Chapter 1

TOURISM AND CLIMATE CHANGE
Interrelationships and Implications

Christian Schott
Andy Reisinger
Taciano L. Milfont
Victoria University of Wellington, New Zealand

Abridgement: This chapter contextualizes the interrelationships between tourism and climate change and thus provides an introduction to this volume. It commences with a brief but comprehensive overview of the key issues identified by climate change research, including an update since the 2007 report by the Intergovernmental Panel on Climate Change as well as a brief discussion of the latest rounds of climate change negotiations. The pursuing discussion is informed by these points and explores climate change's indirect and induced impacts on tourism and possible ramifications. Both of these parts highlight behavioral change as a critical factor to both adaptation and mitigation motivating the psychological contribution in an effort to shed light on the obstacles to behavioral change. In concluding, the chapter syntheses the discussion grounded in multiple disciplines into a set of research themes which the volume subsequently begins to address.
Keywords: behavioral change, climate change science, indirect impacts, multidisciplinary research, psychology.

INTRODUCTION

As the body of literature on climate change and its multifaceted implications grows, it is increasingly evident that the climate change challenge appears to be a version of Harding's "tragedy of the commons" (1968). Tourism is a sector reliant on activities taking place in this public domain. Complex economic and commercial imperatives confront environmental, social, and cultural ideals, with only the varying strengths of regulatory frameworks for protection. This complexity places tourism operators in a challenging environment, particularly since stated preferences by tourists about the environmental or social sustainability of their activities do not always match their actual preferences as revealed by their spending priorities. This chapter will explore and synthesize some key imperatives for and obstacles to action on climate change in the tourism industry. While many of the imperatives come from the field of natural science that deals with climate change projections and their impacts, most of the obstacles have their roots in human behavior and decisionmaking within complex systems. Psychology has a major contribution to offer to further the understanding of those obstacles, and by implication the measures required to negotiate them. However, this valuable perspective is currently virtually ignored in the tourism literature on this topic.

This chapter will first provide a brief overview of the current state of climate change research to emphasize the scale of the issue and the severity of the likely impacts (editor's note: for a more detailed review of current climate change science see Chapter 2 by Rodriguez-Camino). Next it discusses how some of the key climate change impacts and mitigation options may affect and interrelate with tourism. This section seeks to explore some of the indirect and induced interrelationships between climate change and tourism that have thus far not been examined in any depth (editor's note: for a summary of the key direct interrelationships between tourism and climate change see Chapter 3 by Cabrini). Both of these sections emphasize the need for more action and highlight the crucial role of developing a better understanding of the barriers to action and their roots. Among the many disciplines that could widen and deepen our understanding of these barriers, and illuminate options for overcoming them, the chapter highlights insights from human psychology to facilitate the use of these insights in further research into the complex interrelationships between tourism and climate change. The chapter closes by calling for more transdisciplinary work to be conducted and by synthesizing the issues raised in the chapter into research themes which are informed, where appropriate, by the multidisciplinary nature of the challenge.

Global Challenge and Current State of Knowledge

Climate change is now widely recognized as one of the defining challenges of the 21st century (Brown 2007; Rudd 2007; Ban 2008). This is due to the additional pressures that climate change will exert on already stressed natural resources and increasing natural hazards in many regions, and the attendant need to rapidly reduce greenhouse gas (GHG), which in turn will limit the rate and magnitude of further warming. The latter requirement will create its own economic, environmental, cultural, and social challenges for virtually all countries and economic sectors due to the scale and urgency of this issue. The most recent comprehensive summary of current knowledge on climate change is provided in the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC). Released in four volumes in 2007, this report covers the scientific basis of climate change including future projections (IPCC 2007a), an assessment of the potential impacts of climate change, the vulnerability of sectors and regions to those impacts as well as their potential to adapt (IPCC 2007b), and the potential technological options, costs and policies to reduce net GHG emissions from human activities (IPCC 2007c). The fourth volume is a Synthesis Report that summarizes and integrates the key findings from the first three volumes (IPCC 2007d).

The Fourth Assessment Report makes a compelling case, based on a comprehensive assessment of thousands of scientific articles from the peer-reviewed literature, stating that it is very likely that most of the warming over the past 50 years has been due to the emission of GHG from human activities, and that in the case of continued GHG emissions at or above current levels further warming and other climatic changes over the 21st century are very likely to be greater than changes already observed during the 20th century. Additional future changes depend on the amount of further GHG emissions. But even for scenarios that include very rapid emissions reductions, additional warming of at least 2°C above pre-industrial levels now appears all but unavoidable due to the build-up of GHG concentrations already in the atmosphere. If no major steps to reduce emissions are taken, warming by 2100 could range between about 2.5 and more than 6°C relative to pre-industrial levels, with attendant changes in rainfall patterns, rising sea level, and increasing intensity of tropical cyclones (IPCC 2007d). Impacts of those changes on natural and human systems are expected to be wide ranging, including impacts on water security, ecosystems, food production, coastal regions, and human settlements and health. The capacity to adapt to these changes is unevenly distributed across the world and within societies, with the poorest and those already under stress from non-climate pressures least able to cope with additional climate change-related stresses. Climate change is thus thought to make it more difficult in some regions to achieve and retain Millennium Development Goals, particularly those related to the eradication of poverty and hunger, environmental sustainability, and health (UN 2000).

