Chapter 7

Climate Change and Tourism and Recreation in North America: Exploring Regional Risks and Opportunities

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Introduction

The countries of North America are an important component of the global tourism industry. The United States and Canada were among the top ten nations for international tourist arrivals in 2001, ranking third (46 million) and eighth (20 million) respectively (World Tourism Organization, 2002). In terms of international tourism receipts, the United States led all countries generating US$112 billion while Canada ranked eighth (US$16.2 billion) (World Tourism Organization, 2002). Both countries also possess strong domestic tourism markets, several times greater than their international tourism markets. Combined domestic and international tourism spending in Canada reached C$54.6 billion in 2001 (Canadian Tourism Commission, 2002) and until the cross-border flows were interrupted by terrorism, the war in Iraq and SARS, was one of the fastest-growing industries in the nation. In 2001, combined tourism expenditures in the United States were US$559.6 billion (Travel Industry Association of America, 2003). Such statistics confirm the importance of the tourism sector to the North American economy.

Tourism in North America is as diverse as the communities and landscapes it occurs in, from the urban centres of New York and Las Vegas, to the beaches of the Florida Keys and ecotourism in the Arctic. As varied as is the tourism sector of North America, so too are the potential impacts of projected climate change (US National Assessment Team, 2000; IPCC, 2001). Consequently, it is beyond the scope of this chapter to provide a comprehensive assessment of the implications of climate change for the tourism industry in North America. Instead, the chapter will illustrate potential impacts of climate change on tourism in three regions of North America (Great Lakes, Rocky Mountains, Gulf of Mexico

Coast), chosen for the diverse characteristics of their tourism sectors and the varied nature of projected climate change impacts. Nature-based tourism is a very important component of North American tourism and because tourism regions that rely on their natural resource base to attract visitors are likely to be more at risk than those that depend on cultural or historical attractions (Wall, 1992), particular emphasis will be placed on this dimension of North American tourism.

Great Lakes Region

Some of the earliest research to examine the impact of climate change on tourism was on the skiing industry in the Great Lakes region. McBoyle *et al.* (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 & 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. For example, Lipski and McBoyle (1991) estimated that Michigan's ski season would be reduced by 30 to 100%.

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 a climate adaptation strategy. In order to reduce their vulnerability to current climate variability, ski areas in eastern Canada and the Midwest, Northeast and Southeast regions of the US have made multimillion dollar investments in snowmaking technology and many now have 100% snowmaking coverage of skiable terrain. Scott *et al.* (2002) were the first study 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) found that with current snowmaking capabilities, doubled-atmospheric CO_2 equivalent scenarios (relating to the 2050s) projected a 7% to 32% reduction in average ski season in the central Ontario study area. With improved snowmaking capabilities, modelled season losses were further moderated to between 1% and 21%. The findings clearly demonstrate the importance of snowmaking, as the vulnerability of the ski industry was reduced relative to previous studies that projected a 40% to 100% loss of the ski season in the same study area under doubled-CO_2 conditions (McBoyle & Wall, 1992). Similar reassessments of widely cited

