Climate Change and Small Island Tourism: Policy Maker and Industry Perspectives in Barbados

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Tourism in many small island developing states is vulnerable to potential impacts of climate change. Policies related to climate change and tourism depend on value-driven decisions made in the context of uncertainty and complex socioeconomic, cultural, and political relationships. Debates on policies for climate change and tourism are influenced by varied individual and group responses. This article examines the views of policy makers and tourism managers in Barbados on potential climate change impacts on the island's tourism industry, and their preferred policies in response to them. Many considered it very likely there will be damage to coastal tourism facilities, beach changes, and adverse effects on marine ecosystems. Both groups saw increasing public awareness as the most appropriate policy response. Tourism managers were less inclined to regard policy responses as very appropriate, perhaps being more cautious about policy interventions. Future research directions for "postnormal science" related to this topic are also identified.

Keywords: *tourism and climate change; small island developing states; attitudes to climate change; coastal management; Barbados*

CLIMATE CHANGE AND SMALL ISLAND DEVELOPING STATES

Long-term changes in climate are high on the global environmental agenda, not least because of their potential impact on economic activity. Environmental groups and most governments are concerned about warnings from the scientific community. The world's governments agreed at the 1992 United Nations Conference on Environment and Development that the potential impacts are important enough to demand coordinated international action through the UN Framework Convention on Climate Change. The Intergovernmental Panel on Climate Change (IPCC; 2001a) has projected possible changes for the period 1990-2100, including a rise in average global temperature of approximately 1.4-5.8°C, an elevated sea level of between 9 and 88 centimeters (chiefly because of the thermal expansion of ocean waters), and alterations in the frequency and intensity of extreme climatic phenomena (Wall 1996, p. 210; Wall and Badke 1994, p. 194; World Tourism Organization 2003a). At the First International Conference on Climate Change and Tourism, held in 2003 and organized by the World Tourism Organization (WTO), it was recognized that within current scientific research, there remain considerable uncertainties about the magnitude of changing global climate effects, but the conference broadly accepted the IPCC predictions as a working hypothesis (WTO 2003b, p. 3).

Climate change is unlikely to be a homogeneous force, and its consequences are likely to vary among different locations depending on the magnitude and speed of change, and the characteristics of existing biological and human systems (Wall 1998, p. 68). In particular, it has been suggested that although "most nations may suffer deleterious consequences from climate change, small island states may face the most dire and immediate consequences" (Burns 2000, p. 233; Lal, Harasawa, and Takahasi 2002). The IPCC (2001b, p. 17.5) also noted that "small island states constitute a very high-risk group of countries as a consequence of their high vulnerability and low adaptive capacity."

Small island developing states (SIDS) are often especially susceptible to sea-level rise because they have long coastlines relative to land area and because large proportions of their area are low lying. Many tropical islands are also characterized by occasional intense climatic events, such as hurricanes, and these may be more frequent with global climate change. Thus, many islands are susceptible to the impacts of sea-level rise, such as the inundation of low-lying coastal land, the erosion of beaches and shorelines, and salt water intrusion in freshwater aquifers (Nicholls 1998). They are also vulnerable to related adverse socioeconomic impacts on agriculture, freshwater supplies, and human settlements. For example, accentuated storm surges may result in coastal infrastructural damage. SIDS often also have limited capacities to adapt to the potentially adverse consequences of greenhouse effects. For many, the cost of responding to climatic threats, such as the expense of flood protection, is a

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much higher proportion of national wealth than it is for large and affluent continental countries.

In many SIDS, much of the coastal infrastructure that is threatened by an elevated sea level is related to tourism, an industry that can be a major economic activity for these island states. Small islands may have few economic alternatives to tourism due to a lack of natural resources, poor infrastructure, and a lack of investment capital. Wilkinson (1997, p. 1) argued that "given the current world economic system, for many islands tourism is almost inevitable." And the 25 countries where international tourism made the largest percentage contribution to gross national product in 1995 were all island states (Harrison 2001, pp. 9-10). The importance of tourism in such countries and its tendency to be concentrated on the coast tend to make it particularly vulnerable to the adverse consequences of climate change. The IPCC (2001b, p. 310; Smith 1990, p. 178) noted that with a sea-level rise of 50 centimeters to 1 meter, many small islands could lose a significant part of their land oriented toward coastal activities: "Even the less-vulnerable small islands would suffer significant economic effects from the loss of beach tourism and recreation areas because of sea-level rise and, possibly, more storms leading to increased beach and reef erosion."

POLICY RESPONSES TO CLIMATE CHANGE

There are many influences on how we respond to environmental problems that could adversely affect our livelihoods and lifestyles as well as our wider environmental context and resources. These influences include our level of awareness of the specific environmental problems, our perception of the scale of the threat, our view of the likely time scale of the threat, whether the impacts are direct or indirect, whether the impacts directly affect the individual under consideration, and which groups in society and which countries suffer most. Among some further factors are our perceptions of whether simply accepting the problem without responding is acceptable, our views on the appropriateness of direct government intervention in relation to the problem as opposed to looking to individuals to take a lead, the financial and opportunity costs involved in responding to the problem, and the resources likely to be available to reduce the impacts. All of these help to shape the emergence and form of public policies, although these policies are also affected by relations among the different individuals, interest groups, and organizations engaged in the political process. These relations reflect the constellation of political interests and are often determined by alliances among more powerful groups. And the various factors also influence the adaptation undertaken directly by various actors in addition to the steps taken by government.