In contrast, some regions and sectors could also benefit from modest amounts of warming. Examples of this include agriculture in some mid- and many high latitude regions that are expected to experience beneficial conditions, the health sector in regions which currently experience significant incidences of winter illnesses, as well as some Northern and Southern Hemisphere regions due to a potential poleward shift of tourist flows in search of pleasant 'summer holidays'. Overall, however, the latitudinal gradient implicit in many of these "positive" impacts would result in increasing inequity of the global distribution of natural resources and exposure to hazards (IPCC 2007b). The disparity in cereal production between developed and developing countries presents a case in point as it is expected to increase as a result of climate change, even when factoring in climate change adaptation at the farm-level (Easterling, Aggarwal, Batima et al 2007; Rosenzweig and Parry 1994). Similarly, many developing countries that rely heavily on tourism for foreign income could experience the most detrimental impacts on the industry from climate change (Perch-Nielsen 2010). Rising sea levels and the deteriorating health of coral reefs associated with increasing sea surface temperatures are already making a noticeable impact on small tourism dependent island nations such as the Maldives in the Indian Ocean and Kiribati in the Pacific (Secretariat of the Pacific Regional Environment Program 2010). In both countries the coral reefs and coastal zones, now under threat, constitute one of the main attractions on those islands.

The costs of adapting to climate change are difficult to estimate. A variety of recent reports estimated funding required in the range of US$10-100 billion per annum before 2020 (for a summary see Mueller 2008), but these figures could still underestimate the true costs due to the "adaptation deficit" that is accumulating in countries already struggling to integrate projected climate trends and variability in their current infrastructure developments and planning (Parry, Arnell, Berry et al 2009). But even with improved adaptation efforts, unmitigated climate change is likely to eventually exceed adaptive capacity in many sectors and regions; and some systems such as largescale ecosystems are unlikely to be able to adapt to even moderate changes (IPCC 2007b, 2007d).

In light of these concerns, more than 130 countries now agree that climate policies should aim to limit global warming to 2°C relative to preindustrial conditions (Meinshausen, Meinshausen, Hare et al 2009). Such a level of warming would not avoid all impacts and substantial adaptation to the unavoidable changes would still be necessary, but it would reduce the risk of large-scale impacts

for many sectors and regions. Sea levels in particular would continue to rise for many centuries, even if warming were limited to 2°C, potentially reaching more than 1m due to thermal expansion of the oceans alone, with additional contributions from melting glaciers, ice caps, and the polar ice sheets (IPCC 2007d). Given that the world has already warmed by about 0.5°C between pre-industrial times and 1980-1999, limiting warming to 2°C above pre-industrial levels would require global Carbon Dioxide equivalent (CO_2-e) GHG emissions to peak before 2020 and decline to about 50% of 1990 emissions levels by the year 2050 (IPCC 2007c). Net carbon dioxide emissions would need to reduce to near zero by the end of the 21st century if the warming of the global climate system is to be halted, let alone reversed, given the very long lifetime of this GHG in the atmosphere (IPCC 2007c; Moss, Edmonds, Hibbard et al 2010; Solomon, Plattner, Knutti, Friedlingstein 2009; van Vuuren, Meinshausen, Plattner et al 2008).

The economic potential to achieve rapid emissions reductions exists and could be realized by a portfolio of climate policies and technologies across the energy, transport, building, agriculture, forestry, and waste sectors. Tourism is not specified in the IPCC assessment but instead represented in numerous core sectors with the greatest GHG relevance in the building sector (mainly through energy efficiency, but also use of local renewable energy sources such as solar hot water heating) and transport. However, other sectors are also heavily linked to tourism through co-benefits of emissions reductions. These include habitat restoration resulting from mitigation actions in the forestry and agriculture sectors which would also benefit nature-based forms of tourism such as ecotourism, as well as benefits from green branding and ecolabeling related to actions in the waste and energy efficiency sectors.

No single technology will be able to achieve significant emissions reductions on its own, but existing technologies, if supported by adequate policies to overcome a variety of barriers, could limit global GHG emissions below year 2000 levels by the year 2030 at a price of carbon of up to US$100/t$CO_2$-equivalent (IPCC 2007c). Further technology development and diffusion would lower costs and enable deeper emissions reductions beyond 2030 to allow eventual stabilization of GHG concentrations by the end of the 21st century (IPCC 2007c). Examples in the energy sector include the development of advanced renewable energy sources such as solar and wave power and the widespread deployment of carbon capture and storage technologies in combination with bioenergy. Further reductions in energy demand through advanced housing design and more compact urban form are also key tools in reducing emissions, as is the development of less carbon-intensive forms of transport through hybrid and electric vehicles and second-generation biofuels. Reducing the rate of deforestation particularly in tropical regions would also make a significant contribution to overall emissions reductions and reduce mitigation costs in other sectors (IPCC 2007c).

Apart from technological advances, the IPCC importantly mentioned that behavioral changes and management choices can also contribute to GHG emissions reductions (IPCC, 2007c, Summary for Policymakers). However, behavioral responses to date have had a negligible impact on long-term emissions trends. This suggests that a far more sophisticated understanding of the drivers of human behavior, including their responses to different types of policy interventions, is needed if behavioral change and management choices are to be incorporated into climate change mitigation strategies (discussed below). Moreover, implementing policies to achieve technological and behavioral change requires significant political will and would create winners and losers within societies, and could result in significant wealth transfers between countries depending on how regional and country-specific emissions targets are set. This is reflected in the wide range of alternative proposals and their varying ethical foundations that have been advanced to allocate emissions targets to different countries and country groups (Gupta, Tirpak, Burger et al 2007; Höhne and Moltmann 2008).

