

Visitor Knowledge and Actions Related to Climate Change and Sustainability in Protected Area Destinations: The Great Barrier Reef World Heritage Area, Australia

Tazim Jamal^{1,*}, Bruce Prideaux², Hana Sakata³ and Michelle Thompson⁴

¹ Associate Professor, Department of Recreation, Park and Tourism Sciences, 600 John Kimbrough Blvd, 409M AGLS, 2261 TAMU, College Station, TX 77843–2261, USA, Email: tjamal@tamu.edu

² Professor Bruce Prideaux, Faculty of Law, Business and the Creative Arts, James Cook University, Cairns, Australia, PO BOX 6811 CAIRNS QLD 4870, Australia, Email: bruce.prideaux@jcu.edu.au

³ Hana Sakata, Faculty of Law, Business and the Creative Arts, James Cook University, Cairns, Australia, PO BOX 6811 CAIRNS QLD 4870, Australia, Email: hana.sakata@jcu.edu.au

⁴ Michelle Thompson, Faculty of Law, Business and the Creative Arts, James Cook University, Cairns, Australia, PO BOX 6811 CAIRNS QLD 4870, Australia, Email: michelle.thompson@jcu.edu.au

* Author to whom correspondence should be addressed; Email: tjamal@tamu.edu; Tel: +1-979-845-6454

Abstract: This research addresses the role of tourists and tourism in protected area destinations under threat from climate change and other sustainability challenges. Specifically, the study focuses on a world heritage protected area of strong economic, social and cultural significance: the Great Barrier Reef (GBR) World Heritage Area (WHA). Enhancing the adaptive capacity of social systems in destinations vulnerable to climate change is an important social agenda, requiring concerted action by the destination's multiple stakeholders. Visitors, including area and regionally based residents, plus domestic and international tourists are key stakeholders in the complex tourism system. Their motivations, experiences, perceptions and actions as related to these destination places and landscapes are vital to informing marketing, conservation and planning decisions. Yet, troubling information gaps exist on visitor characteristics,

knowledge and behaviors in the context of climate change and tourism. Theoretical and methodological directions to tackle the complex eco-cultural and heritage landscapes that visitors perceive and experience are only just beginning to emerge in the context of climate change and tourism. This conference paper reports survey research results on visitor knowledge and action related to sustainability and climate change at the Great Barrier Reef (WHA). Over the period 2007 to 2010, 4,672 self-completed surveys were collected from tourists in the departure lounge of the Cairns Domestic Airport, Cairns, Queensland. These addressed a range of issues including motivations and activities of visitors to the GBR WHA (Thompson and Prideaux, 2012). The current 2012 survey was also administered at the Cairns domestic airport; during the July–September time period, questions on climate change and sustainability oriented choices made (e.g. choosing ecotourism certified reef operators) were incorporated into the survey. The paper discusses the results in relation to visitor knowledge, perceptions and social actions in the context of climate change and sustainability at the Great Barrier Reef WHA.

Keywords: Climate change; Great Barrier Reef World Heritage Area; tourism

1. Introduction

The Davos Declaration on Climate Change and Tourism has identified climate change as the greatest challenge to the tourism's sustainability in the 21st century (see also Becken 2010). The CO₂ emissions from international tourism, including all forms of transportation, accounted for just under 5% of the world total or 1,307 million tons in 2005, and estimated to increase by 130% from 2005 to 2035 (UNWTO-UNEP-WMO (2008, cited in de Grosbois and Fennell, 2011). Yet, sustainability reporting in the tourism industry tends to be lagging, and carbon footprint reporting remains scarce and generally unclear (see Herremans et al., 2011; de Grosbois and Fennell, 2011). "Tourism is currently considered among the economic sectors least prepared for the risks and opportunities posed by climate change and is only now developing the capacity to advance knowledge necessary to inform business, communities and government about the issues and potential ways forward" (Scott, 2011: 17). Enhancing the resiliency and adaptive capacity of tourism-related social systems in destinations susceptible to climate change impacts is therefore a key priority.

Decision making related to resiliency and adaptation, however, stands to be significantly affected by economic and societal tradeoffs that will need to be made; conflict is anticipated among local communities and tourism stakeholders whose livelihoods and well-being stand to be most affected by climate change (see Becken and Hay, 2007; Gössling & Hall 2006). Moreover, complex adaptive tourism systems contain multiple stakeholders whose diverse characteristics, values and interests, may result in a wide range of perceptions and attitudes towards climate change and impact

management (see Needham, 2010; Farrell and Twining Ward, 2004; Faulkner, 2001). A small number of studies have reported efforts to engage civil society and social action related to climate change in destination areas. Jamal and Watt (2011), for instance, conducted a case study on community social marketing and social action in a mountain resort community adjacent to Banff National Park, Canada (one of four mountain parks jointly listed as a World Heritage Site). Public and private sector participants (e.g. taxi drivers), residents and school children, were involved in direct hands-on initiatives that facilitated environmental sustainability, social action, raised awareness and disseminated knowledge about personal actions that could be undertaken to manage climate change and sustainability.

Not surprisingly, research by McKercher et al., (2010) and Prideaux et al. (2010) illustrate the importance of incorporating multi-stakeholder knowledge and perception into climate change impact models—including that of tourists. Visitor perceptions and expectations of these destination places and landscapes are key to informing marketing, conservation and planning decisions. Yet, while progress is being made on identifying and involving stakeholders and local communities in climate change impact management, our understanding of how visitors relate to climate change is scant—even though visitors are considered to be among the more adaptable stakeholders (at least with respect to actions such as changing travel choices and activities), as observed by Gössling et al. (2012). Of the sparse research available, visitor studies have tended to find a significant gap between awareness and action, even among international tourists who seemed aware of global warming and climate change, but reluctant to alter their own travel behaviors or contribute to carbon offset schemes (see Becken, 2004; Huebner, 20012; McKercher et al. 2010; Muir, 2011). Buckley (2012) reviewed social and environmental impacts, responses and indicators for the tourism sector globally (using five categories: population, peace, prosperity, pollution and protection). Among the future research priorities he identified was “the effects of individual perceptions of responsibility in addressing climate change” (Buckley 2012: 528).