It is science that has revealed many of the global problems affecting our environment. It has revealed such problems as acid rain, ozone holes, and global warming, and it has pushed knowledge of ecological systems to the point at which the unintended consequences of human activities could be seen to be far more widespread, irreversible, and potentially serious than had previously been recognized. But with global environmental processes such as climate change, there is also uncertainty among the scientific community about the scale and significance of the problems. This causes problems for society in terms of decisions about how to respond to the environmental threats entailed with climate change. One difficulty is that, faced with "a barrage of increasingly complicated, and contradictory, information about environmental risks, the lay person is likely to question the authority of science, and the confidence politicians place in scientists" (Redclift 1995, p. 70). And scientists are even more uncertain about predicting likely changes at the local scale due to climate change (IPCC 2001b, p. 17.5; Dubois and Ceron 2003, p. 3). As a result, there are notable difficulties in forecasting the impacts of climate change for specific SIDS. Scheraga and Grambsch noted that the

> extent to which society is willing to expend resources to avoid the effects of climate change will depend in part on its perceptions of the risks posed by climate change, the perceived costs of the effort, and how much it is willing to risk possible negative consequences. (1998, p. 86; see also Paoli and Bass 1997)

A potential consequence of the difficulties of scientific prediction is that climate change will not be a priority for individual actors or for public policies (Langford 2002, p. 108). But the failure of SIDS to invest in policies to respond to climate change may leave them poorly prepared to cope with adverse changes and also increases the probability of severe consequences.

The emergence of public policies around a particular way of constructing climate change as a problem for tourism may appear to result only from "scientific" evidence, but it can also result from mutual reinforcement among selectively networked scientific, policy, and industry communities (Benton and Redclift 1994, p. 23; Liberatore 1994, p. 200; Redclift 1995). For example, some environmental groups might exaggerate the risk of an environmental problem, and fierce public opposition may persuade politicians to override the "scientific" assessments of risks. People's individual responses to the climate change debates depend on their own interests, values, beliefs, and perceptions, and these are strongly influenced by the media and by social and cultural influences (Slovic 1987). The views of individuals are important in terms of their own actions and also the policy debates, and in relation to the acceptance of any policy measures that may be proposed. Thus, a full appreciation of the issues of tourism and climate change requires that science research is combined reflexively with research on attitudes and policies related to climate change and the tourism sector.

In traditional Western methods of research, science research has been seen as largely unrelated to values and cultural context. But when considering such complex and overarching issues as climate change, it has been argued that a new sort of science is needed. So-called *postnormal science* is a label for science that confronts issues that are uncertain when values are in dispute and the stakes are high (Hulme and Turnpenny 2004; Ravetz 1999). Understanding and responding to climate change covers issues of great complexity, involving many different organizations, spatial and time scales, and academic disciplines. It necessitates the integration of knowledge from a very wide range of sources, both academic and lay. And, crucially, it requires an understanding and involvement of the many actors who are affected, including citizens in general. It demands an understanding of their motives, behavior, and values. There is a need to build from traditional natural science and climate

modeling, but also to allow research to embrace the dimensions of context, psychology, emotion, politics, and morality that lie behind decisions. Individual responses and public policies for climate change and tourism depend on many value-driven decisions made in the face of uncertainty and in the context of complex socioeconomic, cultural, and political relationships.

Individuals will each have their own "worldview" on global warming issues and on the need for themselves, policy makers, and others to respond to them. At the same time, shared discourses have emerged that help to frame the issues for at least some people. Adger et al. (2001, p. 698) suggested that two discourses of climate change have become influential. A managerial discourse evokes institutional failure and population growth as the causes of climate change, and suggests international action as a solution. And a profligacy discourse evokes overconsumption as the root cause of climate change and suggests that only by tackling this fundamental issue will global catastrophe be averted. More generally, "ecological modernization" has emerged as an influential way to structure thinking about the dialectics of environmental and social change, and it has come to influence many policy responses to environmental problems. This depends on and promotes a belief that economic activity systematically produces environmental harm and that society should therefore adopt a proactive stance with respect to responding to environmental change and to environmental regulation. An important premise is that environmental care often contributes to efficiency (through more efficient fuel use, for example) and long-term preservation of the resource base for capital accumulation. It is suggested that ecological modernization can be "profitable." It is also envisaged that ecological modernization can contribute to both growth and global distributive justice simultaneously. But although this way of thinking allows for regulatory action to curb uncontrolled capital accumulation, it does not fundamentally challenge the capitalist economic system head-on (Gibbs 2000).