A Brief Update on Recent Scientific Findings

The IPCC assessment reviewed above provides a snapshot of knowledge up to the year 2007. More recent publications have contributed additional weight to some areas of research. Perhaps the most important area concerns the potential rate and magnitude of future sea level rise. The IPCC provided projections for sea level rises of 18cm to 59cm by 2090 (relative to average sea level in 1980-1999), but warned that these model based projections did not consider the possible acceleration of the loss of polar ice. Accelerated flow of glaciers that drain the polar ice sheets have been observed in both Greenland and West Antarctica (Alley, Fahnestock and Joughin 2008; Das, Joughin, Behn et al 2008; Joughin, Das, King et al 2008; Nick, Vieli, Howat and Joughin 2009; Rignot, Koppes and Velicogna 2010; Stearns, Smith and Hamilton 2008; Velicogna 2009), but are not captured by current ice sheet models. As a result, the range given in the IPCC assessment should be regarded as lower bound rather than best estimate of future changes (IPCC 2007a). Based on different lines of evidence, a raft of more recent studies now suggest that sea levels could rise anywhere between 0.5m and 1.5m by 2100, but even a rise as high as 2m cannot be ruled out entirely (for summaries see Allison, Bindoff, Bindschadler et al 2009; Levin and Tirpak 2009; Pfeffer, Harper and O'Neel 2008; Steffen 2009). Given the increasing and large investment in infrastructure, including those in tourism-related facilities and major ports around the world's coastlines, the potential for accelerated sea level rise clearly has major implications for adaptation planning and the need for emissions cuts from a risk management perspective.

At the same time, global GHG emissions during the first decade of the 21st century have risen faster than assumed in most business-as-usual emissions scenarios. These high emission rates imply that the window of opportunity to reduce GHG emissions consistent with a longterm goal of stabilizing concentrations at 450ppm CO_2-e is closing rapidly. In fact some researchers argue that this window of opportunity has already closed (Anderson and Bows 2008; Meinshausen and Hare 2008; Sheehan 2008; van Vuuren and Riahi 2008). An increasing set of model simulations is now exploring the implications of further delays in emissions reductions, and find that such delays inevitably increase global costs as well as increasing the risk of greater climate change (den Elzen, van Vuuren and van Vliet 2010; van Vliet, den Elzen and van Vuuren 2009). Several recent publications emphasize that there is a limit to the total cumulative CO_2 emissions between 2000 and 2050 that are consistent with goals to limit warming to 2°C above preindustrial levels, which presents an increased urgency to initiate emissions reductions in the very near future in order to remain within such an overall emissions budget (Allen, Frame, Frieler et al 2009; Allen, Frame, Huntingford et al 2009; Meinshausen et al 2009).

Negotiation Outcomes and Challenges

Negotiations under the United Nations Framework Convention on Climate Change have sought to deliver a new global agreement that would address mitigation of and adaptation to climate change, as well as technology and finance (UNFCCC 2007). The so-called Bali Action Plan, launched in December 2007, was hoped to conclude with a new legally binding agreement two years later in December 2009 in Copenhagen and to either extend or replace the Kyoto Protocol, whose first commitment period concludes in 2012. The Copenhagen negotiations fell well short of these expectations, despite an unprecedented attendance by heads of state and senior ministers from many countries. The Copenhagen Accord was a political agreement negotiated in the margins of the official meeting by a limited group of countries, albeit including most of the world's largest emitters such as the United States of America, China, and Brazil. The Accord agrees that global efforts should limit warming to 2°C above pre-industrial levels. To achieve this outcome, the Accord contains provisions for binding economy-wide emissions targets by developed countries subject to

international verification and mitigation actions by developing countries that are reported biennially and, if they were supported by international finance, are also verified internationally.

However, the emission reductions to date consist only of voluntary pledges by individual countries, and are thus not necessarily connected with the overall emissions reductions needed to actually achieve the 2°C limit. Indeed, even if all emissions targets offered to date were achieved, warming by the year 2100 would be closer to 3.5°C than 2°C (Rogelj, Hare, Nabel et al 2009; Rogelj, Nabel, Chen et al 2010). It remains to be seen whether the on-going negotiations under the UN Framework Convention on Climate Change during 2010 can strengthen emission targets to make them consistent with at least the longterm 2°C limit stated in the Accord, and whether its political promise can be turned into a legally binding agreement under the UN framework. It is also worth noting that the Alliance of Small Island States has called for global warming to be limited to 1.5°C above pre-industrial levels, given that 2°C and attendant sea level rise would still place a major question mark over the long-term existence of low-lying small island states, including their long-term viability as destinations for tourism which provides a major source of foreign income for these countries (AOSIS 2008).

Other elements of the Accord include measures to reduce deforestation and forest degradation, and significant immediate financial support by developed countries for developing countries of US$30 billion during the 2010-2012 period to support adaptation and mitigation measures. By 2020, the Accord envisages mobilizing as much as $100 billion annually in support of the climate change response by developing countries. Investments and support of this order of magnitude could make a critical contribution to climate-proofing key economic sectors and activities of developing countries, including tourism activities that are critical to many developing economies.

IMPLICATIONS AND THE PSYCHOLOGY OF CLIMATE CHANGE

The interrelationship between climate change and tourism has received increasing attention over the last decade. However, despite some efforts to adopt a wider perspective, the main thrust of the tourism literature focuses on a few topics, including the likely macro level impacts of climatic change on tourism flows (Amelung, Nicholls and Viner 2007; Gössling and Hall 2006; Hamilton, Hamilton and Tol 2007; Lise and Tol 2002; Maddison 2001; Mather, Viner and Todd 2005), the impacts of climate change on the ski tourism sector (Elsasser and Bürki 2002; Galloway 1988; König and Abegg 1997; Scott, McBoyle and Mills 2003), tourism's contribution to climate change (Becken, Frampton and Simmons 2001, 2003; Becken and Hay 2007), mitigation options available (Becken and Hay 2007; Gössling and Hall 2008; Peeters 2007), and GHG offsetting (Becken 2004; Gössling, Broderick, Upham et al 2007). More recently research on global environmental change and tourism has also placed a strong focus on climate change related issues, but in a specific environmentally-focused context (Gössling and Hall 2006). However, the breadth and depth of the diverse interrelationships and implications of climate change and, linked to this, tourism as an economic sector, social phenomenon and psychologically and culturally important activity has only been touched on. There have been a number of departures from the outlined research thrust, but they have tended to be isolated exceptions.

