, pp. 417-434.

This paper has shown that tourism is not necessarily environmentally more beneficial than other economic activities. The paper uses case studies and indicates that eco-efficiency depends on the source and destination of the vacation, tourists' culture, and the environments chosen for vacation. For the purpose of this article environmental damage per unit of value generation has been chosen as the basis for calculations. It has mentioned that short travel distances are a precondition for sustainability and their analysis reveals that distance and mode of transport are the most important factors influencing eco-efficiency in tourism. Overall, the paper concluded that the eco-efficiency concept can be used to analyze the combined environmental and economic performance of tourism. The concept can help to assess the relative importance of different tourism sectors in terms of environmental impacts and financial value generation. These results provide insights of how to improve its environmental performance in the economically most feasible way. The eco-efficiency concept has also proved to be applicable on very different levels, including day-visits, journeys and destinations. It may be used to evaluate the eco-efficiency of destinations/markets, to identify problematic aspects of a journey (transport, accommodation, or activities), and to reveal differences between different forms of tourism (e.g., adventure-, nature-, eco-, cultural-, beach tourism) or tourist types (e.g. elderly rich, young adventurers, etc.).

Hamilton, J.M. and R. S. J. Tol. 2007. *The impact of climate change on tourism in Germany, the UK and Ireland: a simulation study*. *Reg Environ Change*, Vol. 7, pp. 161–172.

This study is a first step towards reconciling the local and global aspects of the impacts of climate change on tourism. The authors used an econometric simulation model of domestic tourism in countries and of international tourist flows between 207 countries. For the analysis they combined that model with the sub-national data-sets of domestic and international tourism and developed a downscaling method that is consistent with the assumptions in the country model. First, they apply this to Germany, the UK and Ireland; these are countries for which the authors have good data and with which they are familiar. The model showed that climate change in countries at higher latitudes and altitudes will become more attractive to tourists, both domestic tourists and those from abroad. Tourists from the north west of Europe currently dominate international tourism—the Germans, the Irish and the British together account for 25% of the international tourist market—which implies that the world total of international tourist

numbers initially falls because of climate change. The model also showed that the effect of climate change is much smaller than the combined effects of population and economic growth, at least for most countries.

Jim, C.Y. 2000. Environmental changes associated with mass urban tourism and nature tourism development in Hong Kong. *The Environmentalist*. Vol. 20, pp. 233-247.

This paper endeavors to evaluate the environmental impacts of tourism in Hong Kong. Conservation of the environment by spatial concentration, the mode of urbanization in Hong Kong, has inadvertently but by necessity incorporated the tourism sector. The environmental problems of urbanization and industrialization have overshadowed the modest contributions of the relatively clean industry. The data of the study came from the Census and Statistics Department of Hong Kong. Recent trends in tourist activities showed a small number taking up countryside excursions to supplement their urban experience. Heightened environmental awareness in the source countries may account for the increasing interest in the more nature- and ecologically-oriented tourism. The study suggested that the dedicated facilities to complement the use of the countryside for tourism could also be implemented, such as golf courses, theme parks, urban-fringe parks, and water-based recreation including more bathing beaches and marinas. With increasing overseas patronage, the existing conservation program could be given additional justifications, incentives and impetus, with the economic benefits ploughed back for countryside management.

Jones, B and D. Scott. 2006. Climate change, seasonality and visitation to Canada's National Parks. *Journal of Park and Recreation Administration*. Vol. 24, pp. 42-63.

This paper examined the relationship between climate and visitation in order to understand the potential impact of climate change on the volume of visits and seasonal pattern of tourism in Canada's national parks. The study used visitation data obtained from Parks Canada, the federal agency responsible for managing the country's national parks. The data consisted of the total number of visitors entering each of Canada's national parks per month between January 1996 and December 2003. Multivariate regression analysis using four climate variables and monthly visitation data for 1996 to 2003 was used to develop a monthly climate-visitation model for 15 high visitation parks. Each park-specific model was then run with two climate change scenarios to assess potential changes in park visitation under a range of climatic conditions projected for the 2020s, 2050s and 2080s. Results indicate that Canada's national parks could experience an increase in visitors under climate change due to a lengthened and improved warm-weather tourism season. In the 2020s, overall visitation levels were projected to increase 6% to 8%, with a number of parks projected to experience larger increases (+12% to 30%). The largest increase in visitation occurs during the spring and fall months. Visitation was projected to increase between 9% and 29% system-wide in the 2050s and between 10% and 41% in the 2080s.

