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Why sustainable tourism must address climate change

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This opinion piece examines Weaver's thesis that sustainable tourism's current expanding engagement with climate change may not necessarily be conducive to the interests of tourism sustainability. It critically examines and responds to the seven interrelated issues presented by Weaver to support that opinion. This paper dispels some common climate science myths that continue to hamper scientific progress and obfuscate debate over climate change policy responses and specifically refutes recent claims of compromised and inaccurate research findings. It is argued that climate change studies reveal a deficiency in past conceptualizations of sustainable tourism that focused almost exclusively on destination scale issues and highlight the need to properly account for the environmental and social impacts of tourism's travel phase. Addressing climate change is considered a prerequisite to sustainable development and therefore germane to advancing sustainable tourism research. 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. Any retreat from engagement with climate change issues by the tourism industry or its researchers would be to their substantial detriment.

Keywords: climate change; environment; sustainable tourism; tourism impacts; policy-making

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Introduction

David Weaver's (2011) opinion piece in the *Journal of Sustainable Tourism* contends that sustainable tourism is becoming "dominated – at least rhetorically – by the issue of climate change" and that "tourism's expanding engagement with climate change, as it is currently unfolding, is not necessarily conducive to the interests of tourism sustainability". Seven interrelated issues are presented to articulate this central thesis.

It is important to note that there are a number of points where Weaver (2011) and I share common ground. But there are also many points where a second critical opinion is clearly needed and this opinion piece – like Weaver's – is offered in the spirit of furthering healthy debate on the place of climate change in sustainable tourism research and practice. In contrast to Weaver (2011), this paper argues that how tourism responds to climate change is absolutely critical to the sustainability of tourism and should the sector retreat from climate change engagement, it would be to its substantial detriment. It also seeks to "clear the air" on some common climate science myths that continue to hamper scientific progress and obfuscate debate over policy responses broadly but also within the tourism sector.

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While the salience of the various concerns raised by Weaver (2011) would normally dictate the order in which they be discussed (e.g. challenges to the credibility of climate science in Issue 5 would be dealt with first), to facilitate comparisons of opinion, the paper has been structured in the same order and using the same titles of the seven issues identified by Weaver (2011).

Before proceeding, it is incumbent that I declare that in my current academic position and my previous position with the Meteorological Service of Canada that I participated in the Third and Fourth Assessments (TAR and AR4) of the Intergovernmental Panel on Climate Change (IPCC) as a contribution author and expert reviewer in Working Group 2 (WG2).

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Issue 1: limited and imbalanced knowledge

Scholarship on tourism and climate change now extends over a period of 25 years, with the engagement of the tourism sector emerging largely over the past decade (see the timeline on the development of climate change as an issue for tourism in Scott & Becken, 2010). Weaver (2011) uses the CABI Direct database to document the rapid increase in the number of academic publications on climate change and tourism between 1986 and 2009. Of the 128 papers found, 66% were classified as studies of the potential impacts of climate change on destinations or changing visitation patterns (40% on winter-ski tourism and less than 10% on small islands or coastal areas), while 15% focused on the contribution of tourism to climate change through greenhouse gas (GHG) emissions.

Given the thesis that the growing influence of climate change is seen as having a potentially negative impact on the development of sustainable tourism's research and its implementation, presumably this noted exponential growth in research and publications (one of few empirical metrics of "dominance" offered in the paper) is not interpreted as a positive trend. However, let us consider this growth in climate change and tourism publications in another way. What percentage of total tourism scholarship does climate change represent? Analysis of the content of four leading tourism journals (*Annals of Tourism Research*, *Journal of Sustainable Tourism [JOST]*, *Journal of Tourism Research*, *Tourism Management*) revealed that climate change papers represented only 1.7% of all papers published in the past decade (2000–2009). The proportion of climate change papers was highest in JOST but still represented only 6.4% of papers. Surely this cannot be construed as "dominance" of the tourism or sustainable tourism literature.[1] Is it not prudent for the tourism research community to invest at least 2% of its effort to understand what Butler and Jones (2001, p. 300), in their concluding summary of the *International Tourism and Hospitality in the 21st Century* conference, stated, ". . . could be *the* major problem of the century *(original emphasis)*" and what the *Davos Declaration* (endorsed by the United Nations World Tourism Organization [UNWTO], United Nations Environment Programme [UNEP], World Meteorological Organization [WMO], 2007 and later the International Tourism Ministers Summit on Climate Change in London) concluded, "must be considered the greatest challenge to the sustainability of tourism in the 21st century" (UNWTO–UNEP–WMO, 2008, p. 38)?