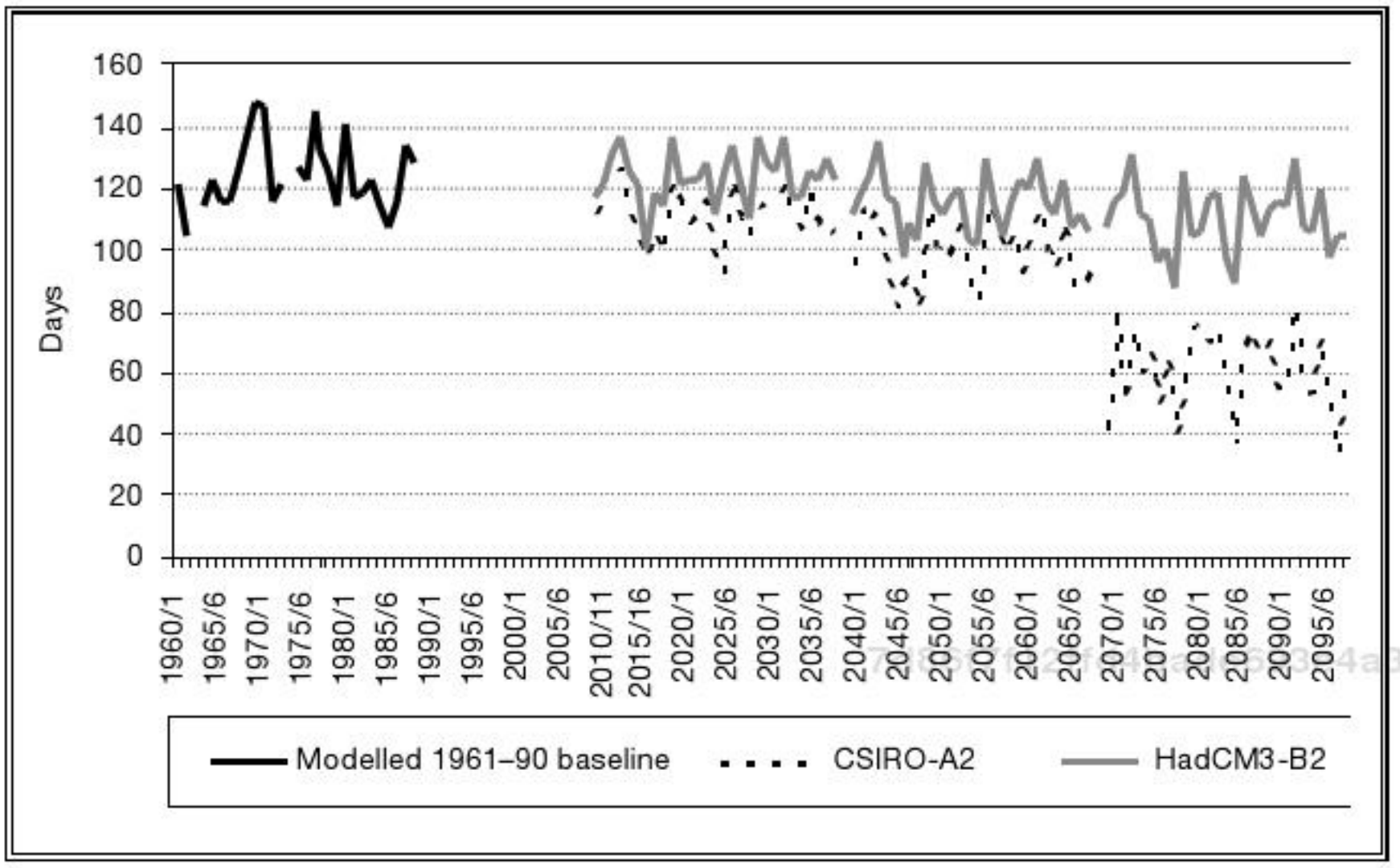

Figure 7.1 Modelled ski season length at Horseshoe Resort (south-central Ontario, Canada)

earlier climate change studies on the Quebec ski industry and other areas of North America are required.

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 and there are large water requirements. The additional snowmaking requirements and greater energy required to make snow in warmer than average temperatures would be an important cost increase that could affect the profitability of some ski areas. 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 tourism industry. Large corporate ski entities in the region such as 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 important components of winter tourism in North America have been overlooked by climate change impact assessments. The International Snowmobile Association (2003) has estimated the annual economic value of the North American snowmobile industry at over US$10 billion and, in some regions, it exceeds the economic importance of skiing. Notably, climate change was not considered in Canada's recent National Snowmobiling Tourism Plan (Pannell Kerr Forster, 2001), despite the potentially important implications for the sustainability of snowmobile-based tourism in the plan's long-term time-frame (starting in 2008).