Specific groups of actors can differ in their responses to global warming issues. In the case of tourism businesses, they may be reluctant to commit their own financial resources when they face intense commercial pressures in the short term and when threats to their business due to climate change are likely to be fairly long term (Harvey 1996). But their "business-as-usual" response may be tempered if the financial sector considers that the risks substantially increase actuarial uncertainty, because this can lead to tourism businesses facing increased insurance premiums, with certain risks being deemed uninsurable and with the withdrawal of insurance coverage. With the public, the rising tide of affluence in advanced capitalist countries in recent decades has increased middle-class interest in environmental qualities and deepened concerns about environmental dangers to health and safety. For the less well off in poorer countries, however, the need to meet immediate basic needs may be the prevailing concern, with concern for uncertain long-term environmental risks seeming either irrelevant or a luxury they cannot afford. With environmental nongovernmental organizations (NGOs), they might argue for an "extra margin of safety" when estimating risk and designing policies on the basis that it is "better to be safe than sorry," whereas neoliberal critics might contend that this conservative approach unnecessarily alarms the public and encourages more government regulation than is necessary. And, especially at times of economic difficulty, governments may tend to support policies linked to short- and medium-term economic growth rather than longer-term considerations, and to favor a strategy of education and voluntary action because this can be delivered at low cost to the government and may also avoid direct political strife (Carter 2001, p. 264).

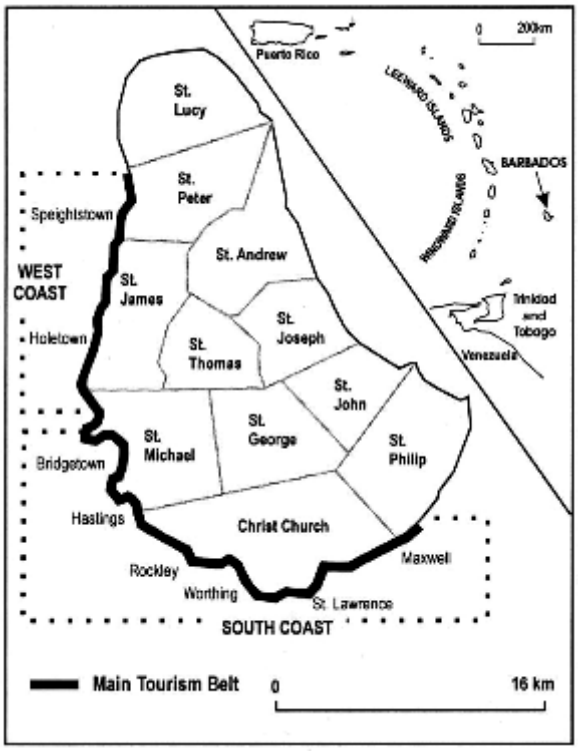
STUDY OBJECTIVES

This article reflects postnormal science, using a small-scale assessment of the views of selected actors on specific connections among climate change, tourism, and tourism-related policies. It has five closely related objectives. First, it examines the potential repercussions of climate change for tourism in the Caribbean microstate of Barbados. It is considered a useful case study because, with the notable exception of a short general review by Wall (1996), there is little published research on the potential repercussions of climate change for tourism in small islands. Second, the study considers views on this topic for two groups of actors: actors who might be involved in developing public policies related to tourism and climate change, and diverse managers working in the tourism industry, largely in the private sector. This involved the use of semistructured interviews and questionnaires, and also "official" policy statements and advice. The third objective is to assess the opinions of these two groups of actors on the likelihood (or possible risks) of different types of climate change impacts relevant to tourism. Next, attention is paid to the preferences of these groups for different policy responses. Finally, the last objective is to suggest some future research directions in postnormal science related to this topic.

TOURISM DEVELOPMENT IN BARBADOS

Barbados is the most easterly of the tropical Caribbean island chain (see figure 1). Its population of 267,000 live in an area of only 431 km^2, making it one of the ten most densely populated countries in the world. In the past, sugar cane production was central to the economy, but since the 1980s, there has been a significant shift to the service sector, notably tourism. Large-scale tourism development dates from the late 1950s and early 1960s, however. By its independence from Britain in 1966, the number of tourists staying overnight was 79,104, and thereafter the numbers have reflected a boom-bust pattern (Dann and Potter 1997, pp. 207-9). By 2001, there were 507,078 tourists and also 527,597 cruise passenger visitors (Barbados Ministry of Tourism 2002). The national economy relies significantly on tourism. Its contribution to real GDP has held at around 13-15% throughout the 1990s (Barbados Ministry of Physical Development and Environment 2001, p. 19). In 2001, tourism provided about 52.6% of the country's foreign exchange earnings as well as direct and indirect employment for 10.6% of the workforce (Barbados Ministry of Tourism 2002). In that year, the largest tourist source market was the UK (42.9%), followed by the United States (21%).

FIGURE 1
LOCATION AND FEATURES OF BARBADOS



Much of the tourist accommodation is located on the west and south coasts (figure 1), with a general trend of "upmarket properties on the West Coast and budget properties on the South Coast" (Barbados Ministry of Tourism 2001, p. 20). The absence of a strong tourism planning framework in the early stages of development has contributed to various environmental and social problems. Thus, Wilkinson suggested in 1993 that Barbados "is an example of the nonsustainability of a fragile island microstate embracing large-scale mass tourism in what is nearly a policy and planning vacuum" (p. 34). The Barbados Ministry of Tourism (2001, p. 26) accepted that "in the past tourism projects of all types, particularly hotel development along the coast, occurred with little consideration to the negative environmental impacts that they could have on these coastal areas."