Overall, then, while a few studies are emerging, there is a significant lack of research on visitors and climate change generally. Protected area destinations with heritage designations present additional challenges, as they are of social-cultural significance to stakeholders at the local-global level, and often entail cross-sectoral governance. Among the scant studies is Scott et al. (2007), which explored climate change scenarios with a wide range of visitors in the mountainous landscapes of Waterton National Park, Canada (the joint Waterton Glacier International Peace Park is also a UNESCO World Heritage Site). Turton et al. (2009) examined the climate–resource relationship and tourism at various Australian destinations, using an extensive multi-stakeholder process. Stakeholders in their interactive workshops (aimed to facilitate a social learning environment) were represented by government agencies and marketing representative (tourists were not included in Turton et al.’s study). Such collaborative endeavors are especially crucial in the case of fragile reef systems like the Great Barrier Reef World Heritage Area (WHA).

Reef degradation poses a serious risk to the industry, with coral reefs under threat worldwide from climate change as well as other challenges such as detrimental fishing practices (e.g., overfishing), coastal development, land and marine-based pollution, etc. (<http://www.iucnredlist.org>. Accessed October 8, 2010). The costs range from environmental to social and economic. Reef health, including the impacts of coral bleaching, is seen to be important to the experience and satisfaction of dive tourists, for instance (see Zeppel, 2011). A 30% loss of corals resulting in reduced tourism off the coast of Kenya (Mombasa) and Tanzania (Zanzibar) created economic losses of about US\$12–18 million (Payet and Obura, 2004, cited in Hall, 2008). Study of coralline beaches and ecotourism in the Dominique Republic indicates that current rates of beach erosion could result in significant revenue losses to the hotel industry, but if corals continue to die off, beach erosion (and hence tourism revenue loss) would be substantially higher, increasing even a decade after the disappearance of live corals. The report's recommendations include: "Increase public awareness about marine and coastal ecosystems, the benefits they provide to society, and threats to their existence" (Wielgus et al., 2010, p. vii).

Public awareness, unfortunately, is especially understudied in the context of tourism and climate change, and little is understood of how visitors perceive and value protected World Heritage Areas like the Great Barrier Reef, their knowledge and actions related to climate change and sustainability issues, or their behaviors and travel choices in light of climate change and sustainability issues. The exploratory research presented below commences a preliminary look at this in the context of climate change and tourism. The aim of the study was to explore visitor motivations, perceptions and behaviors related to the Great Barrier Reef (GBR), and also commence a preliminary exploration of the relationship between visitor knowledge and environmental action and behaviors.

2. Method

2.1. Study Location and Setting

Protected areas, including coastal marine parks, are of immense historical and cultural significance in addition to their biodiversity value. Their physical landscapes are repositories of tangible as well as intangible cultural and heritage goods. The far north Queensland area contains vital environmental and cultural resources on which tourism is heavily dependent, including the World Heritage Areas of the Wet Tropics and the Great Barrier Reef (GBR). Increases in water temperatures from 2°C to 6°C are expected to have severe implications for the health of coral reefs, fisheries and coastal ecosystems that are shared with the Wet Tropics WHA.¹ The research reported below is located within this complex region in Far North Queensland; the study boundaries extend from Cairns south to Mission Beach and north to Cape Tribulation. The economic significance of tourism in this region is well documented (Prideaux and Falcone-Mammone, 2010).

¹ See http://www.wettropics.gov.au/th/th_climate.html. Accessed 10/27/2010

Climate change research has documented a range of potential impacts on vertebrate populations, birdlife, temperature, rainfall and weather patterns, as well as potential changes in landscape due to accelerated growth of existing invasive species during extreme hazard occurrences such as Cyclone Larry.² This is expected to have a significant impact on certain sectors of the tourist market, such as those who value bird watching and other nature-based and marine activities including diving in the Great Barrier Reef Marine Park (see Zeppel, 2011). As discussed in Turton et al. (2009), an estimated 74% of rainforest birds (including 26 critically endangered species) in northeast Australia could be threatened by mid-range warming in this century, with upland birds most at risk of extinction and potentially threatened by even small increases in temperature. In contrast, the population size of lowland birds may increase in the short term (Shoo, Williams & Hero, 2005, cited in Turton et al., 2009). Australia's Great Barrier Reef has undergone eight mass bleaching events since 1979 (1980, 1982, 1987, 1992, 1994, 1998, 2002 and 2006), with the most severe ones occurring in 1998 and 2002 (affecting about 42% and 54% of reefs respectively) (Berkelemans et al, 2004; cited in Hall 2008). Local anthropogenic issues, such as pollution, over-fishing and sedimentation, increase the resilience and vulnerability of reef ecosystems to climate change related effects such as ocean acidification.

All these are anticipated to impact visitor experiences and enjoyment (and their adaptability), yet, little baseline information is available on visitor knowledge, perceptions and actions related to climate change and sustainability issues. The study reported below addresses these in the context of the Great Barrier Reef, Australia, which is protected as a Marine Park and as a World Heritage Area. The study area is delimited to Far North Queensland and ranges from Cairns south to Mission Beach and north to Cape Tribulation.

2.2. Data Gathering and Analysis

The paper reports survey research results on visitor knowledge and action related to sustainability and climate change in the Great Barrier Reef World Heritage Area. It should be noted that over the period 2007 to 2010, 4,672 self-completed surveys were collected from tourists in the departure lounge of the Cairns Domestic Airport. These addressed a range of issues including motivations and activities of visitors to the GBR WHA, recognition of GBR as a World Heritage Area, travel and accommodation choices (Thompson and Prideaux, 2012). The current 2012 survey, also administered at the Cairns domestic airport, included questions on climate change and sustainability oriented choices made (e.g. choosing ecotourism certified reef operators). Results from the current

² Research indicates a rapid response in growth rates of existing invasive weed *Miconia calvescens* due to the opening of the canopy caused by the Cyclone Larry, as well as rapid rise in recruitment, etc. (see <http://www.csiro.au/science/Weeds-and-rainforests-Cyclone-Larry.html#4>. Accessed 7/28/11)

July–September 2012 airport survey are presented and discussed, in the context of world heritage, climate change and sustainability in this iconic tourism destination, the Great Barrier Reef WHA.