Koetse, M., and P. Rietveld. 2009. The impact of climate change and weather on transport: An overview of empirical findings. *Transportation Research*, Vol. 14, pp. 205-221.

This paper presents survey findings on the effects of climate change and weather conditions on the transport sector. It also revealed that global scale increase in temperature may influence patterns in tourism and skiing holidays with the associated changes in passenger transport. The paper also investigated that temperature increase affects the touristic attractiveness. Climate change related shifts in the weather patterns might also affect infrastructure disruptions. The paper reviewed the traffic safety and congestion and it is revealed that precipitation increases accident frequency but decreases accident severity. Also precipitation reduces traffic speed and the effect is particularly large during peak hours and on congested roads. Furthermore, an increased frequency of low water levels may increase costs of inland waterway transport considerably. The study also found that given the nature of transport as a derived demand, trade flow patterns will be affected by climate change in the long run when climate change affects location patterns of production and consumption.

Lise, W., and R. S. J. Tol. 2002. Impact of climate on tourist demand. *Climatic Change*, Vol. 55, pp. 429–449.

This paper investigates the sensitivity of tourist demand for vacation destinations with respect to climate in order to draw conclusions for the possible impact of climate change in the long term. First, a general picture is obtained of the link between tourist demand and temperature. Next, this general picture is further clarified with a case study of Dutch tourists to study the link between the demand for tourist activities during holiday trips and temperature. Finally, adaptation of tourist suppliers is briefly discussed. The analysis of this paper is based on data sets of two levels. On the macro level, time-series on tourist numbers, destinations, and expenditures at the aggregate national level, are readily available from sources such as the Organization for Economic Cooperation and Development, World Development Indicators and national statistical services. Climate data are obtained from various sources, including Cramer and Leemans' and Schlesinger and Williams' global climate data as well as data from tourist guides. The analysis of this paper leads to the conclusion that climate is an important consideration for tourists' choice of destination. This paper finds that climate matters in a regular way that can be quantified. The authors found that an average temperature of about 21°C is the ideal for the large bulk of international tourists. The factor and regression analysis showed that different dominant holiday activities imply different preferences for holiday climates. This study suggests that people's preferred vacation activities are largely independent of climate. Instead, people purchase a climate that suits their holiday plans. A gradual warming would thus induce tourists to seek different holiday destinations or travel at different times during the year. Climate change is therefore likely to lead to drastic changes in tourist behavior.

Maddison, D. 2001. In search of warmer climates? The impacts of climate change on flows of British tourist. *Climate Change*, Vol. 49, pp. 193-208.

The main objective of this paper is to suggest an approach to measure the welfare impact of changes in the climate of holiday destinations on tourists and also to predict changes in the number of trips to particular holiday destinations caused by climate change. A theoretical model

is used for this purpose. The model reveals how well-informed individuals allocate their time and money between visiting different holiday destinations and the consumption of other goods; in order to measure the welfare impact of changes in climate the author invokes the concept of 'weak complementarity'. Weak complementarity describes a situation in which it is possible to hypothesize the price of a particular commodity being so high or so low that marginal changes in the level of a non-marketed environmental amenity cease to matter. This paper investigates the impact of climate change on the chosen destinations of British tourists. Destinations are characterised in terms of 'attractors' including climate variables, travel, and accommodation costs. These variables are used to explain the current observed pattern of overseas travel in terms of a model based upon the idea of utility maximisation. For the dependent variable quarterly data on international travel (i.e., the number of return trips) by British residents is taken from the International Passenger Survey (IPS) for 1994. The data set also contains the average return fare (by air or by sea) paid per person to each destination, average spending on items other than fares and the average duration of the stay.

