

The Tourism Industry: Its Vulnerability and Adaptability to Climate Change

Geoffrey Wall

Faculty of Environmental Studies
University of Waterloo, Waterloo, Ontario
Canada

Abstract:

In the consideration of climate change and tourism, it is suggested that more emphasis be placed on risk assessment. The vulnerability of tourism to climate change is discussed briefly and the difficulty of generalizing across a multitude of locations and activities is stressed. Mitigation and adaptation are discussed and the need for both is acknowledged. Case studies of skiing and marinas and recreational boating from the Great Lakes region of North America are presented and a variety of research needs and opportunities is suggested.

Keywords: adaptation, Great Lakes, mitigation, recreation, research needs, risk, tourism, vulnerability, uncertainty

Introduction

This contribution does not examine climate change per se. Rather, it is based upon the assumptions that climate and weather, which are inherently variable on a multitude of time scales, may change at an unprecedented rate in future decades and that such events have implications for tourism. There are many uncertainties. This term is used by cautious scientists who correctly acknowledge the complexities of the climate system and the need for further research to enhance understanding. The term, however, permits sceptics, both academics and public officials, to dismiss the growing evidence that the climate is changing. But certainty will only exist after the fact (and even then the processes may still be incompletely understood). For this reason, it is preferable to use the term “risk”. Risks are extremely difficult to calculate but risk is a more palatable and actionable term than uncertainty. What risks do tourism businesses face from climate change and variability and what can be done to reduce these risks? Are there also opportunities associated with the changing circumstances?

The uncertainties that usually surface in climate change deliberations and are given most prominence in discussions are usually those associated with physical systems. Climate modellers have been particularly successful in using these uncertainties to garner increased research funds. However, it is contended that the uncertainties of human systems are much greater than those of physical systems. While models of climate change have become more sophisticated, including the development of transient models (Scott *et al.*, 2002, 2003), and the results of research vary with the scenarios adopted to drive the analyses, studies of the ski industry show that global trends in the length of the ski season are universally negative (Galloway, 1988; Konig and Abegg, 1997; Perry, 2000). However, the magnitude of curtailment is reduced substantially by the adoption of snow-making (see below). Much more needs to be known about human responses to the vicissitudes of weather and climate.

Furthermore, climate change is one among many phenomena that are part of an increasingly turbulent environment. In the past few years, the global system, including the tourism system, has been disrupted by wars,

terrorism, the Asian economic crisis and contagious diseases among other factors. It is impossible to study everything at once and just as we abstract tourism from broader human systems to facilitate analyses, it is necessary to remember that climate change is only one form of global change and may not be the most important for all places and activities, and at all temporal and spatial scales. Thus, both tourism and climate change should be considered in a broad context and the most challenging situations may be in places where the various forces of global change, both human and physical, are superimposed upon each other, such as in coastal cities and remote mountain communities that are being opened to tourism.

The Vulnerability of Tourism to Climate Change

Vulnerability refers to the extent to which a system may be (adversely) affected, disrupted, or displaced by an external force. In this case, we are concerned with components of the tourism system and the challenges associated with climate change.

The magnitude of the implications of climate change for tourism and recreation will depend upon both the distribution and importance of tourism phenomena and the characteristics of climate change. Other things being equal, locations whose economies are highly dependent on tourism appear to be at the greatest risk.

Some claim that tourism is now the largest industry in the world and few areas are untouched by tourism. In this sense it is a global industry. At the same time, tourism is widely but not evenly distributed and is highly concentrated in specific places, especially cities, coasts, and mountains. Cities are often major tourism attractions but they usually have a diversified economy. The less-populated areas often have a high dependence on tourism and many coastal and mountain locations specialize in catering to tourists. Much tourism and recreation is concentrated in high-energy environments, such as mountains and coasts—areas that appear to be particularly vulnerable to climate change through modifications in the hydrological cycle, particularly changes in water levels, stream flow, and the magnitude and timing of snowfall.