The wide-ranging implications of climate change for this complex industry will have different levels of significance in different settings and contexts due to varying levels of environmental vulnerability, political structures, social fabric, and health care provisions, to name but a few, as well as the many characteristics of tourists and tourism activities taking place. In fact, the complexity of the relationship and the many factors that influence the type and severity of issues raised by climate change can be best summarized by Wall and Mathieson's 2006 conceptual framework. However, irrespective of the differences that will undoubtedly exist, possible direct,

indirect, and induced implications under the more extreme scenarios and over longer periods of time can be argued to include water supply, food security and nutrition, health, increased poverty, widening gap between affluent and poor, near-term development versus long term sustainability, and migration.

Implications

Water Supply. Supply of water and competition for these supplies between different economic sectors as well as, on a micro scale, between tourists and local residents is expected to become a greater issue in areas that are forecast to experience reduced rainfall and increased water shortages such as Africa, Australia, Central America, and parts of South and Central Asia, as well as many small islands (IPCC 2007a, d). This will undoubtedly have implications for the current patterns of water consumption and regional policies that govern water abstraction and usage, for example by hotels and golf courses, and the generation of drinkable water, as well as a greater emphasis on whether and how waste water is treated. In turn, the recycling of waste water can raise cultural issues and create challenges in combining imperatives of local sustainability with tourists' expectations of unlimited resource use during their stay, particularly in luxury holidays.

Food Security and Nutrition. Crop yields are widely expected to change under altered climatic conditions, in part due to the above point about water (Easterling et al 2007; Rosenzweig and Parry 1994), which in the case of many developing countries will be to their detriment. This decrease in yield will likely be worse in vulnerable areas where large scale tourism infrastructure has been developed at the expense of agricultural land, which means that less arable land is now available. Many examples of wide-reaching change in land use exist: including the rice fields in Thailand that were filled in to pave the way for more hotels and golf courses. This will make it more difficult and costly to procure food and beverage supplies for tourists as for the local population, while at the same time increasing the vulnerability of local populations to variations in tourism income due to the inability to extract alternative value out of local land resources.

Health. As the risk of severe heat stress increases in certain regions and diseases and bacteria spread or increase in prominence (such as Malaria in Africa; Patz, Campbell-Lendrum, Holloway and Foley 2005), tourists are expected to either demand "adequate" protection and care facilities or to simply avoid regions affected by these issues. As a result tourist-focused hospitals and health care centers will become more important than ever; for both tourists as well as the local communities. It is likely that more facilities may be built in an effort to retain tourism as an economic sector. However, tourism to destinations suffering from elevated risk of these health issues is likely to be relatively small scale under scenarios of severe climate change.

Increased Poverty. The poor are likely to become poorer as a result of numerous changes including access to food and water (Smith 2006) and as a result of emissions cutting efforts that will reduce air traffic and thus impact economic sectors that rely on global connectedness through transport networks, such as tourism. While there will also be new opportunities to generate income, it is unlikely that these will outweigh the loss of income opportunities in developing countries in particular for rural and subsistence populations.

Gap between Affluent and Poor. Parallel to the likely increase in poverty is the likelihood of the gap between the affluent and the poor increasing further (Tol, Downing, Kuik and Smith 2004) as the poor are less (financially) equipped to mitigate and to invest in adaptation measures to protect their livelihood and home. Decreased volumes of tourism in developing countries as a result of changing tourist flows would exacerbate the issue as will a lack of adaptation measures in terms of a destination's attractiveness in the eyes of potential tourists.

Near- vs. Long-term Sustainability. Investments in tourism infrastructure in the form of hotels and airports have long lifespans and payback periods, which increases the need to ensure that such developments are climate-proofed with regard to rising sea levels, changes in rainfall and storminess. However, such climate-proofing can come at a significant near-term opportunity cost of foregone development options. This creates a challenging dilemma for local planning whether the near-term economic benefits, including employment, poverty reduction and potential up-skilling of local populations, outweigh the longer term difficulties of tourism investments potentially becoming unviable in a changing climate or requiring more expensive upgrades later.

Migration. According to estimates based on scenarios of abrupt climatic change up to 100 million people could be forced to migrate due to environmental disasters (Schwartz and Randall in Wright 2007). In the Pacific Ocean, entire island nations are projected to become uninhabitable over time due to sea level rises, as mentioned earlier. Some of these islands are popular tourist destinations and their inhabitants are dependent on tourism for income. As sea levels rise, these destination islands are expected to become uninhabitable, and large scale migration of the inhabitants is likely to occur. Parallel to the forced migration, the flow of migrant tourism workers is likely to adjust to any changes in the flows of tourists triggered by the effects of climate change. This migrant labor force would consist predominantly of low skilled or unskilled workers, which will increase the pressure on certain areas as these areas may also receive other migrants with limited transferable skill sets while only able to retain a smallscale tourism industry because general demand for tourism would be expected to decline, particularly if food and employment opportunities change drastically.

Undoubtedly, there are more, in particular indirect and induced, impacts of climate change for tourism and vice versa. However it is beyond the scope of this chapter to formulate more implications. Instead the chapter will explore possible ramifications of the points presented, before turning its attention to the psychology of climate change. Key ramifications raised by these points include, for example, that the dominant value structures, and in particular the economic growth paradigm, will likely have to be challenged. This will lead to a new set of implications for tourism as an important driver of many economies, but also with regard to the non-commercial guises of tourism as a predominantly recreational activity and important aspect of society. Furthermore, in a carbon intensive world which looks similar to the more extreme scenarios proposed by researchers and the IPCC it is indeed perceivable that in realization of the ineffectiveness of voluntary measures, policies such as carbon rationing or unilateral trade barriers might be put into place by individual countries which will dramatically alter access to as well as the overall scale of tourism. The UK government's decision to increase the country's departure tax for climate change reasons is an example of fiscal unilateral action. Such measures taken in the name of sustainability could have major implications for some of the countries most vulnerable to climate change that critically rely on tourists for their foreign income. While the UN Framework Convention on Climate Change recognizes that the poorest and most vulnerable countries should be protected from flow-on effects from mitigation actions taken in developed countries, understanding and quantifying such flow-on effects and deciding on appropriate means to mitigate such adverse effects is fraught with technical difficulties as well as political sensitivities.