As with most tropical island destinations, Barbados' key tourist attractions are its climate and coastal environment, notably its sandy beaches. Barbados enjoys a tropical, oceanic climate with an average temperature of 26.8°C, with no drastic changes in either seasonal or daily temperatures. It has wet and dry weather seasons, with the wet season running from June to November and coinciding with the Atlantic hurricane season (Barbados Ministry of Physical Development and Environment 2001, p. vii). During the wet season, the island may experience weather disturbances that can be extreme, and these originate in Africa and then travel across the Atlantic. The last hurricane to directly hit the island, however, was Hurricane Janet back in 1955.

The first systematic review of possible impacts of greenhouse effects on Barbados was produced in 2001, this being its *First National Communications to the United Nations Framework Convention on Climate Change* (also called the FNCCC report; Barbados Ministry of Physical Development and Environment 2001). This report highlights three projected trends that could have significant consequences for tourism: sea-level rise (and its attendant impacts of erosion, inundation, and saline intrusion), elevated air and sea temperatures, and changes in weather patterns (notably, changes in the volume and seasonality of rainfall, and changes in storm frequency and intensity).

RESEARCH METHODS

Two survey instruments—semistructured interviews and questionnaires—were used to examine views on the likely impacts of climate change on the Barbados tourism industry and on the preferred policies in response to climate change issues. The instruments were administered in August and September 2002 to two groups of actors on the island: policy makers and tourism industry managers, the latter largely being in the private sector.

Fourteen policy makers in government, the quasi–public sector, key private sector industry associations and businesses, and NGOs were interviewed, and they also completed a questionnaire. They were selected to include organizations with strategic influence on policy making that directly or indirectly affects the tourism sector. They were actors who might be involved in developing future public policies related to tourism and climate change. Included from the government were policy makers from the Ministry of Tourism, Ministry of Physical Development and Environment, and Coastal Zone Management Unit. Also included were the quasi–public sector Barbados Tourism Authority (BTA), and from the private sector there was the Barbados Hotel and Tourism Association, Bridgetown Cruise Terminal Incorporated, and Barbados Tourism Development Corporation. From the NGO sector, there were representatives from the Barbados National Trust and Barbados Marine Trust. Because Barbados is involved in various Caribbean-wide initiatives for climate change and tourism policies, it was also decided to interview representatives of two Caribbean-wide organizations: the climate change Regional Project Implementation Unit and the Caribbean Tourism Organisation. These policy makers were interviewed using a semistructured approach, with the interviews being tape-recorded. At the end of the interview, each policy maker was handed a self-completion questionnaire to return to the waiting interviewer. The questionnaires included some questions with closed options for responses and others that were open-ended.

The second group—this being 50 tourism industry managers—were sent a self-completion questionnaire that included several identical questions to those used with policy makers and others that were unique to their situation. Questionnaires were sent to the managers of 20 hotels in the main coastal tourism areas (10 small and 10 medium or large hotels), 10 restaurants also in those areas, 10 nature-based attractions, and 10 local tour operators. Nature-based attractions were chosen over other types of attractions, because they seemed more likely to be affected by climate change due to its environmental impacts. A systematic sampling method was used with businesses in each category. The sampling frame was drawn from the 2002-2003 Barbados telephone

TABLE 1

POLICY MAKERS' VIEWS ON THE LIKELIHOOD OF SPECIFIED IMPACTS ON THE BARBADOS TOURISM INDUSTRY

Tourism Impact	Likelihood of Impact (%)					
	Very Likely	Fairly Likely	Neutral	Fairly Unlikely	Very Unlikely	Uncertain
Sea-level rise	64	29	—	—	—	7
Beach alterations	71	21	—	—	—	7
Damage to coastal tourism facilities	64	29	—	—	—	7
Damage to marine ecosystems	57	36	—	—	—	7
Decrease in tourist arrivals	21	36	14	—	—	29
Reduction in air traffic to the island	29	21	14	7	—	29

directory, the BTA's *Winter 2001–Summer 2002 Hotels, Guesthouses and Apartments Rates Sheet* (Barbados Tourism Authority 2001b), the BTA's *2001-2002 Restaurant List* (Barbados Tourism Authority 2001a), and a Ministry of Tourism attractions list. The questionnaires were self-completed, and telephone reminders were made. Completed returns were gained from 19 of the 50 managers, with 4 from small hotels, 3 from medium or large hotels, 5 from restaurants, 5 from nature-based attractions, and 2 from local tour operators. It is possible that those respondents who returned their questionnaire were relatively more concerned about climate change issues than were those who did not respond. The total number of tourism industry and policy maker respondents is fairly small, and this is a study limitation.

In addition, reports and studies by the Barbados government and a Caribbean organization were examined for "official" explanations of potential global warming impacts and policy options. These include documents on climate change produced by the Caribbean Planning for Adaptation to Climate Change (CPACC) project and its consultants. This project has a Regional Project Implementation Unit in Barbados, has coordinated work to develop vulnerability and risk assessments for coastal areas in Barbados, and is associated with national policy making in Barbados (CPACC 2003). Also important was the FNCCC report, published in 2001 by the Barbados Ministry of Physical Development and Environment. Additional sources are used when they support or elaborate on interpretations presented in official Barbados government sources.