The author (Wall, 1992, 1993) has elsewhere suggested that domestic travel patterns are likely to be more stable than international travel because the former often take place in relatively short periods of free time and time limitations place constraints on the destination choices of travellers. Conversely, long-haul destinations are more at risk than those depending largely on a local market. Furthermore, destinations that rely primarily upon their natural resource base to attract visitors, such as mountains and coasts, are likely to be more at risk than those that depend upon cultural or historical attractions.

Smith (1990) pointed out that vacation travel decisions are influenced by conditions at home as well as at potential holiday destinations. He suggested that in a warmer world, many winter vacations currently taken in Florida or Mexico by residents of the colder parts of the USA and Canada may become less compelling under the relatively large increment of winter warming projected for these latitudes.

The length of the season is also of crucial importance for private sector operators of tourism facilities. Capital is invested all year round but, for many activities and destinations, the operating period is limited and profits must be made in a short period of time. A few inclement weekends may tip the balance between profit and loss. Anything that influences the length of operating seasons, be they climatic factors or otherwise (such as the length and timing of school holidays), is likely to have an impact upon the viability of tourism businesses.

In addition to the relatively direct impacts of climate upon tourism, climate also impinges upon recreation in a less direct fashion. For example, an abundance of snow may make the skiing conditions very good but the journey to the slopes impossible. Conversely, recent observations in Alberta indicated that, although snowfall was

reduced, many skiers were attracted to the hills by the mild, sunny weather. On a longer time scale, climatic change will influence the distribution of vegetation types, wildlife, and fish species on which some forms of tourism depend. Much tourism takes place on or near the shoreline and the presence of water enhances many forms of tourism even if water contact is not required. Fluctuations in climate at meso and macro scales have implications for water levels and discharge, and influence amenity and property values. Hare (1985) pointed out that, at the low-water point of the mid-sixties in the Great Lakes, the water retreated hundreds of meters from some of the beaches and shores of Lake Huron. Furthermore, the volume of water has implications for water quality; in some locations, such as parts of the Mediterranean and the Great Lakes where beaches are closed periodically because of pollution, this is already marginal for body-contact recreations.

There are far-reaching consequences of weather and climate for tourism. However, it is extremely difficult to generalize the possible implications of climate change for tourism. It is difficult to think of almost any area of land or water that, with or without human modification or management, does not have potential to provide some recreation opportunities. The discussion will now turn to a consideration of what can be done to address the challenges.

Mitigation and Adaptation

Strategies to respond to global climate change are often considered under the headings of mitigation and adaptation (Task Force on Climate Adaptation, 1993). Mitigation refers to attempts to curtail the production of greenhouse gases and thereby to reduce the magnitude and speed of climate change. Adaptation accepts that climate change is likely to occur and attempts to identify steps that may be taken to restrict its adverse consequences and to take advantage of opportunities. Mitigation and adaptation should not be regarded as alternative strategies for they are interrelated and can occur at the same time.

In the early discussions of global climate change, there was reluctance to consider adaptation. As it was becoming increasingly recognized that climate change would have multiple consequences for human systems, the remedy was seen to be the reduction of greenhouse gases. Adaptation was seen as weakening the case for mitigation.

Increasingly, adaptation has become more widely recognized as a necessary strategy, in part because many believe that climate is already changing and adaptation will be required even if limitations are placed upon greenhouse gas production. Thus, mitigation and adaptation are now more frequently seen as being complementary rather than competitive strategies. It follows that tourism could be vulnerable to and will have to adjust to both climate change and to the mitigation strategies that are imposed to reduce greenhouse gas production.

Mitigation

Energy consumption in travel between origins and destinations is seen as the most important contribution of tourism to the rising concentrations of greenhouse gases. Temporary movement of people from temperate to tropical latitudes does have local implications for energy and water consumption but on-site recreational activities are usually viewed as being minor net contributors to the global production of greenhouse gases. However, the increased demands for energy and water and the generation of wastes may have far-reaching local consequences, particularly as tourists tend to make much larger demands than local residents for these scarce resources.