All surveys were administered in the domestic terminal of the Cairns International Airport. One of the study's research team spent two days per month surveying departing visitors at the departure lounge. Data collection days were randomized within weekdays. Visitors were surveyed by asking waiting passengers if they were residents of the region or visitors. The self-completion style questionnaires was 4 pages long and took approximately 10–12 minutes to complete. The language of the questionnaire was English and therefore the sample was limited to visitors who can read and write in English. Passengers at the domestic airport comprised of both regional Australian visitors as well as international visitors.

Data collected for this research included closed and open-ended questions on socio-demographic information, motivations for visiting the region, activities undertaken, plus issues related to climate change and sustainability. Questionnaires were collected from July 2012 to September 2012 (n=368). Closed-ended responses were based on nominal as well as ordinal data, which were analyzed using SPSS 20 statistical software. Nonparametric tests were used to test the closed responses as the data was distribution-free and ordinal and nominal in nature. Open-ended responses were analyzed through content analysis. Care should be taken in generalizing these results over a larger population.

3. Results

This section summarizes and discussed some of the key findings from this exploratory investigation of climate change and visitors to the GBR. The sample consists of 368 valid responses from participants with a response rate of 92%.

3.1. Demographic Overview

The sample consisted of 51.5% males and 48.5% female. Survey respondents originated from both Australia (53%) and overseas (47%). International visitors originated mainly from the Europe (28.6%) which included UK and Ireland (10.9%) plus Germany (3.8%), as well as North America (11.2%). Ages ranged from 19 to 85 years old. The main age groups of respondents for this period were: 20–29 years (24.1%), followed by 50–59 years (20.5%), 30–39 years (12.9%) 40–49 years (12.9%), 60–65 years (9.9%) and under 20 years (8.6%). A majority of respondents (43.2%) reported that they had received a degree or higher university qualification, finished secondary education (21.3%) had a diploma (16.7), had a trade or TAFE qualification (10.7%) or other kinds of education (8.1%). A good proportion were professionals (25.1%), students (18%), or retired/semi-retired (16.1%). Other occupations included public service (8.7%), self-employed (8.2%), management (6.6%), tradesperson (5.5%), clerical (3.6%), domestic duties (2.7%), service industry (2.5%), retail (2.2%) and manual/factory worker (.8%).

3.2. Booking Tours That Have Environmental Accreditation

Participants were asked if they have a preference to book tours that have environmental accreditation. We found that close to half people (46.4%) answered “depends,” 22.8% answered “Yes” and 30.8% answered “No.” The probability that a person prefers to book an environmentally accredited tour appears to depend on their level of education. People who have a diploma or better in terms of formal education are significantly more likely to prefer to book such tours than those with less formal education (52.2% vs. 26.3%; $p=0.02$). This accords well to finding in ecotourism research (Musau and Prideaux, 2003).

Table 1. Education Level vs. Book Environmentally Accredited Tours

Book Environmentally Accredited Tours	Secondary	Trade/TAFE	Diploma	Degree	Other Education
Yes	29.0%	23.1%	53.3%	54.2%	38.5%
No	71.0%	76.9%	46.7%	45.8%	61.5%

3.3. Recognition and Importance of World Heritage Designations in the Cairns Region

Approximately half of the respondents (51.2%) reported that they noticed World Heritage designated sites in the Cairns region. They were asked to name the World Heritage sites they noticed; open-ended responses were categorized under GBR or grouped under other significant heritage areas (which included the rainforests of the Wet Tropics World Heritage Area (WTWHA)). The table below shows that about a third of respondents who noticed a WHA in the region named either or both sites in their responses. The results indicate that GBRWHA (31.9%) is slightly better recognized by the respondents than the WTWHA (28.5%). Overall however, results indicate a generally poor recognition of the World Heritage brand despite the region’s main selling proposition is based on two World Heritage properties.

Table 2. Recognition of World Heritage Designations in the Cairns Region

Area	%
GBR	22.6
Reef	9.3
Total of GBR related responses	31.9
Rainforest/Wet Tropics	10.9
Daintree	13.4
Other locations in WTWHA	4.2
Total of Wet Tropics related responses	28.5

It would appear, however, that the World Heritage status may not greatly affect tourism visitation to Cairns. When asked if they would still have made this trip to Cairns if the Great Barrier Reef *lost* its World Heritage status, a high percentage of visitors responded affirmatively (Yes 84.2%/ No 15.8%).

3.4. Visiting the Great Barrier Reef: Activities

More than half of the respondents (64%) reported that they have been to the GBR on this trip to the region and 36% of respondents reported that they have not been to the GBR. It was a first visit for 71.4% of respondents who reported visiting the GBR on this trip to the region, the remaining were repeat visitors. The most common activities related to the reef were snorkeling (50.8%) followed by swimming (35.2%), glass bottom boat and semi-submarine coral viewing (29%) and visiting other islands in the region (20.8%). A range of activities were identified (Table 3), of which several key activities are summarized below.

Table 3. Participation Rate in Great Barrier Reef Activities

Activity	No (%)	Yes (%)
Swim	64.8	35.2
Snorkeling	49.2	50.8
Sailing	90.7	9.3
Helicopter flight	96.4	3.6
Visiting the islands	79.2	20.8
Marine biologist tour	92.3	7.7
Certified diving	94.0	6.0
Overnight cruise	97.0	3.0
Diver training course	98.1	1.9

Uncertified diving	95.9	4.1
Viewing marine animals	73.0	27.0
Glass bottom boat/Semi sub	71.0	29.0

SWIMMING AND SNORKELING

There was significant difference between domestic and international respondents in their participation in swimming. Approximately half of international respondents participated in swimming (48.5%). Most domestic respondents reported that they did not swim (76.1%) during their visit to the GBR. There was also significant difference between domestic and international respondents in their participation in snorkeling activity: many international respondents went snorkeling (68.0%), while nearly two-thirds (64.0%) of domestic respondents reported that they did not.