Martin, M.B.G. 2005. Weather, climate and Tourism a geographical perspective. *Annals of Tourism Research*, Vol. 32, pp. 571-591.

This article highlights the close relationship between climate, weather and tourism, and shows the need to understand the nature of these relationships, in order to show how tourism planning might be more effective. Further, the article asserts that tourism planning should incorporate more than simple, general descriptions of the climate, which are often unconnected to the needs of tourism. The author suggested that various agents playing roles in tourism must be made aware of the need to incorporate aspects of climate and weather into the design and development of their various projects. The author explains nine factors on the implication of weather, climate and tourism for tourism planning. Specifically, the paper considers the influence that climate and weather exert on the geographical space, demand, supply, and market agents of the tourism system. The paper also emphasized the need to improve the networks of meteorological observatories and better access to the information.

Matzarakis, A. 2006. Weather- and climate-related information for tourism. *Tourism and Hospitality Planning & Development*, Vol. 3, pp. 99-115.

The aim of this paper is twofold. One is to describe in a useful and understandable way how weather and climate can affect the making of decisions about a vacation area and how to access existing information. The second aim is to show what kind of weather/climate information exists and which information is relevant for tourists and the tourism industry. The methodology used for the paper is applied climatology and the human biometeorology to address the issues in climate and tourism. The sources of meteorological and climatological data include national weather services, private weather services, environmental agencies and governmental authorities running their own measurement networks. Also some of the data came from tourism guidebooks and the Internet. The paper suggested that climate information needs to be quantified and should be provided to the tourism planning and tourism industry using mean values, extremes, frequencies and probabilities. The paper also emphasized that climate information is important

from the human-biometeorology point of view especially the thermal component of climate index for tourism. The paper also cautions that emission scenarios in tourism destinations will suffer from bioclimatic change conditions and this will have a significant impact on local economies in the near future.

Meze-Hausken, E. 2007. Seasons in the sun - weather and climate front-page news stories in Europe's rainiest city, Bergen, Norway. *Int J Biometeorology*, Vol. 52, pp. 17–31.

This paper explores aspects of weather and climate dealt with in print media over a period of 10 years. Two research issues are discussed in the paper. The first one investigates the diversity of contexts in which weather and climate information is taken up in a newspaper's front-page story. This serves as a background for the second issue which tries to uncover the cliché of good and bad weather by comparing weather descriptions in the news with factual meteorological data. The paper hypothesized that defining a day as good is a matter of supply and demand, suggesting that during seasons with generally much rainfall and darkness, even a day with relatively little sunshine, gives the impression of a good or beautiful day. The case study for this paper focuses on print media in Europe's rainiest city, Bergen, Norway. Material for this paper was collected from 10 years of frontpage articles of the daily newspaper *Bergens Tidende*, spanning 1994–2003. The findings suggest that many articles clearly had components from several categories, even if the primary weather message was the coding rule. An analysis of *Bergens Tidende* has shown that climate and weather issues tend to dominate front pages throughout much of the year, truncating the normal range of news topics, although some seasonality is present. Some stories on anomalous climate seasons or weather disasters lead to engaged debates over causes, impacts, and mitigation for the future, while others provide an event-description with some connotation of the weather during that event. Scientific knowledge on topics like climate change or El Niño is presented in a way which the audience comprehends without deeper knowledge of the subject, and is aimed to place local happenings in a wider time and geographical perspective. This study investigated how society represented through journalists and news in print media, value, think, and perceive weather events and climatic conditions.

Morgan, R., E. Gatell, R. Junyent, A. Micallef, E. Özhan, and A.T. Williams. 2000. An improved user-based beach climate index. *Journal of Coastal Conservation*. Vol. 6, pp. 41-50.