While trips are, by definition, discretionary activities for participants in most forms of tourism, they are certainly not discretionary for the businesses and communities that cater to tourists and depend upon their expenditures. Thus policies designed to curb travel may have considerable implications for destination areas. In the 1970s, when gasoline was in short supply in North America, the economies of tourist destination areas were adversely affected (Knapper, Gertler, and Wall, 1981). However, it was found that many urbanites elected to save their gasoline for recreation, there being more alternatives for modifying the journey to work than the journey to play in dispersed locations that were poorly served by public transportation. More recently, restrictions on mobility in the British countryside as a response to foot and mouth disease have demonstrated clearly that the economies of many rural areas depend as much on the production of leisure experiences as on agricultural products.

In summary, tourism and recreation are not usually viewed as major net generators of greenhouse gases, except perhaps in the travel phase, but policy initiatives taken to curb travel, perhaps through the pricing or rationing of gasoline, may have substantial implications for destination areas.

Adaptation

Adaptation involves adjustments to social and economic activities to enhance their viability and to reduce their vulnerability (Task Force on Climate Adaptation, 1993). Adaptation is a practical means of accommodating current climatic variability and extreme events as well as adjusting to longer-term climate change. Both natural and human systems are already adapted to an unknown extent to much of the variability in current climates. It is through changes in the magnitude and frequency of extreme events that the implications of climate change will most likely be imposed.

Three main groups can be considered with respect to the potential to adapt to climate change: the participants themselves; the businesses that cater to them; and the institutions that provide the context in which they operate.

1. Participants

By definition, tourism and recreational participation results from choices. Tourists have considerable choice concerning whether or not to participate, where to go, what activities to participate in, and when to travel. Since the product of tourism is an experience, participants may be able to substitute activities and locations without a great deal of loss in the quality of their recreation. Those wishing to observe or hunt particular species of plants and animals may find them less accessible or replaced by others, but, insofar as there are still wild spaces and provision of tourism and recreational opportunities, most potential participants will likely be able to satisfy their leisure needs.

2. Businesses

Participants' flexibility may be a problem for those catering to tourists' demands. Much recreational provision, be it a ski hill, a campground, a marina, or a national park, is fixed in location with sunk capital that cannot readily be liquidated and re-invested. If the quality of the recreational resources and associated experiences is degraded or if the length of operating seasons is curtailed below economic viability, then there may be considerable economic dislocations for recreational businesses and the communities on which they depend.

3. Institutions

Institutional decisions impinge on tourism. The timing of public holidays, school vacations, and hunting and fishing seasons, the dates of opening and closing of parks and other tourism attractions may all need to be modified in new climatic circumstances. For example, the increased length of summer may permit longer camping seasons in temperate latitudes provided conditions are not adversely affected by declining water levels or the reduced availability of water. However, if parks remain open longer, it is not known if more visits will be made or if they will be more widely spaced throughout the season. Also, enhanced economic benefits could have trade-offs in the form of increased environmental deterioration as the parks host more visitors for longer periods of time.

Case Studies

Two examples from the Great Lakes Region of North America provide some specific examples of climate-related risks and adjustments.

Great Lakes Skiing

Some of the earliest research to examine the impact of climate change on tourism was on the skiing industry in the Great Lakes region (Scott, Wall, and McBoyle, in press). McBoyle and Wall (1986), using the climate change scenarios available at the time, found that the ski season to the north of Lake Superior would be reduced by 30 to 40%. Skiing conditions would also be curtailed in south-central Ontario, resulting in the contraction or possible elimination of the ski season (40 to 100% reduction). Skiing in the Lower Laurentian Mountains of Quebec was projected to experience a 40 to 89% reduction in season length (McBoyle and Wall, 1992). Lamothe and Periard Consultants (1988) similarly projected that the number of skiable days would decline by 50 to 70% in southern Quebec. Comparable results were also projected for ski areas in the Great Lakes region of the United States.