It is argued that these results corroborate major knowledge gaps identified by Hall (2008), Scott (2008), Scott & Becken (2010), UNWTO–UNEP–WMO (2008) and the absence of peer-reviewed literature on which to inform policy and operational decisions. The knowledge gaps ("imbalance") being referred to are geographic and sectoral in nature. I fully concur that climate change and tourism research is needed in a number of regions of the world (see priority areas identified by Hall, 2008 and Scott, Amelung, et al., 2008) and some priority sub-sectors, such as coastal tourism. Rather than "imbalance", the early focus

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on winter sports tourism can be deemed rational, even strategic, because this sub-sector is one of the most direct and most immediately impacted by climate change. Scholars could perhaps be forgiven for focusing on the nearer-term risks posed by climate change that would presumably be of most interest to tourism stakeholders (governments, industry, investors). This early focus was also simply a reflection of the geographical distribution of early scholarship on climate change and tourism that until 2000 primarily emanated from research teams in Canada and Switzerland. Furthermore, while climate change research on coastal tourism has been limited, it is not absent and is rapidly emerging.[2] Recent works highlight the response of tourists and tour operators to beach erosion (Buzinde, Manuel-Navarrete, & Morais, 2010), an analogue for response to sea-level rise, and provide case studies of the vulnerability of coastal tourism infrastructure to sea-level rise (Bigano, Bosello, Roson, & Tol, 2008; Schleupner, 2008). Ongoing work by the author using satellite data and geospatial data of coastal geology and tourism development in a geographic information system has revealed that 266 of 906 major tourism resorts in 19 CARICOM[3] nations of the Caribbean are vulnerable to flooding by a one metre sea-level rise (a level projected to occur within the twenty-first century by a number of recent studies – Nicholls & Cazenave, 2010; Rahmstorf, 2007, 2010a). A greater proportion of coastal resort properties (440–546) will be vulnerable to coastal erosion related to a one metre sea-level rise, with critical beach assets affected much earlier. Such impacts will transform coastal tourism in the region, with implications for property values, insurance costs, destination competitiveness, marketing and wider issues of local social and economic wellbeing.

Having been immersed in this field for over a decade, I am perhaps more optimistic that 128 peer-reviewed papers do not represent "an absence of peer-reviewed literature", for policy and planning. The field is now developing a critical mass of knowledge and research techniques better suited to deliver relevant knowledge for government and the private sector (Scott & Becken, 2010). This capacity is demonstrated by the increased frequency with which active scholars in this field are commissioned by governments (e.g. ministries of tourism, international development agencies, coastal management agencies) and private consultancies. I can attest through personal experience that some companies are incorporating climate change into strategic planning. However, we should not expect to hear much about this. Where tourism companies see risk to their business or properties, they will not broadcast this vulnerability to guests, investors or insurers, but rather quietly adapt or divest high-risk assets. Similarly, where a company sees competitive advantage, they again will not broadcast this to competitors but use this insight like any other strategic business information to improve their position in the marketplace. Occasionally, there are glimpses of strategic adaptation revealed in the media (e.g. Ebner, 2008).

Limited knowledge is usually a rationale for additional research to advance understanding and evidence-based decision-making, not a justification for retrenchment from an area of inquiry. We also have rudimentary understanding of other major issues related to sustainable tourism (e.g. the economic impacts of tourism in developing countries and whether it actually alleviates poverty or just furthers the elite, the role of tourism in the spread of invasives and health pathogens – to name but two) – should investments in these areas of study be curtailed as well? While there is much to be done to understand the risks and opportunities of climate change, I am optimistic that a somewhat increased level of investment (again, representing less than 2% of tourism research publications over the past decade) will be sufficient to advance knowledge in this field substantially in the decade ahead. This optimism is based on the new contributions to the subject from an increasingly diverse range of scholars from tourism and other disciplines and the training of the first 11 PhDs in this field (all in the last five years)[4] since the original three in the mid-1990s (which were all at the University of Zurich).