This study was based on responses of North European beach users at sites in the UK and various Mediterranean locations. Investigation of this issue together with associated publicity might help to spread the tourism load and hence reduce undesirable social and environmental effects of extreme seasonality in tourist demand. Questionnaire surveys were carried out in Wales, Malta and Turkey to establish the preferences of north European beach users for thermal sensation and bathing water temperature, plus priority levels for other climatic attributes. In total, more than 1600 beach users were interviewed during the summers of 1994 and 1995. The questionnaire survey included an investigation into the preferences of beach users for the climatic aspects of thermal sensation and bathing water temperature. It also aimed to assess the relative priority levels given to these two aspects plus sunshine, absence of rain, and windiness at the beach location. Results showed that excessively hot thermal sensation occurs in many southern and eastern Mediterranean coastal destinations during July and August, the present peak of the beach tourism season. The climate index devised showed that many southern and eastern Mediterranean tourist destinations can become unpleasantly hot even for sedentary beach use during July and August. This is the peak of the summer season in terms of visitor numbers for many such destinations, when infrastructure components such as accommodation, transport (both local and international), sewage and water supply are often strained to their limit.

Nastos, P.T. and A. Matzarakis. 2006. Weather impacts on respiratory infections in Athens, Greece. *Int J Biometeorol*, Vol. 50, pp. 58–369.

The paper focuses on the contribution of meteorological parameters to the total variability of respiratory infections. For this reason, data on the daily numbers of general practitioner consultations for respiratory infections during the year 2002 were used. This came from the Local Health Service in the surroundings of Athens. The meteorological data obtained by the Meteorological Station of the National Observatory of Athens comprise daily values of mean, maximum, and minimum air temperature, air temperature range, relative humidity, absolute humidity, sunshine, surface atmospheric pressure, wind speed, as well as day-to-day changes of these parameters. In addition, biometeorological parameters and thermal indices such as mean radiant temperature, predicted mean vote, physiologically equivalent temperature and standard effective temperature as well as their day-to-day changes are used in the study. The relationship between every meteorological-biometeorological parameter and consultations for respiratory infections was examined by applying the Pearson Chi-Square Test. The study also applied generalized linear models. The results of the analysis show that the thermal index predicted mean vote is strongly associated with respiratory infections.

Page, S. J. 2009. Current issue in tourism: The evolution of travel medicine research: A new research agenda for tourism? *Tourism Management*, Vol. 30, pp. 149-157.

The paper addresses the issues associated with tourist holiday-taking and its management by the tourism industry. The paper seeks to broadly outline the evolution of this area of study and some of the influential studies published to date along with some of the research agendas now emerging in this new area of study. The paper summarizes the social science intersection of tourism studies from individual concerns with travel. The paper discussed issues of tourist well-being, trends affecting tourist risk and injury, and the steps the tourism industry is taking to minimize the risk and incidence of injury. The paper emphasized a limited and managed interaction with natural environment and local population which provide positive tourist experiences of both place and wider holiday by minimizing risk situations. In the conclusion the author noted that government and public sectors have responsibilities to ensure that all tourism providers dutifully take care of their guests and visitors. In this regards the author suggested “Best Practice” measures for government agencies.

Parrilla, J.C., A.R. Font, and J. R. Nadal. 2007. Accommodation determinants of seasonal patterns. *Annals of Tourism Research*, Vol. 34, pp. 422–436.

This paper showed general agreement that certain characteristics such as weather, school holidays, and special events influence tourist demand. It explores an alternative vision, analyzing the supply determinants of seasonality related to accommodation services as a representative sector of tourism. The data came from the Economic Research Center and direct interview from some establishment managers. The final results derived from the behavioral model evaluation. From a demand perspective the results showed that the most popular tactics for reducing yearly peaks and troughs have been the organization of special events and festivals, the identification of new market segments, and promotional pricing. From a supply perspective the tactics include expanding the current capacity to deal with peak-period demand and closing enterprises during the low periods. Authors suggested that for the private sector, results can help justify quality service investments related to expanding the high period and increasing efficiency through lower fluctuation. For public administration, results can justify restructuring industry policies to promote transforming lower-quality hotels into higher and converting them from the silver to the gold category.