An important limitation of these early studies on climate change and skiing in North America (and indeed the international literature) has been the omission of snowmaking as an adaptation strategy. In order to reduce their vulnerability to current climate variability, ski areas have made multi-million dollar investments in snowmaking technology and many now have complete snowmaking coverage of skiable terrain. Scott *et al.* (2002) were the first to examine snowmaking as an adaptation strategy. Using a range of climate change scenarios based on the Intergovernmental Panel on Climate Change's (IPCC) Special Report on Emission Scenarios (SRES), Scott *et al.* (2003) projected a 7 to 32% reduction in average ski season in the central Ontario study area, with current snowmaking capabilities and under doubled atmospheric CO₂ equivalent scenarios (~2050s). With improved snowmaking capabilities, modelled season losses were further moderated to between 1% and 21%. The findings clearly demonstrate the importance of snowmaking as an adaptation strategy.

Importantly, snowmaking requirements to minimize ski season losses in the study area were projected to increase 191 to 380% by the 2080s (Scott *et al.*, 2003). However, it should be recognized that while snowmaking is an effective adaptation strategy, it is not without associated challenges, for both capital and operating costs are substantial as are large water requirements. Thus, it may not be the inability to provide snow on ski hills, but the cost of making additional snow and the negative perceptions related to no-snow conditions in ski market areas that could cause adverse economic impacts within the Ontario ski industry.

Large corporate ski entities in the region like Intrawest and American Skiing Company may be less vulnerable to the impacts of climate change than single ski operations because they generally have more diversified business operations (real estate, warm-weather tourism resorts, and four-season activities), are better capitalized (so that they can make substantial investments in snowmaking systems), and, perhaps most importantly, are regionally diversified (which reduces their business risk to poor snow conditions in one location). Other possible adaptations include the extension of operations in mountainous areas to higher latitudes where snowfall may continue to be reliable, as has occurred in the European Alps, but this strategy has ecological consequences, particularly where operations are conducted above the treeline.

Marinas and Recreational Boating

Almost all forms of recreation are enhanced by the presence of water. Some, such as bathing and fishing, cannot be undertaken in the absence of water of appropriate quantity and quality. Other activities, such as hiking and camping, are often associated with shorelines and may be enhanced by the presence of water even if no direct contact with water is involved. Thus anything that impinges upon the quantity or quality of water is likely to affect outdoor recreation. Furthermore, if water is in short supply, recreation will increasingly compete with other uses of this scarce resource.

The Great Lakes constitute a dramatic example of the implications of fluctuating water levels, and hence climate variability, for recreational activities. The Great Lakes have long been a mecca for recreational boating and fishing, and their shores are the location of recreational facilities such as private cottages and public parks. The lakes are also used for water supply, navigation, and power generation, and the levels of the lakes fluctuate in response to climatic variations. Fluctuating water levels are required for the maintenance of ecological processes but some users, such as power generation and navigation, would prefer greater stability and relatively high levels, whereas others, such as cottagers, would prefer relatively stable lower levels. Marinas and recreational boating are harmed by extremes of both high and low water, particularly the latter, which is the most likely situation under global climate change.

Surveys of marina operators and recreational boaters on the Canadian side of the Great Lakes, undertaken in 1992, indicated that almost all had incurred costs at some time or other associated with fluctuating water levels (Bergmann-Baker, Brotton, and Wall, 1995). There are examples of marina operators experiencing low-water problems at times when they were still paying off loans acquired to build breakwaters to protect themselves from high water.

Boaters also accrue a variety of costs but they are more mobile than marina operators and, thus, can adjust more easily. However, they may be affected in other ways. For example, global warming may increase fish productivity if water quality is not adversely affected but some desirable cold-water species may decline and alien species may find it easier to colonize the lakes.