In the only study that has examined the implications of climate change for snowmobiling, Scott *et al*. (2002) found that snowmobiling was more vulnerable to climate change than alpine skiing because of its greater reliance on natural snowfall. Snowmaking has very limited application in snowmobiling and Nordic skiing because of the technical and economic barriers associated with producing snow over tens or hundreds of kilometres of trail. When the climate change impact scenarios for seven snowmobiling areas in south-central Ontario were compared, the average projected reduction in season length was substantial (29% to 49%) as early as the 2020s. The average snowmobiling season was projected to decline by approximately 50% at most locations by the 2050s, with further average season reductions of between 70% and 79% by the 2080s. Similar assessments are required in other regions of Canada and the United States where snowmobiling is a key component of winter tourism.

Winter festivals in the Great Lakes region have experienced problems over the past few winters due to lack of snow and warmer than normal temperatures. The Canadian Ice Fishing Championship was cancelled in 2002 because of the lack of lake ice on Lake Simcoe (Ontario), while some winter festivals in the states of Minnesota and Wisconsin had to cancel events due to dangerous ice conditions and a lack of snow in early 2003. Snow and ice cover scenarios in the Midwest and New England regions of the United States (US National Assessment Team, 2000) indicate that both snow and ice cover will decline and become more variable under climate change, putting community winter festivals at even greater risk in the future.

Implications of climate change are not confined to the winter season. The Great Lakes have long been a Mecca for recreational boating and fishing, and with the longest freshwater beaches in the world, are the location of recreational facilities such as cottages and parks. The Great Lakes constitute a dramatic example of the implications of fluctuating water levels and, hence, climate variability, for recreational activities. Marinas and recreational boating are harmed by extremes of both high and low water, particularly the latter, which according to Mortsch *et al*. (2000) is projected under most climate change scenarios. Surveys undertaken in 1992 of marina operators and recreational boaters on the

Canadian side of the Great Lakes indicated that almost all had incurred costs at some time or other associated with fluctuating water levels (Bergmann-Baker *et al.*, 1995). Since they had been operating their marinas (approximately one-third had been a marina operator for less than five years although most marinas were considerably older), in times of low water, 67% of respondents had experienced problems of access to docks or berths, with inadequate channel depths or had ramp access difficulties, and smaller proportions were forced to use fewer slips, experienced short boating seasons or had dry rot in wooden structures. In response to these problems, 55% had dredged, 45% had adjusted their docks, 44% restricted the sizes of boats, 44% had to relocate boats, 27% closed slips, 19% constructed floating docks, and 7% replaced rotted structures. Unfortunately, it is not possible to put a precise dollar value on these adjustments but clearly it has been substantial. In addition, other adjustments were made in periods of high water. In fact, there are examples of marina operators experiencing low water problems at times when they are still paying off loans acquired to build breakwaters to protect themselves from high water. A similar survey of cottage owners along the shores of the Great Lakes (Scott, 1993) found that water levels projected by two climate change scenarios were substantially lower than those preferred by cottagers, particularly on Lakes Huron, Erie and Ontario. Boaters also accrue a variety of costs (most commonly hull and propeller damage) but they are more mobile than marina operators and, thus, can adapt more easily by using alternative boat launch facilities and travelling to other bodies of water.

Below average water levels on the Great Lakes during the summers of 1999–2002 once again revealed the sensitivity of marinas and the recreational boating industry to climate variability. Water levels on Lakes Huron and Michigan that were approximately one metre below the long-term average brought about the creation of a C$15 million Great Lakes Water-Level Emergency Response Programme by the government of Canada to assist marinas with emergency dredging costs.

Lower than average water levels on the Great Lakes also have implications for the character of shoreline ecosystems and their tourism potential. Studies of altered Great Lake shorelines under climate change scenarios (Lee *et al.*, 1996; Schwartz *et al.*, 2004) reveal the vulnerability of some key wetland complexes that are important waterfowl habitat and a source of recreation for many people. For example, in naturally confined marshes such as Point Pelee National Park, lowered lake levels will cause the marsh to revert to marsh meadow and, eventually, to dry land. Because of the protective sand spits, the marsh will be prevented from moving lakewards and vegetation will shift from hydric to mesic conditions (Wall, 1998). Some plant species may change growth form to accommodate to drier conditions but vegetation will change dramatically

as species intolerant of drying die and are replaced by species emerging from buried seeds. The trees, which mark the landward edge of the marsh, may advance due to a lowering of the flood line. Wetland species diversity will decline and the suitability of the marshes as a habitat for recreationally and commercially valued species, such as migrating waterfowl and muskrats, will be reduced. Sport fishing may also be affected by the reduced quality of shoreline marshes where fish feed and spawn. In time, the marsh may lose its wetland character and, under extreme conditions, key bird migration routes may change, diminishing the quality of North America's sixth ranked birdwatching site (by annual visitation and economic impact) (American Birding Association, 2003).