POLICY MAKER AND INDUSTRY PERSPECTIVES

Tourism Industry Managers' Views on Climate Change

As many as 18 of the 19 tourism industry managers agreed with a statement that global climate change is a reality, with one being uncertain; and all considered that the impacts will affect the Barbados tourism industry. There was less agreement about whether the impacts of climate change would be positive or negative. Four felt they would be *very positive* or *fairly positive*, 4 considered they would be *neutral*, 8 thought they would be *very negative* or *fairly negative*, and 2 were *uncertain*. Thus, only 8 of the 19 had drawn a clear conclusion that the impacts would largely be negative. When these tourism industry managers were asked whether they considered information about global climate change is being disseminated in Barbados, 14 replied positively and 5 replied negatively. They were also asked how important climate change is compared to other issues affecting Barbados's tourism industry. Seven considered it *very important*, 9 replied that it was *fairly important*, and 3 saw it as *fairly unimportant*.

Views on the Impacts of Climate Change on Tourism

In the semistructured interviews, the policy makers were asked what impacts they considered global climate change might have for the Barbados tourism industry. The replies represent perceived "risks" relevant to the industry. Most of the replies focused on impacts on the marine environment, with the impacts mentioned by several respondents being sea-level rise, increased storm surges, beach erosion, and warmer seawater temperatures that can damage the coral reefs. Other impacts mentioned by fewer policy makers were an increased risk of hurricanes, increased temperatures, damage to the built environment, damage to coastal infrastructure, and the likelihood that milder weather in northern countries would lead to fewer tourist arrivals.

In the questionnaires, both the policy makers and tourism industry managers were asked about the likelihood of global climate change having specified impacts on the Barbados tourism industry, these being presented to them in a list. There was a scale of six options for responses ranging from *very likely* to *very unlikely* and including an *uncertain* option. Responses made by the 14 policy makers are shown in Table 1, and the replies of the 19 tourism industry managers are presented in Table 2, with both indicating perceived risks relevant to the industry.

Table 1 shows that for the policy makers, the most frequently identified *very likely* tourism impact was beach alterations (the beaches being a key tourism resource and also providing vital protection from the sea). According to a CPACC (1999, p. 3) report, an elevated sea level is likely to increase beach erosion in Barbados because most beaches are very narrow (averaging 12-15 meters). Beach loss is also associated with the loss of nearby coastal land. The FNCCC report (Barbados Ministry of Physical Development and Environment, 2001, pp. 27-29) details instances of coastal land loss reducing the natural protective capacity of a beach against flooding and inundation, as well as leading to the collapse of the beach. Climate change may also lead to shifts in

TABLE 2

TOURISM INDUSTRY MANAGERS' VIEWS ON THE LIKELIHOOD OF SPECIFIED IMPACTS ON THE BARBADOS TOURISM INDUSTRY

Tourism Impact	Likelihood of Impact (%)					
	Very Likely	Fairly Likely	Neutral	Fairly Unlikely	Very Unlikely	Uncertain
Sea-level rise	47	42	—	—	—	5
Beach alterations [a]	58	32	—	—	—	5
Damage to coastal tourism facilities[a]	63	26	—	—	5	5
Damage to marine ecosystems	58	21	16	—	—	5
Decrease in tourist arrivals	36	32	11	16	—	5
Reduction in air traffic to the island	32	42	5	16	—	5

a. Excludes one respondent who did not reply on this issue.

the tracks and intensity of hurricanes, and thus can increase storm erosion and damage. There are, however, no reliable scenarios for altered hurricane activity in current climate models (Nicholls 1998, p. 32).

For the policy makers, the next two most frequently identified *very likely* tourism impacts were a rise in sea level and damage to coastal tourism facilities. Both are interrelated, and they are also reported in government reports. The Coastal Zone Management Unit in Barbados has conducted a study on the south and west coasts to estimate potential coastal inundation and loss of infrastructure due to a 1-meter sea-level rise and a storm surge generated by a Category 3 hurricane. The CPCC (1999, p. 3) commented that the "result is astonishing since most of the present day coastal development, including the tourism infrastructure, is located within this inundation zone." A CPCC consultant identified problems between the west coast and the coastal highway, which is between 100 m and 1 km inland:

> As tourism has developed since the 1960s and up to the present day, this low lying area has become completely developed with houses, hotels, roads and other infrastructure. . . . The vulnerability of this coastal area is now very high, and besides coastal ecosystems, there are now many human and economic resources at risk. (Cambers 2001, pp. 3-4)

The FNCC also expressed concern that in Barbados as a whole,

> over 90% of all hotels are within or proximal to the beach, with 70% of the island's hotels located within 250 meters of the high water mark. This translates to the island's hotels sitting almost exclusively within the 1 in 500 and 1 in 100 inundation zones, placing them at risk of major structural damage. (Barbados Ministry of Physical Development and Environment 2001, p. 20)