SAILING

There was a significant difference between domestic and international respondents concerning whether or not they went sailing when they visited the Great Barrier Reef. Only 4.6% of domestic respondents participated in a sailing activity compared to a significantly higher proportion of international respondents (14.8%).

CERTIFIED VS. UNCERTIFIED SCUBA DIVING; DIVER TRAINING COURSES

A significantly higher proportion of international respondents (11.2%) reported that they participated in a certified scuba diving activity when they visited the GBR, in contrast to 1.5% of domestic respondents. Significant difference between international and domestic respondents' participation in a diver training course was also noticed; domestic respondents again showed lower participation (3.6%). There was no significant difference between international and domestic respondents' participation in uncertified introductory scuba diving, however: domestic respondents (3.6%) had slightly lower participation than international (4.7%).

GLASS BOTTOM BOAT/SEMI-SUB CORAL VIEWING

When it pertains to viewing coral from a glass bottom boat or a semi-sub, there is no significant difference between domestic and international visitors but that may be due to the sample size. Approximately one-third (33.7%) of international visitors participated in such an activity during their trip to the Great Barrier Reef compared to just 24.9% of domestic visitors.

Marine Biologist Tour

The result showed no significant difference ($p=.673$) between international and domestic respondents' participation in a marine biologist tour. Both international (8.3%) and domestic respondents (7.1%) showed a very low participation in marine biologist tours when they visited the GBR. Some reef operators include a marine biologist led snorkel tour in their offering, while others charge for this activity (around \$20 or so).

VIEWING MARINE ANIMALS

There was a significant difference between international and domestic respondents' participation in marine animal viewing. A much higher proportion of international respondents (34.9%) participated in this activity, compared to 20.3% of domestic respondents.

3.5. Deterrents to Visiting the Great Barrier Reef

The questionnaire investigated the overall experience and deterrents to visiting the GBR, such as a hypothetical oil spill, a coral bleaching event and visibility/clarity of viewing marine life. Participants were also asked to rate their experience at the GBR. A high proportion (83.9%) of the participants reported that they had a "good" experience at the GBR, 14.3% reported that their experience was "fair" and only 1.8% rated their experience as "poor."

HYPOTHETICAL OIL SPILL

The questionnaire also investigated participants' potential reactions to hypothetical environmental degradation of the GBR or events that might affect their experience. The survey asked participants if they would still have chosen to visit if the GBR near Cairns was damaged by a major oil spill. Overall, 26% of all respondents reported that they will visit Cairns even if the GBR near Cairns was damaged by a major oil spill, 29.5% reported that they would not visit the region, 44.5% reported "maybe" they would visit the region. There was no significant difference in their response between genders ($p=.932$). However, a significant difference was observed in their origins: 35.8% international respondents reported that they would not have visited the region compared to 20% of domestic respondents. 36.7% of domestic respondents and 19% of international respondents responded "yes" to visiting if there was a major oil spill. 43.3% of domestic respondents and of 45.3% international respondents responded "maybe." The sample size was too small to test age group and educational background.

CORAL BLEACHING EVENT

Close to a third of all respondents reported that they would still have visited Cairns even if the GBR was affected by a major coral bleaching event (described in the questionnaire as when the coral dies because of high water temperatures). 19.7% answered “no” and more than half (50.7%) reported a major coral bleaching of the GBR would not have come to Cairns. We did not observe significant difference in the reaction between genders ($p=.808$). Significant difference was found only in regard to origin of the respondents. The result indicates that international respondents are less likely to visit Cairns if a major coral bleaching occurred. 13.2% of domestic and 23.4% of international respondents expressed that they would not have visited and 39.6% of domestic and 22.6% international reported that it would not have affected their decision to visit Cairns. About half of both domestic (47.3%) and international respondents (54%) responded “maybe.” The sample size was too small to test age group and educational background.

VISIBILITY/CLARITY OF VIEWING

Participants expressed the most negative response to degradation in water visibility/cleanness—they were asked if they would still have visited Cairns if water at the GBR was known to be murky. Only 25.3% reported “yes,” 34.4% reported “no” and 40.3% reported that they may have still have made their trip to Cairns depending on the murkiness of the water. There were no significant difference in their reaction across gender ($p=.428$). However, the respondents’ origins did matter: International respondents reported more negative responses (Yes 17.3%, No 40.6% and Maybe 42.1%) than domestic respondents (Yes 37.5%, No 25% and Maybe 37.5%). The sample size was too small to test age group and educational background.

3.5 Perceived Seriousness of Climate Change

Participants were asked to rate how serious a problem climate change is. Most people considered climate change as a serious problem, as shown in below table. International visitors were found to be significantly more likely to rate climate change as a “very serious” or worse problem than Australian visitors. The figure for international visitors is 70.1% compared to 54.0% for domestic visitors.

Table 4. Perceived Seriousness of Climate Change

Level of Seriousness	Percentage of Respondents
Not serious at all	5.6
A little serious	9.6
Somewhat serious	23.7
Very serious	40.4
The biggest environmental issue we face	18.6
The single biggest issue we face	2.0

There is a statistically significant difference between those who consider climate change to be a “very serious” or even worse problem and those who consider it to be less than a “very serious” problem based on education level ($p=0.013$). As the table below shows, the more educated a person is the more likely they are to consider climate change to be a “very serious” or worse problem. Nearly two thirds (65.9%) of those with a diploma or higher in terms of formal education consider climate change to be a “very serious” or worse problem compared to just 46.8% of those with a less formal education.