The multi-billion dollar freshwater sport fishery of North America and the associated tourism market (estimated at over US$11 billion) (American Sportfishing Association, 2001) would also be impacted by climate change. A number of cold-water fish species are particularly sought by anglers. Studies of the potential impact of changes in water temperatures for selected cold-water species have projected negative impacts throughout the United States, including the lower Great Lakes. A study by the US Environmental Protection Agency (US EPA) (1995) projected substantial losses (50%–100%) in cold-water fish habitat in the Great Lakes states. Tourists that are attracted to this region for cold-water species may have to travel to other regions, such as northern Ontario, Quebec or New Brunswick, where these preferred species may still be available or more prolific. This situation is further complications by the proliferation of non-native warm-water species in the region. Notably, the US EPA (1995) study estimated annual economic damages to the sport fishing industry in the United States as a whole at US$320 million in the 2050s. This study also found that when alternative modelling assumptions were used, the estimated damages increased substantially, suggesting the need for further research to narrow the range of uncertainty.

Rocky Mountain Region

The natural environment is very important in determining the attractiveness of a region for tourism and the scenic landscapes and parks of the Rocky Mountain region are internationally renowned tourism destinations. A study of the nature-based tourism market (HLA Consultants & ARA Consulting Group Inc., 1995) found that the natural setting was the most critical factor in the determination of a quality tourism product. Consequently, if climate change adversely affects the natural setting of mountain destinations (the loss of glaciers, special flora or fauna, increased fire and disease impacted forest landscapes) the quality of the tourism product could be diminished with implications for visitation and local economies.

A number of studies has examined the potential biophysical impacts of climate change on mountain environments in North America and provide insight into the implications for tourism. Vegetation modelling suggests that the Rocky Mountain region experience both latitudinal and elevational ecotone changes, with the potential for species reorganizations and implications for biodiversity. The upslope migration of the tree line has already been documented in Jasper National Park (Alberta, Canada). Similar impacts are expected in Yellowstone National Park (Wyoming, USA), where vegetation modelling results project that the range of high-elevation species will decrease, some tree species will be regionally extirpated, and new vegetation communities with no current analogue will emerge through the combination of existing species and non-native species (Bartlein *et al.*, 1997). Vegetation modelling in Glacier National Park (Montana, USA) projected a 20m per decade upslope advance of forest through 2050, with considerable spatial variation determined by soil conditions and aspect (Hall & Farge, 2003). A study of mammal populations in the isolated mountain tops of the Great Basin in the western United States, projected that regional average warming of 3°C would cause a loss of 9% to 62% of species inhabiting each mountain range and the extinction of 3 to 14 mammal species in the region (McDonald & Brown, 1992).

Like glaciers around the world, those in western North America have been retreating over the past century. Glacier National Park (Montana, USA), which early visitors referred to as the 'little Switzerland of America', has lost 115 of its 150 glaciers over the past century and scientists estimate the remaining 35 glaciers will disappear over the next 30 years (Hall & Farge, 2003). Similar projections have been made for glaciers in Canada's Rocky Mountain parks (Brugman *et al.*, 1997). The loss of glaciers has a direct impact on tourism operations such as Snowcoach Tours in Jasper National Park (Alberta, Canada), which currently provides glacier tours to over 600,000 visitors annually. The loss of Glacier National Park's namesake would be a significant heritage loss, but could serve an important educational role to inform visitors how the landscape the park was established to protect has changed in only 100 years. Scott and Suffling (2000) suggested that the indirect impact of the loss of natural beauty associated with glacial landscapes for tourism also remains an important uncertainty.