One potential repercussion of an elevated sea level that features in official reports is salt-water intrusion in fresh aquifers, which will affect potable water supplies. A CPACC (1999, p. 3) source noted, "Salt water intrusion is another potentially severe problem since all water supplies for Barbados come from wells located on the coastal zone." Barbados's groundwater aquifers are unconfined and are hydraulically connected to the sea. Wells near the west coast are those most likely to suffer from saline intrusion due to a sea-level rise (the area already suffers from saline problems as a result of overpumping), and water from this area serves many of the island's luxury hotels (Barbados Ministry of Physical Development and Environment 2001, p. 33). The threat to fresh water resources, however, also comes from a possible increase in drought severity and frequency (Barbados Ministry of Physical Development and Environment 2001, p. ix). The potential consequences of a loss of potable water should be seen in the context that tourists are generally voracious consumers of water, so if water is in short supply, then increasingly they will come into competition with other water users.

Damage to marine ecosystems was seen as a *very likely* tourism impact to result from climate change by just more than half of the 14 policy makers. Studies indicate that the island's reefs are especially vulnerable. Barbados has an estimated 4.9 km^2 of bank reefs and 1.4 km^2 of fringing reefs, and these are important for sand creation, beach stabilization, and the prevention of erosion through their role in dissipating wave energy; they also help to attract tourists interested in diving and snorkeling (Barbados Ministry of Physical Development and Environment 2001, pp. xii-xiii, 39-41; Cambers 2001, p. 13). Increased seawater temperatures due to climate change could cause reef damage due to an increase in coral bleaching. The primary causes of reef degradation in Barbados are, however, thought to be inadequately treated sewage and contamination from fertilizers and pesticides (Wilson 1996, p. 91). The government has begun to respond to these latter issues by passing the Marine Pollution and Control Act in 1998 and through new sewage schemes. Mangroves are also important for shoreline protection, but they may be susceptible to damage from a sea-level rise. But if the sea-level rises sufficiently slowly, then the mangroves may be able to grow upward and move landward as formerly dry land is flooded, although this is not possible where there are coastal defenses or building development (Nicholls 1998, p. 35; Wall 1996, p. 212).

The two impacts of climate change on the list that the policy makers identified least often as *very likely* were decreases in tourist arrivals and air traffic to the island. More than a quarter of policy makers were *uncertain* whether these impacts would occur. This relatively low identification might have been influenced by these two impacts being more indirectly linked to greenhouse effects, or it could have been

TABLE 3

POLICY MAKERS' VIEWS ON APPROPRIATENESS OF DIFFERENT POLICY RESPONSES

Policy Response	Appropriate			Inappropriate		
	Very	Fairly	Neutral	Fairly	Very	Uncertain
Mitigation strategies	57	29	—	—	—	14
Adaptation strategies	86	14	—	—	—	—
Collaborative work across sectors	86	7	—	—	—	7
Policy formulation	86	7	—	—	—	7
Increase public awareness	93	7	—	—	—	—

affected by some policy makers in the survey not being directly involved with tourism. Research suggests that potentially milder winters in the UK and in parts of the United States, the two main tourist source markets, could discourage tourists from seeking to escape from northern winters (Viner and Agnew 1999, p. 3; Wall 1996, p. 213; WTO 2003a, p. 10). Thus, the FNCCC warns, "Milder winters will lessen the incentive for northerners to trek to the tropics to escape the cold weather" (Barbados Ministry of Physical Development and Environment 2001, p. 23). Furthermore, attitudes toward sunbathing might change in the face of climate change and increased exposure to ultraviolet radiation associated with ozone depletion (Wall 1996, p. 212). These changes could lead to a reduction in air traffic to Barbados, as could levies raised to compensate for greenhouse gas emissions by airplanes, which could add significantly to the cost of long-haul airfares (Ceron and Dubois 2003, p. 22; IPCC 2001b).

Table 2 presents the tourism industry managers' views on the likelihood of the listed climate change impacts on the Barbados tourism industry. It indicates they were often quite aware of potential impacts. Their views are perhaps less dissimilar to those of the policy makers than might be expected, although more of the managers concerned about greenhouse effects may have chosen to return the questionnaire. Their awareness of possible consequences could reflect past experience of storm damage in the hurricane season as well as recognition of the general vulnerability of small islands to extreme events. Although their views are often quite similar, there are differences nevertheless between the tourism industry managers and the policy makers. Slightly smaller proportions of the managers considered it *very likely* that the industry would be affected by sea-level rise and by beach alterations. And fewer were *uncertain* about the likely impacts on the volume of tourists and air traffic to the islands, with more considering these to be *likely* consequences. The latter responses may reflect their greater familiarity with the tourism industry in comparison to some policy makers in the survey.