Table 5. Perceived Seriousness of Climate Change vs. Level of Education

Seriousness of Climate Change	Secondary	Trade/TAFE	Diploma	Degree	Other Education
Less than "Very Serious"	53.4%	52.8%	36.2%	35.2%	23.1%
Very Serious or Worse	46.6%	47.2%	63.8%	64.8%	76.9%

3.6. What Participants Considered to be the Single Greatest Cause of Climate Change

Participants were prompted to respond to an open ended question on what they believed was the “single greatest cause” of climate change. A total of 278 responses were received and categorized under anthropogenic impacts (i.e. energy use, fossil fuel, over population, human greed, urbanization, capitalism), climate change is a myth (i.e. I do not believe in it, climate change does not exist, weather), nature (i.e. volcanic gases, natural cycle, nature), both anthropogenic and natural impact (i.e. man and nature) and others. The category “Others” includes responses where causes were not identifiable (i.e. CO₂, global warming, ice cap melt, ozone). As the table below indicates, a high proportion of respondents believed that climate change is mainly caused by anthropogenic activities.

A low proportion perceived it does not exist (2%) or that it occurs as a part of the natural cycle (4.8%).

Table 6. Single Greatest Cause of Climate Change

Identified Causes of Climate Change	Percentage of Respondents
Anthropogenic	63.8
Climate change is a myth	2.0
Nature	4.8
Both anthropogenic impact and natural cycle	0.9
Others	28.5

3.7. Making a Meaningful Contribution to Reducing the Impact of Climate Change

Respondents were asked if they believe they can make a meaningful contribution to reducing the impact of climate change. The result indicates that most people are making an effort in mitigating the impact on climate change (61% said yes, they were trying to reduce my impacts now in a meaningful way). But it also shows that many of the respondents were hesitant to take an action to mitigate their impact on climate change (No, it is too big an issue for one person 16%; No, I have tried to change, but it is too difficult .3%; Possibly, but it would require a major lifestyle change that I am not willing to make now 12.8%; Yes, but sometime in the future 9.9%).

Table 7. Personal Commitment Level to Reducing the Impacts of Climate Change

	Percentage of Respondents
No too big	16.0
No too difficult	0.3
Possibly	12.8
Yes sometime	9.9
Yes trying	61.0

There is a statistically significant difference between those who claim to be trying to reduce their impact on climate change now and those who are not, based on age group. As shown in the following table, respondents aged 40 or older are significantly more likely to be trying to reduce their impacts now than are their younger counterparts (71.0% vs. 50.0%).

Table 8. Climate Change Reduction Contribution by Age Category

Climate Change Reduction Contribution	Under 20 yrs	20–29 yrs	30–39 yrs	40–49 yrs	50–59 yrs	60–65 yrs	Over 65 years
Trying Now	51.5%	48.2%	52.3%	69.8%	71.0%	75.0%	68.6%
Not Trying Now	48.5%	51.8%	47.7%	30.2%	29.0%	25.0%	31.4%

There is a statistically significant difference between people who are trying to reduce their impacts on climate change now and those who are not, based on education level. People who have obtained a diploma or better are much more likely than those with less formal education to indicate that they are trying to reduce their own personal impacts on climate change at the present time (65.5% vs. 52.3%).

Table 9. Climate Change Reduction Contribution by Level of Education

Climate Change Reduction Contribution	Secondary	Trade/TAFE	Diploma	Degree	Other Education
Trying Now	50.0%	57.1%	77.8%	60.7%	65.4%
Not Trying Now	50.0%	42.9%	22.2%	39.3%	34.6%

3.8. Concern about Various Climate Change Impacts on Australia

DAMAGE THE GREAT BARRIER REEF

Participants were highly concerned about the impact of climate change on the GBR (see table below). There was a significant difference in responses between genders, ($\chi^2(3, N = 343) = 13.738, p = .003$). Females reported significantly higher concerns (Not all concerned, 3%, A little concerned 10.8%, Concerned 34.7% and Very concerned 51.5%) than males (Not all concerned, 4.5%, A little concerned 15.9%, Concerned 47.7% and Very concerned 31.8%). Chi square test for independence did not detect significant differences by origin ($p = .682$). The sample was too small to test significance within age groups or educational background.

Table 10. Level of Concern that Climate Change Will Damage the Great Barrier Reef

Level of Concern	Percentage of Respondents
Not at all concerned	3.7
A little concerned	13.1
Concerned	41.9
Very concerned	41.3

As the two tables below show, survey participants were greatly concerned about impacts at the reef and on the wildlife and only a little less concerned about the sustainability of the rainforest in the face of climate change.

DAMAGE THE RAINFOREST

Participants were highly concerned about the impact of climate change on rainforest. Female expressed significantly higher concerns towards the impact of climate change on rainforest, $\chi^2(3, N=343) = 7.883, p=.048$. Females reported significantly higher concerns (Not all concerned, 3%, A little concerned 12.6%, Concerned 37.1% and Very concerned 47.3%) than males (Not at all concerned, 5.1%, A little concerned 17.6%, Concerned 44.3% and Very concerned 33%). Chi square test for independence did not detect significant differences within origin ($p=.497$). The sample is too small to test significance within age groups or educational background.

Table 11. Level of Concern that Climate Change Will Damage the Rainforest

Level of Concern	Percentage of Respondents
Not at all concerned	4.0
A little concerned	14.8
Concerned	41.0
Very concerned	40.2

LEAD TO THE EXTINCTION OF SOME AUSTRALIAN ANIMALS

Participants were also highly concerned about the impact of climate change that it may lead to the extinction of some Australian animals. Female expressed significantly higher concerns towards the extinction of Australian fauna, $\chi^2(3, N=343) = 8.408, p=.038$. Females reported significantly higher concerns (Not all concerned, 3%, A little concerned 10.1%, Concerned 36.3% and Very concerned

50.6%) than males (Not all concerned, 5.7%, A little concerned 17.1%, Concerned 40% and Very concerned 37.1%). Chi square test for independence did not detect significant differences within origin ($p=.435$). The sample is too small to test significance within age groups or educational background.

Table 12. Level of Concern that Climate Change Will Lead to the Extinction of Some Australian Animals

Level of Concern	Percentage of Respondents
Not at all concerned	4.3
A little concerned	13.4
Concerned	38.7
Very concerned	43.6

REDUCE QUALITY OF LIFE

Participants were not nearly as concerned about climate change reducing their quality of life as they were about the other three issues discussed above. A little over one quarter (26.4%) were “very concerned” that climate change would reduce their quality of life and a further 39.7% were “concerned.” There were no significant differences found on the main demographic variables of gender, origin, age or educational background.