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Issue 2: the unpredictability of future outcomes

The importance of uncertainty in climate change mitigation and adaptation decisions is a well-recognized challenge (e.g. White, 2004; Yohe, Andronova, & Schlesinger, 2004). Weaver (2011) validly questions the usefulness of some long-term analyses (beyond 10–20 years) of the implications of climate change on the tourism system. All of the concerns identified focused on the ability to understand tourism demand (i.e. specific tourist behaviors and macro-scale geographic patterns). These are indeed vexing challenges that will require the development of new approaches to advance understanding and reduce levels of uncertainty to the extent they can be (as with all tourism forecasting techniques). Understanding how climate change will interact with other long-term social and market trends influencing tourism demand, including aging populations in industrialized countries, increasing travel safety and health concerns, increased environmental and cultural awareness, advances in information and transportation technology and shifts toward shorter and more frequent holidays are needed (Scott, 2008) and indeed will be "fraught with complication". However, as Lew (2010, p. 483) recently pointed out, while such factors challenge the horizon of human perception and political action, "that does not mean that we should not try to think in terms of long-term sustainability".

Weaver's (2011) questions about the veracity of models that project proportional changes in international tourism flows through to the 2080s with two-decimal place accuracy are precisely why tourism scholars must become further engaged in climate change studies. Gössling and Hall (2006) raised similar questions about such economic models. Applying disciplinary expertise to the critical review of techniques and assumptions in studies emanating from non-tourism disciplines and engaging in interdisciplinary collaborations are critically needed contributions from tourism scholars to advance relevant scholarship in this field.

Weaver (2011) does not comment on the perceived usefulness of long-term analyses (beyond 10–20 years) with respect to the implications of climate change for the supply-side of the tourism system (e.g. the capacity to produce a reliable snow-based tourism product or the availability and quality of beaches for coastal tourism). Here, many decisions come with a long-term commitment that can be climate-sensitive (e.g. investment in transportation infrastructure, coastal development and protection plans), and this has been where a good proportion of the published literature, as well as government and private sector interest, in climate change and tourism research has focused.

Importantly, scholars in every professional field (e.g. planners, engineers, insurers, institutional investors, environmental assessment, construction) are working to overcome the complexities and uncertainties inherent in climate change. Tourism can be no exception, as insights into the implications of climate change are necessary for contemporary climate change policy debates about the costs–benefits of mitigation policy as well as to provide evidence-based adaptation that will require investments over the coming decades. While uncertainty is uncomfortable, it is all we will have in the timeframe that decisions about the future of the global climate system must be made. Uncertainty cannot be allowed to paralyze decision-making in tourism.

Issue 3: accusations of dogmatic and compromised engagement

The 128 papers that make up the climate change and tourism literature reviewed by Weaver (2011) are argued to be "unanimous" in two respects: (1) that anthropogenic climate change is occurring and (2) that it will have seriously deleterious impacts on many if not all tourist

destinations. I will consider these points in reverse order, as the first point leads to a discussion of the credibility of climate science, and this requires a thorough and candid response.

The second point is only partially accurate. There are publications that unmistakably identify opportunities for certain tourism sectors (e.g. Jones & Scott, 2006, on national parks visitation in Canada; Scott & Jones, 2007, on golf tourism in Canada; Stewart, Tivy, Howell, & Dawson, 2010, on arctic cruise tourism), and many other studies identify both "winners and losers" among destinations, as changes in climate or climate-sensitive environmental resources alter their competitiveness (e.g. Abegg, Agrawala, Crick, & De Montfalcon, 2007, and Scott, Dawson, & Jones, 2008, on the contraction and concentration of ski tourism in the European Alps and New England marketplaces; Amelung, Nicholls, & Viner, 2007; Amelung & Viner, 2006 and Scott, McBoyle, & Schwarzentruber, 2004, on the redistribution of climate resources for tourism; Bigano, Hamilton, & Tol, 2006 and Hamilton, Maddison, & Tol, 2005, on the potential redistribution of international arrivals). On the other hand, there have certainly been alarmist publications (e.g. Halifax Travel Insurance, 2006) and media representations of the impacts of climate change on tourism (e.g. BBC News, 2006; Easier Travel, 2006; Observer, 2007) that were not in any way based on science. Efforts have been made to refute this potentially damaging misinformation (e.g. Rutty & Scott, 2010; UNWTO–UNEP–WMO, 2008), as travel reporters continued to perpetuate such alarmist misinformation through 2010. The need to counter speculation and misinformation and its potential to cause reputational damage for destinations, or bring about maladaptative investment, or regulatory decisions is yet another rationale for the tourism community to invest in climate change research.

Returning to the first point that the tourism and climate change literature review assumes anthropogenic climate change is occurring – I say bravo! That global climate is changing is not in dispute within the scientific literature and was declared "unequivocal" by the IPCC (2007) and only further reinforced by more recent reports on the state of the global climate system (Allison et al., 2009; National Oceanic and Atmospheric Administration [NOAA], 2010). Furthermore, that the dominant forcing (though not the only forcing) on the climate system over the last 50 years is anthropogenic is also not in question within the scientific literature (IPCC, 2007, others). There is no *scientific* basis to believe otherwise.