Other ramifications of more extreme emissions and climate change scenarios, with or without radical policies to mitigate GHG emissions, are likely to include that tourism experiences will become more localized in order to reduce emissions linked to transport. Such a shift to a low carbon or even carbon-neutral tourism industry is also likely to include a great increase in slow tourism such as cycling, walking, and train travel, and could potentially go as far as making virtual tourism common place to provide a touristic experience while avoiding transport related GHG emissions. Burns and Bibbings (2007) argue that the technological advances in televising information (resolution, interactivity, and the whole notion of digital co presence) are making virtual tourism a more credible possibility. Such a shift towards localizing tourism experiences will

render artificial tourism environments, such as the Dubai ski-dome, more attractive (but clearly only if the high energy and water consumption can be met by renewable energy supply). Such artificial tourism spaces could very well become the only means by which large parts of the populations (of developed countries) can gain access to these types of specialized tourism experiences; due to reduced snow cover in mountain areas and the necessity to travel less. But these contrived and inauthentic experiences in artificially created environments, or even virtual forms of tourism, will further challenge the much debated concept of authenticity in tourism (Cohen 1979, 1988; MacCannell 1973; Wang 1999); perhaps the meaning of a "touristic experience" represents will have to be adjusted.

The above overview highlights some of the dilemmas that transpire from exploring the process of bridging tourism theory and practice in the context of climate change. However, the initial challenge to initiating the necessary mitigation and adaptation actions, as discussed in the first part of the chapter, is to understand and overcome the reasons for insufficient action and the attitude-behavior gap, which has been observed widely in environmentally focused studies (Boustridge and Carrigan 2000; Reiser and Simmons 2005; Schott 2006). Because numerous commentators on the topic of climate change have emphasized that behavioral change is essential in addressing the implications of climate change, either through voluntary individual or collective action, the chapter will now discuss the psychology of climate change in an attempt to shed light on the psychological barriers to action.

Psychological Barriers

Most of the environmental problems, including climate change, have their roots in human behavior. Indeed, global environmental problems are ultimately really global symptoms of individual and collective actions (Walsh 1988). Not surprisingly, several publications have highlighted the role of psychology in dealing with these issues (Corral-Verdugo, García-Cadena and Frías-Armenta 2010; Gifford 2008; Oskamp 2000; Schmuck and Schultz 2002; Schmuck and Vlek 2003; Vlek and Steg 2007). While the scientific evidence for climate change and other environmental problems has been accumulating, there is inertia in solving these problems. Psychology can help understand human failure to become aware of global environmental issues and to act appropriately on these issues.

The psychological literature has identified specific barriers or constraints preventing people from becoming aware of climate change and from acting on this awareness (Swim, Clayton, Doherty et al 2009; Milfont forthcoming). For example, Swim et al (2009) discuss several structural and psychological barriers that can restrict actions for mitigating climate change. Structural barriers include institutional barriers (constraints related to benefits and regulatory restrictions), cultural barriers (social expectations of successful lifestyles), barriers in the physical environment (cold climate and building facilities), economic barriers (financial constraints imposed to poor households and small business), and informational barriers (lack of useful knowledge on most effective mitigation actions). By and large, these structural barriers are outside one's influence. Swim et al (2009) also present a sequence of thirteen specific psychological barriers that can restrict actions for mitigating climate change: ignorance, uncertainty, mistrust/reactance, denial, judgmental discounting, place attachment, habit, perceived behavioral control, perceived risks from behavioral change, tokenism/rebound effect, social comparison, and belief in solutions outside human control.

In a more parsimonious account, Milfont (forthcoming) identified five specific psychological barriers. These barriers are seen as inadvertent characteristics of climate change (Pawlik 1991) that influence people's evaluations of this issue. These characteristics can help in understanding the human failure to become aware of global environmental changes.

One, psychophysiological barriers: The physical "signals" of changes in temperature due to climate change are weak in value if compared to variation in temperature due to daily, seasonal, and regional variations. That is, the current physical signals of climate change are overall below the common perceptual thresholds of discernability, and are thus harder to notice than other environmental problems. These psychophysiological barriers to perceiving the physical signs of climate changes is deemed to change, as the consequences of changes in the climate soon become very noticeable. Two, temporal barriers**:** There is a great temporal delay between human actions and their perceptible influence on environmental systems, which means that the consequences of human actions go beyond a single generation. Indeed, the review of current climate change knowledge indicates that current actions will influence how the world will develop over the next centuries (Collins, Colman, Haywood, Manning and Mote 2007). Conversely, mitigation actions will entail costs to current generations but the main benefits would be accrued only by future generations. Another temporal barrier refers to individuals' temporal orientations. Research has shown that environmental issues entail a conflict between shortterm and longterm interests (Joireman, Van Lange and Van Vugt 2004), and that future-oriented individuals (those who are aware of and concerned about the future consequences of their actions) tend to care and act more to address environmental issues than present-oriented individuals (Milfont and Gouveia 2006).

Three, judgmental barriers**:** There are cognitive biases that originate from judgmental heuristics (mental strategies or cognitive short-cuts) (Tversky and Kahneman 1974). When making judgements about uncertain outcomes (for example when judging the importance and implications of climate change), people tend to use such heuristics. Instances or occurrences of global warming and climate change (or natural disasters produced by those) cannot be easily brought to mind, and as a result its probability of occurrence is underestimated due to a cognitive bias. Another cognitive bias refers to the tendency to evaluate hazards as more threatening when such hazards are perceived as unknown (Slovic 1987). Risks from climate change (floods, sea rise) are by and large known and thus underestimated (Weber 2006). Thus, natural disasters caused by climate change are underestimated because of their low frequency of occurrence as well as because of their familiarity.