Table 13. Level of Concern that Climate Change Will Reduce Quality of Life

Level of Concern	Percentage of Respondents
Not at all concerned	9.8
A little concerned	24.1
Concerned	39.7
Very concerned	26.4

3.9. Knowledge and Action about Climate Change

Respondents were asked to rate their own level of knowledge about climate change. More than half of the respondents (59.7%) reported that they have “some” knowledge about climate change followed by “little” (23.6%). Only 13.4% considered that they have “high” knowledge about climate change and 3.4% reported that they had “no” knowledge about climate change. There was no significant difference in their response across gender ($p=.179$), origin ($p=.566$), generations ($p=.472$) or educational back ground ($p=.105$).

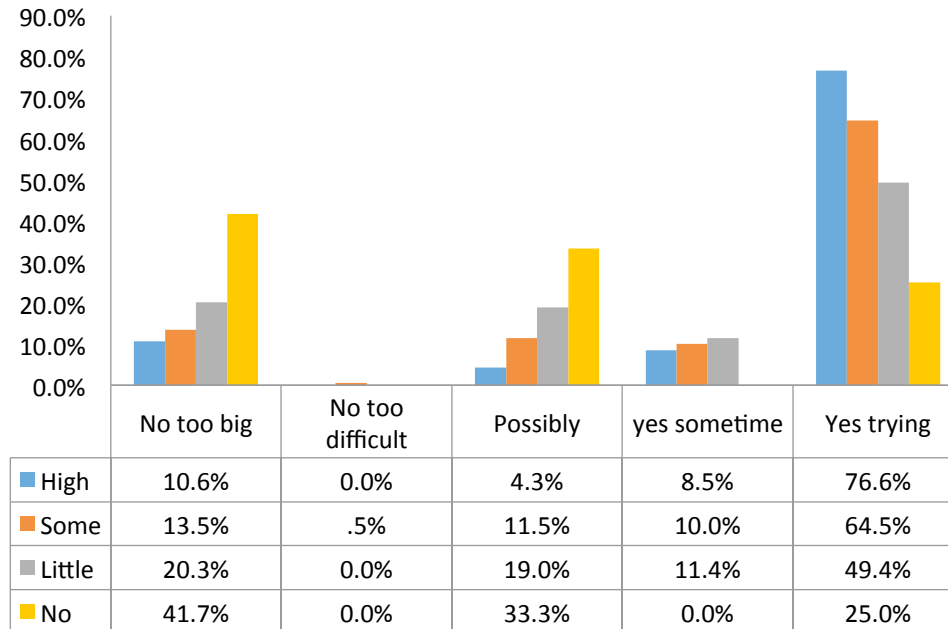
Even though there wasn't a statistically significant difference between climate change knowledge and preference to book tours that have environmental accreditation, it is clear from the table below that those who felt that had a high degree of climate change knowledge were more likely to book a tour that is environmentally accredited. Only 11.1% of those who claim to have no climate change knowledge prefer to book such tours compared to 52.2% of those with a self-professed high level of knowledge on climate change.

Table 14. Preference to Book Environmentally Accredited Tours vs. Perceived Climate Change Knowledge

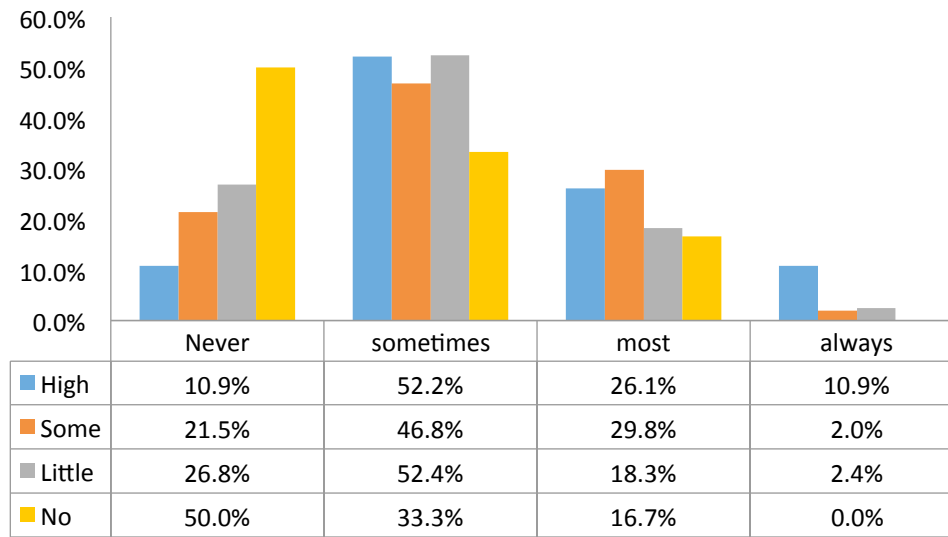
Book Environmentally Accredited Tours	High	Some	Little	No
Yes	52.2%	47.7%	31.4%	11.1%
No	47.8%	52.3%	68.6%	88.9%

There also appears to be a relationship between perceived climate change knowledge and the belief that the participant in question can make a meaningful contribution to reducing the impact of climate change. While sample size was not quite large enough to claim statistically significant differences, there was a clear pattern that indicated the more climate change knowledge a person had, the more likely s/he was acting to try and reduce climate change impacts in a meaningful way. This ranges from a low of 25.0% for those who claim to have no climate change knowledge to 76.6% for those with a high level of climate change knowledge.