Views on Policy Responses for Climate Change

In the semistructured interviews, the policy makers were asked about actions necessary to respond to climate change impacts on the Barbados tourism industry. There were no prompts influencing the actions discussed. Actions to raise awareness, including educational campaigns, were mentioned by the largest number of policy makers (6 of the 14). This was followed by suggestions to devise and apply specific policies. Other suggestions included influencing the location and design of new tourism facilities, notably to site them outside areas liable to sea inundation and to increase their resistance to hurricane damage. Some advocated tourism product diversification away from the dominance of tropical beach tourism, because this would reduce reliance on the beaches and on tourists motivated by a warm climate during cold northern winters. One policy maker argued that "from a future planning perspective, we need as an island destination to change our focus. We need to be able to diversify our product offering." Another suggested that "Barbados's tourism product should be re-invented regarding a gentler form of tourism." Here, it can be noted that the island's tourism authorities have in any case sought to strengthen the industry through diversification, involving the development of natural, historic, and cultural attractions (Barbados Ministry of Tourism 2001, pp. 22, 25; Wilson 1996, p. 92).

In the questionnaires, both the policy makers and tourism industry managers were asked to comment on the appropriateness of specific policy responses to the potential impacts of climate change on Barbados. Five potential policy responses were presented in a list: strategies to lessen the severity of the impacts (mitigation strategies), strategies related to adjusting to the impacts (adaptation strategies), collaborative working across different sectors, the formulation of policies, and policies to increase public awareness. There was a scale of six response options ranging from *very appropriate* to *very inappropriate* and including an *uncertain* option. Responses made by the 14 policy makers are shown in Table 3, and the replies of the 19 tourism industry managers are presented in Table 4.

The tourism industry managers generally were less inclined to regard the policy responses as *very appropriate*, seemingly being more cautious about moving toward policy interventions. This finding might be expected, and it is based on only very small respondent numbers, but it may have important implications for policy work. The two policies for which tourism industry managers and policy makers had similar responses relate to increasing public awareness and policy formulation, possibly due to them being perceived as less expensive and easier to implement. It is also notable that the policy identified most often as *very appropriate* by both groups was that of increasing public awareness. Although this is a relatively inexpensive policy response, its selection may also reflect a recognition that raised public awareness is likely to be necessary to obtain the required political support to fund some potentially expensive strategies.

Three types of policies were identified as *very appropriate* by 12 of the 14 policy makers (86%): adaptation strate-

TABLE 4

TOURISM INDUSTRY MANAGERS' VIEWS ON APPROPRIATENESS OF DIFFERENT POLICY RESPONSES

	Appropriate			Inappropriate		
Policy Response	Very	Fairly	Neutral	Fairly	Very	Uncertain
Mitigation strategies[a]	32	42	16	5	—	—
Adaptation strategies	37	47	—	11	—	5
Collaborative work across sectors	47	42	5	—	—	5
Policy formulation[a]	79	16	—	—	—	—
Increase public awareness[a]	84	5	5	—	—	—

a. Excludes one respondent who did not reply on this issue.

gies, collaborative work across sectors, and policy formulation. Among the policy makers, a higher proportion saw adaptation strategies (adjusting to the impacts) as *very appropriate* compared with mitigation policies (lessening the severity of the impacts). This may reflect a view that, in comparison to Barbados, the economically more developed nations of the North are better placed to reduce greenhouse gas emissions and thus to lessen the overall scale of climate change impacts. As the Barbados Ministry of Physical Development and Environment argued,

> We remain concerned that while we have begun to allocate our scarce resources to the process of adaptation to climate change, there is no concomitant global commitment to the reduction of greenhouse gases, which is the real source of the problem we now face. (2001, p. ii)

There are several potential adaptation strategies that can be applied in response to the specific issue of a possible rise in sea level. These strategies are likely to be important for Barbados because much tourism provision—notably hotels—is fixed in locations close to the coast with sunk capital that cannot readily be liquidated or reinvested. If the quality of the tourism resources and associated experiences is degraded or if the infrastructure is threatened by an increased frequency of floods and storms, then there would be considerable economic dislocation for tourism businesses and the island's economy (Wall 1996, p. 214). Literature on potential adaptation strategies in the Caribbean suggests three possible options: accommodation, protection, and a planned retreat (Nicholls 1998, p. 37).

Adaptation through accommodation can involve new buildings on the coast being built on pilings above flood levels, and adaptation through protection measures can entail protecting areas by building seawalls, constructing groins on beaches, and nourishing beaches by bringing in additional sand. The Barbados Coastal Zone Management Unit has overseen a number of demonstration projects for beach protection and enhancement, which were implemented with financial assistance from international funding agencies (Barbados Ministry of Physical Development and Environment 2001, p. xxi).

Planned retreat is a third potential adaptation strategy. It is suggested that the best way to conserve beaches in relation to hurricanes is to allow them space to move. Ensuring that beachfront development is placed a "safe" distance behind the active beach zone means that more space is provided for the beach to move naturally during hurricanes, thereby increasing the likelihood that the beach is conserved and coastal infrastructure remains intact. The perceived "safe" distance is sometimes referred to as the "coastal development setback" (Cambers 1997a, 1997b; Cambers 2001, p. 12). The setback for new development in Barbados has been 30 m from the high tide mark—and Cambers (1997b, p. 2) suggested that this is "rather low, particularly if there is a major event such as a tropical storm or hurricane." Circumstances also vary greatly, and guidance on setbacks needs to be on a beach-by-beach basis. Coastal development setbacks may have several functions. They can reduce beach erosion by allowing the beach zone to expand or contract naturally, without the need for seawalls and other structures that in fact may threaten the beach system. The setbacks may also reduce damage to beachfront property during high-wave events, such as hurricanes. Furthermore, they may provide improved vistas and access along beaches, and they can provide privacy for the occupiers of coastal property and also for visitors to the beaches.