The drought and wildfires in the state of Colorado and province of British Columbia during the summers of 2002 and 2003 may provide an important analogue of the potential impacts of climate change in the mountainous regions of western North America, as several studies have projected increases in wildfire severity and frequency in large areas of western Canada and the United States (Stocks *et al.*, 1998). The statewide drought in Colorado created dangerous wildfire conditions and the park

closures and media coverage of major fires in some parts of the state had a significant impact on summer tourism. Visitor numbers declined by 40% in some areas of the state and reservations at state campgrounds dropped 30%. The Colorado drought also affected fishing and river-rafting tourism in the state. Anglers were restricted from fishing in many state rivers because fish populations were highly stressed by low water levels and warmer water temperatures. Low water levels also shortened the river-rafting season substantially. Some outfitter companies lost 40% of their normal business and statewide economic losses exceeded US$50 million.

Drought and wildfires also affected the tourism industry in the province of British Columbia in the summer of 2003. Several parks had to be closed at various times during the peak tourism season due to extreme fire hazard conditions. The Kettle Valley Mountain Railway trail, a national historic site that attracts over 50,000 tourists annually, lost five of its wooden trestle bridges to the fires. The estimated cost to restore the bridges is C$30 million. The net impact of the fires for tourism in British Columbia has yet to be determined.

Many of the most popular parks in Canada and the United States are located in western mountain ranges and projected climate change has the potential to extend the park visitation season. An assessment of the implications of climate change for seasonal park visitation in Rocky Mountain National Park (Colorado) projected increased annual visitation of 6.8% to 13.6% (Richardson & Loomis, 2003). Subsequent economic analysis indicated that this increased visitation would generate a 6% to 10% increase in local economic output and 7% to 13% increase in local jobs. Similar or even greater opportunities for increased visitation are anticipated in most of the parks in western Canada and the Northwest US, as the visitor seasons are currently equally climate limited throughout this region. Changes in visitor numbers and seasonal visitation patterns are important for park revenues and the economies of nearby communities, but also have ecological implications. Visitor numbers and related tourism infrastructure were identified by Parks Canada as a significant ecological stressor in 24 of Canada's 38 National Parks and increased visitation has the potential to heighten visitor pressures in certain parks.

The Rocky Mountains are home to some of North America's best-known ski resorts and are an international winter tourism destination. Although snow cover modelling in the mountains of Northwestern United States projected a 75cm to 125cm reduction in average winter snow depth under two climate change scenarios and an estimated upward shift in the snow line from 900masl (metres above sea level) to 1250masl (US National Assessment Team, 2000), the implications for major ski areas in the region have not yet been examined.

Gulf of Mexico Coastal Region

Coastal zones are among the most highly valued recreational areas and are primary tourist destinations. The economy of many coastal communities in this region is dominated by the exploitation of sea, sun and sand for recreation. Climate change has important implications for this region both through the redistribution of climate resources for tourism and sea level rise.

One of the most direct impacts of projected climate change on tourism will be the redistribution of climatic assets among tourism regions, with subsequent implications for tourism seasonality, tourism demand and travel patterns. Changes in the length and quality of tourism seasons would have considerable implications for the long-term profitability of tourism enterprises and competitive relationships between destinations, particularly those where climate is the principal tourism resource like the 'winter getaway' holiday destinations of the United States Sunbelt and the Caribbean.

Using a tourism climate index (TCI) as a standardized metric to assess climate conditions for tourism, Scott *et al*. (2004) investigated change in the spatial and temporal distribution of the climate resource for tourism in North America under two climate change scenarios. Analysis of the number of cities with 'excellent' or 'ideal' TCI ratings (TCI > 80) in the month of January as illustrative of the winter getaway holiday season (Figure 7.2), revealed that the number of cities in the United States increased from two in the baseline period (1961–90) to four or seven in the 2050s and seven or nine in the 2080s. The implication is that southern Florida and Arizona would face increasing competition for 'winter getaway' travellers and the 'snowbird' market (retirees from Canada and the northern US states who spend two to six months in winter peak and optimal climate destinations). In contrast, the number of Mexican cities with TCI ratings of 80 or greater decreased from six to four and one in the 2080s, suggesting that Mexico could become less competitive as a winter getaway destination.