Figure 1. Climate Change Knowledge vs. Level of Commitment to Making a Meaningful Contribution to Reducing the Impact of Climate Change



Respondents had been asked whether they look for a place that is actively protecting its environment, when they select a vacation destination. 22.5% indicated “Never,” 48.4% indicated “Sometimes” 25.9% indicated “Most of the time” and only 3.1% selected “Always.” The majority of people (regardless of their level of climate change knowledge) who seemed to be either “concerned” or “very concerned” about climate change impacts, didn’t seem to factor in the environment when choosing a vacation destination. However, even those most knowledgeable about climate change seldom “always” select a vacation destination that is actively protecting its environment; as the chart below shows, the figure is just 10.9% for “always” and 26.1% for “most of the time” (statistically significant differences between this variable and climate change knowledge cannot be verified due to the small sample size). It therefore appears that environmental protection is not a driving factor for many people when choosing where to go on a vacation, regardless of their level of climate change knowledge.

Figure 2. Climate Change Knowledge vs. Concern about Impacts

3.10. Profile of “Believers and Doers”

The emerging results suggested that developing a profile of climate change savvy (self-typed), highly serious, and action oriented respondents who high level of climate change knowledge might be useful to explore further. This sub-group that we call “believers and doers” is characterized as follows: respondents identify themselves as having a high level of knowledge about climate change; they consider climate change to be a “very serious” or worse than that, and they are acting to try and reduce their personal impacts on climate change in a meaningful way. The size of this group from our sample was surprisingly small at just 31 people out of 368.

We then looked at this group in terms of four demographic variables: age, origin (Australia or international), education level and gender. Compared to the sample as a whole, this subgroup has more males than females (63.3% vs. 51.5%). There is little difference in terms of origin with 54.8% of this sub-group coming from Australia compared to 53.7% for the overall sample. Respondents appear to have much more formal education than the overall sample, with 90.0% having a diploma or better compared to just 68.0% of the entire sample. In terms of age, the group skews towards being older than the overall sample, with 77.4% being 40 years of age or older compared to 53.4% for the sample as a whole. This group is not unlike some ecotourist profiles in terms of education and age (Tao, Eagles and Smith, 2004).

4. Conclusions

Weaver (2011: 5) notes among the challenges related to the rudimentary state of knowledge about tourism and climate change, an “apathetic and fickle travelling public and a reciprocally uncommitted tourism industry.” What is puzzling is the apparent gap in the literature about tourists’ knowledge, beliefs, perceptions and actions. Are they more than merely hedonistic, pleasure seeking travelers? Might they not become potentially engaged members of civic society and the public sphere, actively pursuing sustainability actions and behavior change due to learning and experience from the destination visited? How does knowledge mediate their preferences and actions? This conference paper attempts to offer some early insights into these questions, through an exploration of visitors to the Great Barrier Reef World Heritage Area.

This paper focuses on the 2012 airport survey questions that relate to climate change and environmental practices of visitors to the Great Barrier Reef. In addition, their perceptions related to its World Heritage status was also examined briefly. Based on the results, a preliminary conversation can be started on visitor perceptions, expectations and behaviors, with implications for environmental and social action. The results indicated that visitors would continue to visit the GBR even if it lost its World Heritage status (there has been some concern that Queensland State Government approval of extensive dredging programs to open coal ports within the Great Barrier Reef Marine Park boundaries may result in the Great Barrier Reef World Heritage Area being listed as a World Heritage Area under Threat is of concern). Visitors, particularly international visitors seemed to express much greater concern about the quality of reef experience to be expected. Murkiness/clarity of the water for clear viewing, coral bleaching, or a possible oil spill, all seem to adversely influence their desire to visit—international visitors exhibited greater disinclination than domestic visitors on all three scenarios, with the greatest concern being on placed on the clarity of the water for viewing marine life. The impact of these three scenarios on activities that international visitors tended to engage in more than domestic visitors in this airport survey sample, such as swimming, snorkeling and certified scuba diving, could certainly adversely impact reef experience. While gender did not play a factor here, it was more evident in the high level of concerns expressed about loss of coral, animals and rainforest due to climate change impacts: women were more concerned than men across all three categories.

Building on the above, an exploration of knowledge and environmental behaviors and actions offers some interesting observations, with socio-demographic factors playing a distinctive role. Education level was important in relation to climate change knowledge and contributing to reducing climate change impacts, as well as in choosing environmentally accredited tours (most tour operators to the GBR have ecotourism certification, but not all). The more formal education they had, the more likely they were to perceive climate change as a very serious or even worse problem—68% of the sample had a high school diploma or better, compared to 90% of the “believers and doers” sub-group discussed in the previous section. This involved, highly concerned sub-group also showed an

older age profile (77.4% being 40 years of age or older, compared to 53.4% of the sample as a whole. Not surprisingly, anthropogenic causes were identified as the single greatest contributor to climate change by a high proportion (63.8%) of the 278 responses to this question. Knowledge, too, played a significant role—those with higher levels of knowledge were more likely to believe that they can make a meaningful contribution to reducing the impacts of climate change. But, despite the relatively high level of education in this sample, knowledge and education did not seem to influence them strongly towards choosing a holiday destination that is actively protecting its natural environment. While cost may be playing a factor here, the study is limited in this regard (income and cost issues were left out of the survey to accommodate the climate change questions included this time).

The resiliency of coastal communities and tourism in areas vulnerable to climate change stands to be significantly affected by use-preservation decisions, and swings of tourist demand and flows. The economic and societal trade-offs that will be required could result in significant impacts on local communities and stakeholders whose livelihoods and well-being stand to most be affected by climate change impacts and changes in tourist demand and flows (see Becken 2010; Gössling & Hall 2006; Ritchie, 2009). Sustainable tourism must address climate change and social action with far greater seriousness than it has to date (Scott, 2011), drawing on the benefits of an informed citizenry—residents and tourists who are informed, aware and capable of acting for societal good and environmental sustainability. As the airport survey results above indicate, awareness raising, education and knowledge all play important roles towards this end.

Conflict of interest

The authors declare no conflict of interest

Acknowledgements

We would like to thank to Brian Smith for assistance in survey data analysis plus formatting. We would like to also acknowledge the support of The Cairns Institute, James Cook University, Smithfield, Queensland, Australia.