Integrated coastal management (ICM) can assist in planning for adaptation, because it can provide an anticipatory and predictive approach to assist in responding to medium- and long-term concerns such as sea-level rise, as well as short-term needs. According to Cambers (2001, p. 1), integrated coastal management "is a dynamic process in which a coordinated strategy is developed and implemented for the allocation of environmental, sociocultural, and institutional resources to achieve the conservation and sustainable multiple use of the coastal zone." She contended it should involve integrating the concerns and needs of all relevant sectors of society from fishermen to hotel owners, and also the making of compromises among sometimes conflicting uses and between development and conservation (Cambers 2001, pp. 1-3). The approach to ICM taken in Barbados is led by the Coastal Zone Management Unit, and it is supported by three legislative acts: the Coastal Zone Management Act of 1998, which establishes the legal framework for coastal zone management; the Marine Pollution Control Act; and the Town and Country Planning Act (Barbados Ministry of Physical Development and Environment 2001, p. xx).

CONCLUSION AND FUTURE RESEARCH

The potential impacts of climate change, such as sea-level rise, on many SIDS have given rise to considerable international concern. It seems that low-lying small island states are among the most vulnerable countries in the world, and coastal tourism on these islands—which is often of

considerable economic importance—may also be at risk. Given the high vulnerability of small islands, it is likely that a proactive approach to adaptation planning will be especially beneficial to reduce the adverse effects of climate change and also to exploit any potential benefits. Adaptation to the impacts of greenhouse gases on tourism will likely need to involve a wide range of actors. The views of individuals are important in terms of their own actions, the policy debates, and the acceptance of any policy measures that may be proposed. It is necessary, therefore, to understand the perceptions and views of the various actors in relation to climate change and tourism. The present case study has explored the views of a small number of policy makers and tourism industry managers in Barbados on the impacts of climate change on the island's tourism and on their preferred policies in response to the impacts.

Many respondents felt that damage to coastal tourism facilities was very likely, with notable proportions also considering it very likely that there will be beach changes, sea-level rise, and damage to marine ecosystems. The tourism industry managers and policy makers shared many similar views on these impacts. More of the managers in the industry, however, considered it likely that there will be impacts on the volume of tourists and air traffic to the islands. Both the policy makers and tourism industry managers identified increasing public awareness as the most appropriate policy response to the impacts of climate change on Barbados. But the tourism industry managers generally were less inclined to regard the policy responses as very appropriate, perhaps because they are more cautious about applying policy interventions at this stage.

Within postnormal science, it is suggested that understanding and responding to climate change and tourism involve combining "scientific" research in fields such as climatology, oceanography, and geomorphology with research on the many actors who are affected and on their interests, values, perceptions, and policy preferences. Consideration needs to be given to the reasons for the responses of individuals and for the responses within the domain of public policy. Hence, more research is needed on the competing discourses of climate change and on how various parties "translate" them so that they are relevant to their own situations. Work is also needed on how different actors influence public opinion and the views of other groups, and also on how differential interests, political influence, negotiation, and contestation lead to specific public policies. There is also much to be gained from research on the strategies that have been adopted in response to climate change and tourism in different contexts, and on what appears to work well and what difficulties have been encountered.

One direction for research on climate change and tourism is for researchers to facilitate joint learning and consensus building among affected parties about policy responses in specific contexts, so that practical policies can be identified that are influenced by their views (Hulme and Turnpenny 2004, p. 112). These parties may be encouraged to recognize that there is uncertainty about the likely impacts of climate change, that different parties may favor different policy directions, and that these directions will lead to different outcomes and may benefit some groups more than others and may respond more or less fully to the predicted problems. One approach to joint learning and consensus building is to encourage the various actors to undertake tradeoff analysis, to inform them of the results of their analysis, and then to involve them in deciding on future policies. Tradeoff analysis is a process whereby actors are engaged to consider the merits of different policies, including their impacts, and explicitly to determine policy priorities. It recognizes that there may be more than one objective that is desired for a resource and that it can often be impossible to achieve all of those objectives simultaneously. Tradeoffs thus imply a sacrifice or opportunity cost in terms of benefits foregone (Grimble and Wellard 1997, p. 179). Tradeoffs in relation to climate change may often relate to time preferences: to opt for activities that bring immediate benefits or to invest in activities that will ensure a continued flow of future utility. Tradeoff analysis could be used iteratively, with the results for the other actors being shared before the process is repeated; and eventually all the actors could be brought together in a consensus-building workshop to identify specific policies that they support (Brown, Tompkins, and Adger 2001). Such action research is particularly reliant on establishing mutual trust between the researcher and the people being studied, and there are dilemmas about the degree of influence of the researcher in the process and outcomes, and the relative power and influence of different actors. In practice, it is also the case that policy makers tend to retain much of their control over policy decisions (Bramwell 2004).

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