Four, geographical barriers: Environmental consequences of global warming and climate change operate across temporal social distances, but are also carried across spatial social distances. People's maladaptive behaviours have negative consequences for generations living away, apart in both place and time. Research has shown that there is a tendency to perceive environmental problems as more worrying when they take place at greater distances. This bias in evaluating environmental problems in distinct geographical places has been referred to as "environmental hyperopia" (Uzzell 2000) or "spatial optimism" (Gifford, Scannell, Kormos et al 2009). As a result of this bias, people are typically more concerned about environmental problems at the global and international level than they are at the local and regional level. Freury-Bahi (2008) has shown, for example, that participants' perceived risk of climate change increased as a function of both the spatial distance and number of people under consideration. Climate change was rated as a greater risk for humanity than for inhabitants of the country, inhabitants of the town, and for oneself (humanity > country > town > oneself).

Five, social barriers: Underlying the use of natural resources is the dilemma between individual and public interests: to act serving one's own interests or to act serving the needs of the group or wider society (Hardin 1968). Broader environmental problems such climate change involves both resource dilemmas and public good dilemmas (Gifford 2008; Van Vugt 1998). The resource dilemmas are situations that require individuals' cooperation to preserve a valuable resource (such as rain forest), while public good dilemmas are situations that require individuals' cooperation to create a valuable good (creation of a community centre for edible gardening). Environmental issues are usually the result of a large number of individual acts of destruction, so individualistic orientations tend to produce negative outcomes in such dilemmas. Supporting this,

research has shown that individuals who place higher priorities in individualistic, self-centered value orientations tend to be less concerned about environmental issues than those who place higher priority on altruistic, other-centered value orientations (Coelho, Gouveia and Milfont 2006; Milfont, Duckitt and Wagner in press; Milfont, Sibley and Duckitt in press; Schultz, Gouveia, Cameron et al 2005).

These five barriers can be used to understand human failure to tackle environmental issues. In fact, psychological (but also structural) barriers need to be addressed for significant behavioral change to occur. But how can this be achieved? It seems clear that in order to address these barriers one needs to understand and use human psychology. A starting point is to identify specific cognitive and psychological constraints, but in order to achieve change a focus on motivation to action is essential. Van Vugt (2009) has recently presented a framework to achieve this goal. He identified four main foci of interventions to protect the environment that are in line with four core human motives. Thus, he argues for the need to understand and accept specific human motives and use them when devising interventions to tackle environmental issues. The interventions and their related motives are: information (understanding as the core motive), identity (belonging), institutions (trusting), and incentives (self-enhancing).

The understanding motive refers to the need to understand the physical and social environment. A constraint to fulfill this motive is that global environmental changes are uncertain. Interventions should thus focus on the use of information to reduce environmental and social uncertainty. The belonging motive refers to our need for positive social identity. A constraint to fulfill this motive is that resource competition between communities increases overuse of the natural resources. Interventions should focus on fostering identity, to improve and broaden an individual's sense of community. The trusting motive refers to our need to build trusting relationships. A constraint to fulfill this motive is that authorities are not always seen as legitimate and fair. Interventions should focus on institutions, to increase acceptance of common rules. The self-enhancing motive refers to our need to improve ourselves and increase our resources. A constraint to fulfill this motive is that economic incentives undermine intrinsic motivation to conserve. Interventions should focus on incentives, to punish overuse and reward responsible use.

Although theoretical, this framework can lead to empirical and practical outcomes. For example, tourism organizations may use the understanding motive of tourists to provide them with relevant information about the impact of their behaviors during the trips and holidays, and the future consequences of their actions to the destination. One could also consider the low-lying coastal and small island countries as a case study in which their specific needs and belonging motive lead them to create a formal group (Alliance of Small Island States) to fight for their interests. Another example refers to the ineffectiveness of voluntary measures and the need for institutional and governmental policies, such as carbon rationing, to generate action. Widespread support for such necessary policies would require a focus on trusting motive of community members. This framework thus provides an interesting benchmark for interweaving human psychology and specific areas of intervention that foster actions tackling climate change, which is relevant for tourism.

CONCLUSION

The chapter illustrates that the complex interrelationship between climate change and tourism, including the role of human behavior and its key drivers, are still little understood. Tourists often state that they want to do "the right thing". Tourism operators and regulators need to respond to those ideals through the services and standards they offer. At the same time, spending priorities and actual behavior often do not conform to the tourists' stated attitudes – the attitude-behavior gap. Ultimately, tourist decision making is not only based on economic rationale but also crucially on

what constitutes a good holiday, according to many conscious and subconscious social, cultural, and environmental factors. If tourism is to remain viable while responding to climate change through both emissions reductions and adapting to a changing climate, and associated changes in its regulatory environment, it is crucial that a better scientific understanding of the various dilemmas that the sector faces, and the often competing drivers that create those dilemmas are developed.

The Research Themes

Many disciplines and fields of study have a crucial role to play in building a more comprehensive understanding of the issues involved and the actions required by the private sector, the public sector, tourism consumers, host communities, and non-governmental organizations. Research that is transdisciplinary in nature is therefore essential when dealing with a phenomenon that cannot be dissected into convenient disciplinary boundaries. Bearing in mind this need to engage and collaborate with other disciplines, the following research themes emerge from the chapter's discussion of the current climate change science, the implications for tourism, and the psychological perspective on the topic.