Richins, H. 2009. Environmental, cultural, economic and socio-community sustainability: a framework for sustainable tourism in resort destinations. *Environ Dev Sustain*, Vol. 11, pp. 785–800.

This paper discusses an inclusive community-based sustainability framework with a focus on a resort destination in providing a potential model for more inclusive long-range destination planning and implementation. The model attempts to address the many difficult challenges of development through more inclusive and comprehensive long-range destination planning, implementation and management. In order to identify the socio-community assets the study

includes the important sub-areas of focus including i) the visitor economy with a focus on achieving a viable tourism economy, ii) the brand or identity—that is Noosa as a destination and how a strong brand will enhance the regional tourism industry and its relevant stakeholders, iii) a major focus on achieving a viable tourism industry through new and existing product development, iv) gaining and maintaining quality employment, v) enhancing and achieving sustainable capital investment in the property and other financial assets, and vi) through the continued improvement of quality tourism products and its visitor economy, in turn related and peripheral businesses also are provided with support. Important aims were to achieve a viable tourism industry through providing diverse tourism products which meet sustainable tourism standards, providing excellence in facilities, and developing viable business practices based on strategic approaches for improved market share for Noosa. In addition important aims for product development and operation included achievement of best practice service, accessibility, presentation, range and value for money, in all product categories and in all sectors having contact with visitors.

Scott, D., G. McBoyle, M. Schwartzentruber. 2004. Climate change and the distribution of climate resources for tourism in North America. *Climate Research*, Vol. 27, pp. 105-117.

The purpose of this study was to investigate current patterns and potential changes in the spatial and temporal distribution of the climate resource for tourism in North America using the TCI and 2 climate change scenarios. The paper discussed the implications of the changes in the length and quality of tourism offerings on tourism enterprises and competitive relationships between destinations. The paper used a tourism climate index in order to assess the spatial and temporal distribution of climate resources for tourism in North America. In the methodology the climate change scenario is used for analysis of tourism climate index variables. A total of 143 North American cities were selected for this analysis: 90 in the USA, 44 in Canada and 9 in Mexico. The cities were selected on the basis of 3 criteria: significance as tourist destinations, data availability, and regional spatial representation. The paper revealed that projected climate change substantively will redistribute climate resources for tourism. It is suggested that lengthened summer season will expand the domestic and international tourism markets and expenditures. The paper concluded that some cities are gaining climate suitable for winter sun vacations and there will be increased destination choice and competition for the short-term winter sun holiday.

Scott, D., G. Mcboyle and A. Minogue (2006) Climate Change and the Sustainability of Ski-based Tourism in Eastern North America: A Reassessment. *Journal of Sustainable Tourism*, Vol. 14, pp. 376-398.

This study examines how it reduces the vulnerability of ski areas to climate change in six study areas by developing a model to assess the impact of climate change on season length, probability of operations during critical tourism periods, snowmaking costs, and water requirements. It suggests that in the 2020s, even the warmest climate change scenario poses only a minor risk to four of the six ski areas. The climate data for Canadian locations were obtained from the Meteorological Service of Canada and the data for US locations were obtained from the National Climatic Data Center. The climate change scenarios used in this analysis were obtained from the

Canadian Climate Impact Scenarios project and were constructed in accordance with the methodological recommendations of the United Nations Intergovernmental Panel on Climate Change (IPCC) Task Group on Scenarios for Climate Impact Assessment. A total of 25 possible scenarios representing a broad range of global climate models and future emission levels were considered for this analysis. Each scenario consists of single estimates of possible temperature and precipitation change for each month during three future periods: the 2020s, the 2050s and the 2080s. The snow model was evaluated by comparing the predicted and observed number of days with snow and days when snow depth met or exceeded the assumed operational requirement (30 cm) over the 1961–1990 baseline period. In order to complete the modeling of snow conditions at each ski area, a snowmaking module was integrated with the snow cover model. The estimated technical capacities were derived from communications with ski industry stakeholders and ski industry.