References

- Becken, S. (2004). How tourists and tourism experts perceive climate change and carbon offset schemes. *Journal of Sustainable Tourism*, 10(2): 114–130.
- Becken, S. (2010) “The Importance of Climate and Weather for Tourism,” Literature Review. Canterbury, New Zealand: LEAP Research Centre, Lincoln University.
- Becken, S. and Hay, J.E. (2007) *Tourism and Climate Change: Risks and Opportunities*, Clevedon: Channel View.

- Berkelmans, R. De'ath, G. Kininmonth, S. and Skirving, W.J. (2004). A Comparison of the 1998 and 2002 Coral Bleaching Events of the Great Barrier Reef: Spatial Correlation, Patterns and Predictions. *Coral Reefs*, 23: 74–83.
- Buckley, R. (2012). Sustainable Tourism: Research and Reality. *Annals of Tourism Research*, 39(2): 528–546).
- De Grosbois, D. and Fennell, D. (2011) Carbon Footprint of the Global Hotel Companies: Comparison of Methodologies and Results. *Tourism Recreation Research*, 36(3): 231–245.
- Farrell, B. and Twining Ward, L. (2004) “Reconceptualizing Tourism,” *Annals of Tourism Research*, 31(2): 274–295.
- Gössling, S. and Hall, C.M. (Eds.) (2006) *Tourism and Global Environmental Change: Ecological, Social, Economic and Political Relationships*, New York: Routledge, 54–75.
- Gössling, S., Scott, D., Hall, C.M., Ceron, J.P., and Dubois, G. (2012). Consumer behaviour and demand response of tourists to climate change. *Annals of Tourism Research*, 39(1): 36–58.
- Great Barrier Reef Marine Park Authority (GBRMPA). Science Information Needs for the Management of the Great Barrier Reef Marine Park 2009–2014. On: http://www.gbrmpa.gov.au/corp_site/info_services/science_management/science_information_needs. Accessed 10/27/2010.
- Great Barrier Reef Marine Park Authority (GBRMPA). Great Barrier Reef Outlook Report 2009. Available on: http://www.gbrmpa.gov.au/corp_site/about_us/great_barrier_reef_outlook_report. Accessed 10/27/2010
- Hall, M. (2008) Tourism and Climate Change: Knowledge Gaps and Issues. *Tourism Recreation Research*, 33(3): 339–350 (Research Probe).
- Herremans, I, Nishant, P., and Lu, J. (2011). The Journey Towards Sustainability Reporting: How accountable are the tourism industries? *Tourism Recreation Research*, 36(3): 247–257.
- Huebner, A. (2012). Public perceptions of destination vulnerability to climate change and implications for long-haul travel decisions to small island states. *Journal of Sustainable Tourism*, 20(7): 939–951.
- Jamal, T. (2013). Resiliency and Uncertainty in Tourism. In *The Routledge Handbook of Tourism and the Environment*. A. Holden and D. Fennell (Eds.). New York: Routledge, pp. 505–520.
- Jamal, T. and Watt, M. (2011). Climate change pedagogy and performative action: Toward community-based destination governance. *Journal of Sustainable Tourism*, 19(4–5): 571–588.
- Musau, P. and Prideaux, B. (2003), Sustainable Tourism—A Role for Kenya's Hotel Industry, *Current Issues in Tourism*, 6(3), 197–208.
- McKercher, B., Prideaux, B., Cheung, C. and Law, R. (2010) “Achieving Voluntary Reductions in the Carbon Footprint of Tourism and Climate Change,” *Journal of Sustainable Tourism*, 18(3): 297–317.
- Mair, J. (2011). Exploring air travellers' voluntary carbon-offsetting behaviour. *Journal of Sustainable Tourism*, 19(2): 215–230.

- Needham, M. (2010). Value orientations toward coral reefs in recreation and tourism settings: a conceptual and measurement model. *Journal of Sustainable Tourism*, 18(6): 757–772.
- Payet, R. and Obura, D. (2004). The Negative Impacts of Human Activities in the East African Region: An International Waters Perspective. *Ambio*, 33: 24–33.
- Prideaux, B., Coghlan, A. and McNamara, K. (2010). Assessing Tourist’s Perceptions of Climate Change on Mountain Landscapes. *Tourism Recreation Research*, 35(2).
- Scott, D. (2011) “Why sustainable tourism must address climate change,” *Journal of Sustainable Tourism*, 19(1): 17–34.
- Scott, D., de Freitas, C.R. and Matzarakis, A. (2006) “Adaptation in the Tourism and Recreation Sector,” in K.L. Ebi, I. Burton and P. Hoeppe (Eds.), *Biometeorology for Adaptation to Climate Variability and Change*, Dordrecht, The Netherlands: Springer.
- Thompson, M. and Prideaux, B. (2012), Interdependency of reef and rainforest tourism—A segmentation analysis of visitors to Tropical North Queensland, Cairns< Marine and Tropical Sciences Research Facility
- Tao, C.H., Eagles, P. and Smith, S (2004) Profiling Taiwanese Ecotourists Using a Self-Definition Approach, *Journal of Sustainable Tourism*, 12: 149–168.
- Turton, S., Hadwen, S.W., and Wilson, R. (Eds.) (2009). *The Impacts of Climate Change on Australian Tourism Destinations: Developing Adaptation and Response Strategies—A Scoping Study*. <http://www.crctourism.com.au/BookShop/BookDetail.aspx?d=670>
- UNWTO-UNEP-WMO (2008). *Climate change and tourism: Responding to global challenges*. Madrid: UNWTO.
- Weaver, D. (2011). Can sustainable tourism survive climate change? *Journal of Sustainable Tourism*, 19:1, 5–15.
- Wielgus, J., Cooper, E., Torres, R. and Burke, L. (2010). Coastal Capital: Economic Valuation of Coral Reefs in the Dominican Republic. World Resource Institute (2010). Working Paper available on: <http://www.wri.org/publication/coastal-capital-dominican-republic>. Accessed 10/25/2010
- Zeppel, H. (2011). Climate change and tourism in the Great Barrier Reef Marine Park. *Current Issues in Tourism*. doi:10.1080/13683500.2011.556247.