1. Diversification of geographical and disciplinary perspectives: Most research on climate change in the context of tourism has been conducted by environmentally-focused researchers from Northern Europe, North America, and New Zealand. But vulnerability to climate change and adaptation options are shaped by local socio-economic and cultural contexts, as well as by the adaptive capacity of local people and institutions. Understanding local responses and options to adapt local tourism activities to the impacts of climate change will require intensified place-based research conducted by researchers that are appropriately equipped to understand these place specific factors. This will be aided by drawing on the lessons generated by the growing literature on place-based vulnerability in other sectors (Ford, Keskitalo, Smith et al 2010; O'Brien, Eriksen, Nygaard and Schjolden 2007; Smit and Wandel 2006; van Aalst, Cannon and Burton 2008). In line with this, a much wider engagement of researchers from other disciplinary backgrounds is also essential to unravel some of the complex implications and interrelationships between tourism and climate change (Burns and Bibbings 2007; Dubois and Ceron 2006).

2. The role of regulation and standards versus voluntary actions: The literature suggests that voluntary responses to climate change are often critical in the creation of an initial engagement with the issue, but in themselves rarely achieve a significant deviation from business-as-usual pathways (IPCC 2007c). Tourism operators already commit to a variety of voluntary environmental and performance standards, but their effectiveness in reducing the sector's GHG has been limited. Little is known about what mix of voluntary measures, standards, and regulations could be most effective in allowing tourism to contribute to broader climate change objectives while recognizing its challenging position at the interface of economic pressures, competing consumer demands, and existing voluntary standards as well as regulatory controls. Perhaps a way forward would be to use theoretical models, such the one proposed by Van Vugt (2009), to try and reconcile individuals' needs and rights with necessary regulations.

3. The role of social norms in changing behavior: As the insights from psychology have illustrated, social norms can play an important role in fostering change and embedding new standards of behavior. For example, drawing on evidence showing that human behaviors are significantly affected by social norms, two recent studies have used normative messages when addressing the widely-established initiative of persuading hotel guests to reuse towels instead of requesting fresh ones daily, hence reducing water and electricity use (Goldstein, Cialdini and Griskevicius 2008; Schultz, Khazian and Zaleski 2008). This suggests that there is a rich field at the intersection between psychology and tourism that could assist in identifying and overcoming barriers to successful adaptation to climate change, as well as implementation of emission

reduction opportunities. Equally, other interventions proposed by Van Vugt's (2009) framework should be explored in the context of tourism to evaluate their applicability and effectiveness.

4. Lifecycle assessments and green branding: Some segments of the tourism market are moving towards green branding to provide a point of difference. However, the complexity of lifecycle assessments suggests that the difference between green branding and green-wash often rests on important details. Examples include potentially counterproductive effects of buy locally purchasing strategies (Saunders, Wreford and Catagay 2006; Mueller 2007), or the lifecycle GHG balance of first-generation biofuels (Searchinger, Heimlich, Houghton et al 2008). Specifically, technological advances that rely on high-powered batteries to reduce GHG emissions (such as hybrid engine technology) are of great interest to tourism but need to be analyzed in this context to assess whether any net emissions savings can be achieved when also considering the behavioral response to green technology. The development of more transparent and widely applicable green branding standards of relevance to tourism companies could harmonize approaches and help define best practice. The growing literature on carbon offsets, their effectiveness and social sustainability could provide a helpful starting point in this area (such as the Gold Standard Foundation).

5. Merging climate change into sustainability and development perspectives: There is a growing recognition that integration of climate change into development plans is a prerequisite for its effective recognition, in both developed and developing countries. Treating climate change as a separate concern is generally less effective. Better understanding of how tourism developments can be climate-proofed through synergies with, rather than compromises against, near-term growth and development objectives will be crucial to allow the effective implementation of sustainability strategies.

6. Fostering collaboration and communication: The interdisciplinary nature of tourism research and practice suggests that steps to increase collaboration and communication are critical to promoting effective climate change responses. This applies not only to opening up new research collaborations between academic disciplines and areas of study, but also to increased communication between the public and private sector as well as NGOs. These collaborations may lead to the implementation of case studies and best practice demonstrations that advance the common goal of maintaining tourism as a viable and sustainable industry in the face of the need to contribute to rapid emissions reductions while adapting to unavoidable climate changes. Importantly, platforms are needed that also allow issues and challenges arising from practitioners attempting to convert theory into practice to be shared, as this type of action research can offer a great deal of insight into some of the complexities inherent in the topic.

7. Towards a differentiated analysis of tourism in the context of climate change: The state of knowledge regarding interrelationships between tourism and climate change has reached a stage where researchers need to refine their topics beyond umbrella terms such as tourism and tourists. While some differentiation between different sectors occurs in the tourism literature, future research need to not merely examine the (air) transport, (hotel) accommodation, and snow-dependent sectors, but explore how other tourism (sub) sectors interrelate with climate change. Equally, tourists or tourism consumers are terms that need to be broken down further to reflect the tremendous diversity represented by this term. There will clearly be significant differences in how different types of tourists respond to the challenge of climate change.

While this list of research themes points to a number of important gaps in the existant knowledge, it should not be interpreted to mean that concrete actions to reduce emissions and adapt to inevitable climate changes have to await further research. By contrast, the vast material covered in this introduction makes it clear that there is ample basis for concrete steps by practitioners to deal

with climate change and on which robust response strategies can be built. Equally, the material highlights that it is now time for researchers to create transdisciplinary research teams that can build upon the already existing and highly relevant body of knowledge in many different but highly complementary disciplines. The research themes do not seek to compete with or challenge research frameworks contributed by other authors (Burns and Bibbings 2007; Dubois and Ceron 2006), but to complement their work and help chart research directions that will provide much needed advances in understanding the challenge that has been described as the pivotal one of the 21st century, and likely beyond.