Tzu-Ping Lin, T. –P. and A. Matzarakis. 2008. Tourism climate and thermal comfort in Sun Moon lake, Taiwan. *Int J Biometeorol*, Vol. 52, pp. 281–290.

The purpose of this paper was to analyze tourism climate by using a modified thermal comfort range in Sun Moon Lake, one of Taiwan's most popular tourist destinations. The analysis of tourism climatology was based on climate indices. In order to calculate the thermal comfort range of tourists results from a field study based on 1,644 interviews in the outdoor environment were used. In the survey basic information on the person's activity level and clothing were obtained. Secondly, objective measurements of ambient air temperature, globe temperature (measured by standard globe), air humidity, air velocity and global radiation were carried out, which were then used together with the activity and clothing level, to calculate the physiologically equivalent temperature. Also, the interviewees were asked to subjectively evaluate thermal sensation, thermal preference, and thermal acceptability. The study compared two thermal scales and found that the neutral temperature scale of Taiwan is higher than that of Western/Middle European. Furthermore, the physiologically equivalent temperature range of Taiwan is larger than that of Western/Middle European for each thermal sensation scale. The results of the study also suggested that tourists consider the impact of strong solar radiation on their thermal comfort. On the other hand, the authorities or the tourism industry may offer sheltered outdoor areas to ensure the thermal comfort of tourists in periods with extreme high solar radiation.

Yu, G., Z. Schwartz, and J. E. Walsh. 2009. A weather-resolving index for assessing the impact of climate change on tourism related climate resources. *Climatic Change*, Vol. 95, pp. 551–573.

This study develops and tests a Modified Climate Index for Tourism (MCIT) utilizing more than 50 years of hourly temperature, wind and significant weather data from contrasting climatic regions, Florida and Alaska. This paper improves previous methods by incorporating variables that are more relevant to tourism activities, by addressing the overriding nature of some conditions, and by incorporating hourly observations rather than simple daily averages. The MCIT was tested using hourly weather observations from King Salmon, Alaska and Orlando,

Florida. The results show that average temperature alone is not sufficient to represent tourism climate resources. The Weather observations came from two destinations, King Salmon, Alaska (1943–2005) and Orlando, Florida (1953–2005, except for 1971 and 1972). These observations were used to illustrate how the MCIT and sub-MCIT indices could be applied to measure climate as a resource for tourism. These hourly historical observation data were obtained from the National Climate Data Center of the National Oceanic and Atmospheric Administration. The proposed hourly-based index combines various weather elements in an attempt to better capture the dependence of outdoor tourism activities on climate and climate change. The empirical findings of this study support the use of a tourism-related climate index to assess the impact of climate change on tourism. The results presented here point to the feasibility of an assessment of the sensitivity of a tourism-related climate resource on a regional or national scale. The sample results for the two locations discussed in previous sections show that changes of climate tourism resources are already detectable and they vary with location.

Zaninovic, K., and A. Matzarakis. 2009. The bioclimatological leaflet as a means conveying climatological information to tourists and the tourism industry. *International Journal of Biometeorology*.

The aim of this paper is to present a climate and bioclimate leaflet that can help the tourist industry, tourist operators and also the tourists themselves in their decision-making. The paper concentrated on temperature, climate-tourism-information-scheme, and precipitation that enable tourists to choose the most suitable time period for holidays. The climate tourism index, thermal and aesthetic facets of the tourism climate are used in the methodology. The paper stated that the climatological information can be used for the promotion of the natural potential for tourist destinations. In the conclusion the paper mentioned that the bioclimatological leaflets can improve the tourist health and especially people who are sensitive to summer heat. The study provides a basis for the promotion of the natural potential of tourist destinations. Tourist managers can use climatological information for promotions offering a wider spectrum of possibilities for holiday activities. These activities range from summer tourism with sun and sea bathing, to health, recreation or sport purposes, depending on climate and bioclimate conditions during the year. Also, physicians could use the information to warn their patients of periods that might be unhealthy for them, and suggest the best period for improving their health.