Research Needs

Tourism and recreation is an area that is data rich but information poor. A wealth of studies of tourism and recreation exists but most are site specific and few have addressed relationships with weather and climate. The output of the General Circulation Models is very difficult to use for site or even regional studies and usually does not include variables in a form pertinent to recreation. Climate varies over short distances and with height and aspect in mountainous regions—at scales which are important for recreation but beyond the resolution of existing models. In consequence, combining the available recreation and climatic information is difficult and,

where this has been done in modelling exercises, the assumptions that are involved probably invalidate the results (Mendelsohn and Markowski, 1999).

Greater spatial resolution, a greater variety of climate and climate-related variables, and a reduction in the uncertainty associated with climate scenarios generated from General Circulation Models are required if improved estimations of the likely implications of climate change for tourism and recreation are to be made. However, the improvement of such information is insufficient by itself to further such understanding. Complementary research strategies are required, such as investigation of the adaptation of participants and recreation businesses to existing climatic variability.

The wealth of existing data on current weather and climate is generally not well used by tourism and recreation operators at present. Much might be learned through the use of such data to assess current lengths of operating seasons, their temporal and spatial variability, and the associated economic viability of recreation businesses. Such studies would have considerable practical applications. One outcome of such analyses might be the more widespread acceptance of including climate change as one factor among others in assessments of recreation investment viability.

In order to make rational, objective decisions concerning responses to the vagaries of climate, the decision maker (in this case the tourist or the proprietor of a tourism enterprise) must have an explicit understanding of weather-activity relationships. The identification and measurement of the economic impact of weather variation is a key exercise in understanding climate-weather relationships. The economic assessment of weather hazards, or “*weather costing*”, is not only possible and practical, but it enables comparisons to be made between sites and greater efficiencies to be achieved (Taylor, 1970). However, weather costing has yet to achieve its full potential among recreation enterprises.

Climate is only one factor among many that influence tourism and recreation, thus assessing the relative importance of climate as compared to other variables for both different activities and different locations is important.

Since tourism involves, by definition, activities undertaken by choice, it is important to understand how alternative opportunities are evaluated by potential participants. If future choices are restricted by a modified climate, participants may be able to substitute one activity for another or one location for another. The assessment of the extent to which particular recreations and locations may be substitutes may thus be a fruitful area of research.

Assessment of the implications of climate change for natural area designation and management is an important research area now receiving attention, but which merits further examination (Wall, 1989; Staple and Wall, 1996; Scott and Suffling, 2000).

Other topics which are worthy of investigation include: assessment of the means by which recreational provision can be diversified to reduce vulnerability; evaluation of the role of extreme events in influencing recreational provision; and the role of land-use zoning, insurance, and other social adjustments in influencing recreational provision in high-energy locations such as shorelines and mountains.

Summary and Conclusions

This paper has made clear the implications of atmospheric processes, particularly climate change, for tourism and has suggested that the frequent mention of uncertainties be replaced by a greater concern with risk. The

vulnerability of tourism to climate change has been discussed briefly and the difficulty of generalizing across a multitude of locations and activities has been stressed. Mitigation and adaptation are distinct activities; however, both must be acknowledged and recognized as having implications for tourism. Case studies of skiing and marinas and recreational boating from the Great Lakes region have exemplified impacts and adaptation in response to climate variability. A variety of research needs and opportunities are evident. However, in the absence of comparative studies, it has not been possible to indicate whether tourism is more vulnerable than other economic sectors or has more or less potential to adapt. Similarly, it has been possible to outline vulnerabilities with respect to tourism activities and locations in only the most general way. The potential to address these vulnerabilities has been illustrated but the appropriate mix of mitigation and adaptation strategies required to address tourism vulnerabilities has yet to be ascertained.

Given the existing state of knowledge, it may be premature to make recommendations for policy but some pertinent observations can be made. Coastal areas appear to require careful attention given their susceptibility to changing water levels and their significance for tourism and recreation. Operators of ski areas in climatically marginal areas may need to upgrade their snowmaking equipment and diversify their activities—strategies that could pay dividends even in the absence of climate change. Summer activities in middle and high latitudes may benefit from extended seasons provided that coastal processes are not disrupted and water is not in short supply.

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