While travellers would have greater choice of 'winter getaway' destinations in the Gulf of Mexico coastal region, with shorter and less severe winters, they may be less compelled to travel to warm-weather destinations as a winter escape. In addition, if, as Last (1993) suggests, cultural attitudes toward sunbathing shift in response to increased risk from UV radiation associated with ozone depletion and ongoing health education campaigns, 'winter getaway' destinations may be competing for a diminished travel market.

An important consequence of global climate change is sea level rise. In the Gulf of Mexico region, the mid-range estimate for sea level rise is 50cm by 2100 (IPCC, 2001). This projected rise in sea level is a threat

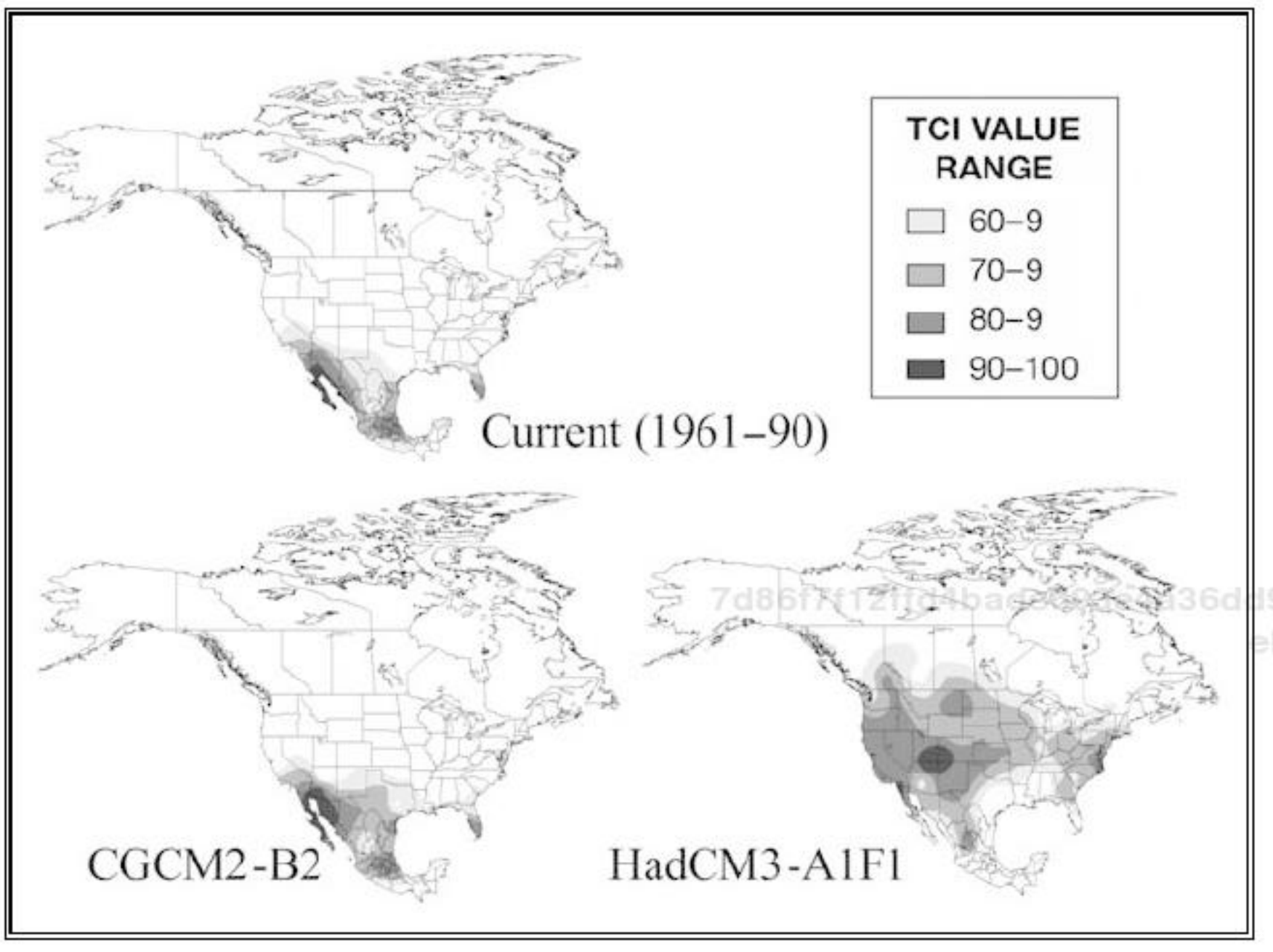

Figure 7.2 Projected changes in tourism climate index ratings in January

to coastal tourism infrastructure from south Florida to Texas, but is a particularly serious problem in the low-lying beaches and wetlands of the Florida Everglades and the compacting (and thus subsiding) sediments of the Mississippi River Delta in Louisiana.

The health of south Florida's tourism industry is strongly dependent on the region's beaches. Extensive investments have been made to extend and renourish highly valued recreational beaches in the past. Sea level rise in beach areas backed by sea walls or other development that precludes landward migration, would lead to the loss of beach area through inundation or erosion and pose an increased threat to the recreation infrastructure concentrated along the coast (sea-front resorts, marinas, piers). The US EPA (1999) reported that a 60cm sea level rise would erode beaches in parts of south Florida 30m to 60m unless beach nourishment efforts were expanded. The cumulative cost of sand replenishment to protect Florida's coast from a 50cm rise in sea level by 2100 is estimated at US$1.7 to $8.8 billion (US EPA, 2003). A study of beach nourishment as an adaptation strategy to preserve major recreational beaches throughout the United States estimated the cost at US$14.5 billion for a 50cm sea level rise and US$26.7 billion for a one metre sea level rise (Leatherman quoted in Smith & Tirpak, 1990).