ABOUT THIS VOLUME

This volume seeks to take the initial steps in addressing the identified research themes by providing a platform for knowledge exchange between different disciplines and for learning from both theory and practice in the context of tourism and climate change. The different disciplinary perspectives presented in this volume include anthropology, climatology, climate change studies, economics, environmental sustainability, hospitality, policy and planning, psychology, scenario planning, and transport studies. While it was also attempted to provide insights on the topic from diverse parts of the world, this proved more challenging than anticipated and as a result the contributions originate from eight developed countries across three continents. The academic and case-study chapters in this volume are arranged into four sections: a contextualization of tourism and climate change science, a section examining issues and actions in the supply of tourism products in this era of climate change, a section discussing issues and actions in different countries and with different tourism consumers, while the final section of the volume explores adaptation and innovation actions and identifies resultant issues.

Section One: Contextualizing Climate Change and Tourism. In Chapter 2 climatologist Ernesto Rodríguez-Camino presents a comprehensive overview of the current state of knowledge about climate change by summarizing the extensive work of the IPCC. The chapter outlines the challenges that climate change presents for humankind by examining both the causes and effects. In Chapter 3, Luigi Cabrini positions the existing knowledge about climate change and the different future scenarios in the context of tourism by drawing on the work conducted by the UNWTO. His contribution illustrates the role of tourism as both a vector and a victim and emphasizes some of the key challenges that climate change will present for tourism as an economic sector and for specific tourist destinations. He concludes the chapter by reinforcing the need for adaptation as well as mitigation and by outlining the climate change related initiatives led by the UNWTO.

Section Two: Tourism Supply in the Era of Climate Change. Paul Peeters' contribution in Chapter 4 is the first in a series of chapters that adopt a sector or sub-sector perspective to deepen our understanding of the interrelationships between tourism and climate change. Peeters examines the transport sector to assess the possibility of technological innovation delivering the levels of GHG emission reductions required to avert serious climate change. He discusses different modes of transport and their impact on climate change while consistently considering contextual factors that impact on the net emission savings. In the following chapter (Chapter 5) Zientara and Bohdanowicz shift the sectoral focus to accommodation by examining the European hotel sector. The chapter explores climate change related actions by hotel chains in Europe while also identifying issues that arise from the discussed initiatives. Zientara and Bohdanowicz frame this analysis within the broader concept of corporate social responsibility and thus highlight that climate change mitigation needs to be integrated into broader sustainability focused frameworks of action.

In Chapter 6, Ross Klein discusses the role of cruise tourism in the context of climate change by reviewing the environmental record of the North American cruise tourism industry, with a particular focus on GHG-related impacts. Distinguishing between the different ship-based sources

of pollution he also explores options for this rapidly increasing type of tourism to mitigate its impact on climate change. The volume then presents three case study chapters. The case studies discuss a variety of mitigation initiatives in tourism while also highlighting the issues faced by practitioners when converting GHG mitigation theory into practice. The first case study (Chapter 7) documents the extensive mitigation initiatives implemented by the New Zealand Youth Hostels Association in its nationwide network of hostels and the obstacle identified by the organization. The second case study (Chapter 8) also presents a New Zealand based tourism business, KEA Campers, and discusses the initiatives and diverse challenges experienced by a campervan operator in seeking to lower the company's GHG emissions. The last chapter in this section (Chapter 9) is a case study contributed by Philips Hospitality which discusses innovation in emissions reducing lighting technology for the hospitality sector and elaborates on a number of successful European initiatives.

Section Three: Destinations, Tourists and NGOs. In Chapter 10, Pearce and Schott adopt a destination perspective in exploring the public and private sector responses to the implications of climate change from the perspective of a tourism-dependent island nation – New Zealand. In line with the earlier highlighted need for greater collaboration the chapter examines collaborative public-private sector responses and draws out the most critical direct and indirect implications of climate change for New Zealand. Chapter 11 focuses on economics-based methods for estimating the tourism industry's GHG footprint by using the example of Australia. Dwyer, Forsyth, Hoque and Spurr also include tourism related activities in their estimation method and propose a production-based approach for sector-based GHG footprint analysis. In contrast to this quantitative perspective, Chapter 12 is based on a qualitative methodology and explores the level of concern exhibited during discussions in cyber-communities. Burns, Bibbings and Wrobel refer to the technique as cyber-ethnography and support their analysis by segmenting cyber-community members into different types based on the level and nature of concern about climate change. Chapter 13 adds the practical perspective to this section by presenting a case study about a Canadian NGO concerned about climate change in the context of tourism. With this grass-roots initiative Dodds and Graci illustrate the successes as well as constraints of alerting consumers to the complexities of climate change and its interaction with tourism.

Section Four: Adapting and Innovating Tourism Products and Destinations. In Chapter 14, Matzarakis highlights some of the recent advances in climatology that are valuable for tourism academics and practitioners alike. He promotes the need for more refined measures when assessing the impact of climate on humans and presents the Climate-Tourism-Information-Scheme (CTIS) as an option before suggesting a range of adaptation techniques available in response to heat stress conditions as forecast by the CTIS, using the example of Spain. Chapter 15 deals with the future of tourism in the Baltic States under conditions of climatic change. In this chapter, Agarin, Jetzkowitz and Matzarakis develop regional climate forecasts for the Baltic States and explore destination development strategies to adapt and potentially benefit from climatic changes. As a means of demonstrating the severity of climate change related issues facing humankind and the future of tourism Yeoman and Wouters propel the reader to the year 2050 in Chapter 16. They apply scenario planning to the urbanized area of Los Angeles and seek to develop a picture of what the implications of longer-term climatic change projections could look like in the context of tourism. Chapter 17 concludes this section with a case study of GreenEarth.travel and its innovative initiatives in mitigating tourism-related GHG emissions. The example of the Tourism Earth Lung initiative in Sri Lanka is presented and discussed as an option for other developing countries.

Finally, Chapter 18 draws the volume's diverse contributions together and provides some concluding words about the issues and actions emerging from this analysis of the interaction between tourism and climate change and the related implications.