Sea level rise would also exacerbate the impact of major storms on the Florida tourism industry. The US EPA (1999) indicated that the ten–day closure and clean-up period from Hurricane Georges (September 1998) resulted in tourism revenue losses of approximately US$32 million in the Florida Keys region. A similar ten–day closure in the Miami Beach area would cause losses of approximately US$44 million. The Federal Emergency Management Agency in the United States estimated that a storm of similar strength, imposed on a 30cm sea level rise, would cause 35% to 60% more damage, extending the clean-up period and related tourism losses.

New Orleans is a major tourism destination in the region that is severely threatened by sea level rise. The city is, on average, already 2.4m below sea level and, with the current rate of subsidence and a 50cm sea level rise, most of New Orleans and vicinity would be 3.2m to 3.8m below sea level by 2100 (Burkett, 2001). The estimated cost of protecting the city over the next 50 years alone is US$14 billion.

The insurance implications of increased risk to tourism infrastructure from tropical storms and associated flooding in the region are also an important consideration. Munich Re and other large insurance companies have determined that worldwide economic losses due to natural disasters have been doubling every ten years over the past three decades (IPCC, 2001). Although the trend in insured losses has not increased as dramatically as economic losses, it has increased almost tenfold between 1975 and 2000. The implication of the significant increase in insured losses for insurance premiums is obvious. As Scott (2003) has discussed, the insurance costs for tourism infrastructure or business interruption in high-risk areas like hurricane prone coastlines could increase substantially if the above trends continue. In some regions, insurance coverage may no longer even be available, exacerbating the impacts of climatic extreme events and restricting new tourism investment in high-risk regions. Climate change risk is beginning to be considered in credit assessments and investment valuation. Innovest Strategic Value Advisors (2003) noted that Hypovereinsbank includes climate change in the general environmental risk audit of its credit risk assessment and Credit Suisse now considers climate change in the financial assessments of projects.

The ecological impacts of sea level rise on wetlands and coral reefs in the region also have significant implications for sport fishing and diving-related tourism. Sea level rise could become a major cause of wetland loss throughout the coastal zone of the region. Coastal wetlands in Louisiana are currently converting to open water at a rate of 80 square kilometres a year and a 30cm to 90cm increase in sea level is projected to submerge at least 70% of Louisiana's remaining salt marshes (US EPA, 2003). Even freshwater marshes located far inland may convert to

brackish or salt marsh. Similarly, large areas of the Florida Everglades are projected to be inundated as a result of a 50cm sea level rise (US National Assessment Team, 2000).

The reefs of the Florida Keys support a large diving and fishing industry. These activities generated an estimated US$4.4 billion in tourism revenues in a four-county area of south Florida in 2000–1 (Johns *et al.*, 2001). Like reef systems around the world, the reefs across this region have been under considerable human-induced stress (overfishing, pollution). Coral reefs across the Caribbean have suffered an 80% decline in cover over the past 30 years (Gardner *et al.*, 2003). Recent coral bleaching events caused by high water temperatures and scenarios for future water temperatures in the region portend an imperiled future for coral reefs and related tourism.

Conclusion

This chapter has examined how the impacts of climate change could affect the sustainability of the tourism industry in three regions of North America during the 21st century. Although the examples of potential climate change impacts discuss are no means exhaustive (see also Wall, 1992, 1998; Scott, 2003), it is clear from the above discussion that climate change has far-reaching consequences for North American tourism. Future climates will influence the viability of alternative types of tourism, providing challenges and threats to some destination areas and enhanced opportunities for others. 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, the capacity of the tourism industry itself to adapt to climate change, and how the impacts of climate change interact with other long-term influencing variables in the tourism sector (globalization and economic fluctuations, fuel prices, ageing 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, and so on).

The critical uncertainties regarding the magnitude of projected climate change, the subsequent environmental impacts, and how these environmental changes will affect different segments of the tourism marketplace and alter the competitive relationship between tourism destinations, precludes any definitive statement regarding the net impact of climate change on the North American tourism sector at this time.

Research to understand the implications of global climate change for the tourism sector is still in its infancy. The development of a strategic research agenda is required to assess the implications of climate change

for North American tourism and to target the key informational needs of tourism decision makers (both in government and business). In particular, adaptation is not a well-developed theme in the research on climate change and tourism and, because it is critical to understanding the vulnerability of tourism to climate change, requires greater attention in the future. As Wall and Badke (1994) indicated, almost none of the research on climate change and tourism has been done by tourism experts. Consequently, increased collaboration between climate change scientists, government tourism officials and the tourism industry should be paramount in the development of such a research programme.

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Chapter 8

Nature Tourism and Climatic Change in Southern Africa

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Introduction

Tourism in southern Africa features as one of the economic activities engaged in the complex manoeuvring towards a sustainable future. Among the various kinds of tourism available in the region there is continuing demand for the array of spectacular and varied landforms and landscapes as well as for the immensely diverse and largely endemic flora and fauna. It is not surprising, therefore, that governments and the tourist supply sector perceive nature tourism to be an important contributor to regional prospects for continuous, durable, self-generating and ecologically tolerable wealth creation. The purpose of this chapter is to consider these perceptions in the light of possible modifications to ecosystems caused by changes in regional climate. The impacts of such changes on nature tourism are discussed with respect to selected well-known and much frequented national parks and conservation areas.

There are two reasons for choosing large parks to assess the effects of climatic change. First, wildlife in most parks will have to adapt or die as fences and a whole range of other land transformations and activities associated with human habitation restrict migration from them. From this it could be argued that the larger the spatial extent and/or altitudinal range of a park, the greater is the probability of species adaptation to change. The implication then is that if parks are large and well managed they may remain sufficiently ecologically viable to merit their continued conservation status despite changing climates. Second, there is consensus that the trend towards warmer conditions evident over the past century will continue (Joubert & Kohler, 1996; Hulme *et al.*, 2001; Midgley *et al.*, 2001). The climate change predictions are less confident about rainfall changes although there is increasing agreement that large parts of southern Africa may become drier (Joubert, 1997; Hulme *et al.*, 2001; Midgley *et al.*, 2001). However, even if this trend did not materialize, rising temperatures would increase evapotranspiration rates