That tourism researchers are reliant on the expertise of the climate science community for information on how the climate system may evolve under varied anthropogenic and natural forcings and feedbacks in the climate system is not unique, so too are all other socio-economic sectors that study the implications of climate change for natural and human systems. Tourism has often borrowed concepts and techniques from a wide range of academic disciplines (indeed how many leading tourism scholars were *not* trained in another discipline?). So, how is relying on the expertise of climate scientists/applied climatologists any more problematic than using any of the other many disciplines that tourism studies are informed by? And it must be remembered from earlier in this piece that a critical mass of tourism/climate change related PhDs are now developing the skills base within the tourism academy.

Weaver (2011) provides an overview of two highly publicized challenges to the credibility of climate change science, the so-called "climategate" associated with an illegal hacking of the emails of climate scientists at the University of East Anglia (UEA) in the United Kingdom and mistakes made in the IPCC Fourth Assessment Report. Each requires a response so that it is unmistakable that these events in no way undermined the credibility of climate change science.

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Three independent reviews were commissioned to investigate the allegations associated with the "climategate" at the UEA. A fourth was established to specifically examine the conduct of scientists at the Pennsylvania State University (the United States) that was identified in allegations against UEA scientists. It is beyond the scope of this paper to comprehensively review the findings of each review panel, but a brief summary of the consensus conclusions from the review panels is provided below (see British House of Commons, 2010; Muir Russell, Boulton, Clarke, Eyton, & Norton, 2010; Oxburgh et al., 2010; Pennsylvania State University, 2010).

With respect to the "climategate" allegations at the UEA, all of the review panels concluded that (1) the rigour and honesty of the Climatic Research Unit (CRU) scientists is not in doubt, (2) there is no evidence of behavior that might cast doubt on the integrity and conclusions of the IPCC and (3) there was no subversion of the integrity of the peer-review process. The Muir Russel et al. (2010) review had the public domain temperature data independently analyzed, and this process was able to validate the CRU's conclusions. Similarly, the Penn State Inquiry Committee determined there was no substance to the allegations that there was an intent to "suppress or falsify data", "conceal or destroy emails or data related to AR4" or "misuse privileged or confidential information available to academics" and that further investigation of these allegations was not warranted.

With respect to practices of data access, the review panels concluded that the CRU was *required not to provide* access to proprietary data sets provided to them by national governments. To clarify, the CRU is neither the producer nor the owner of the climate archive that is the compilation of climate data provided by national weather services around the world. The majority, but not all, of this historical climate data is freely accessible online, expect that of certain national weather services that sell their data and provide it to the CRU (and others) with an agreement that they do not share the data with others. Furthermore, the CRU is not the only provider of global climate data sets, others are freely available (e.g. the Global Historical Climate Network of the US NOAA).

Each of the review committees did express concerns about the compliance with Freedom of Information (FOI) requests but indicated that it was the responsibility of the UEA to improve its procedures in this regard. The report of the independent Science Assessment Panel indicated that the repeated FOI requests made by climate change sceptics "could have amounted to a campaign of harassment" and the issue of how FOI laws should be applied in an academic context remained unresolved.

While these emails were certainly an embarrassment to the CRU, they revealed largely the isolated emotional remarks of scientists frustrated by dealing with disingenuous requests for information that existed or that they were not free to distribute. How many of us have not said something highly negative in frustration over rejecting a paper on methodological grounds (sometimes in more than one journal), only to see it eventually published in a third-tier journal? Now consider one's tolerance limits when someone who repeatedly demands one's time with requests for data that is already publicly available or that one cannot legally release to a third party, then goes on to demand one's computer codes (even though the methods of one's analysis are available in multiple publications) and one's personal emails, which have nothing to do with one's published research.

While I do not agree with all of the actions of members of the CRU, I certainly understand them. I was on the editorial board of Climate Research when the controversial paper by Soon and Baliunas (2003) was published and later discredited by Mann et al. (2003). At the time, it was suggested to me by a member of the CRU that I should also resign in protest, a suggestion I did not feel was appropriate and declined to act on.

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The IPCC is not infallible, and despite the enormous peer-review processes in place (in two rounds by over 2500 scientists and government reviewers), two errors have been confirmed in its 2007 Fourth Assessment Report. First, in the Asia Chapter of the WG2 Report, written by authors from the region, it was stated that 80% of Himalayan glacier areas would probably disappear by 2035. This was an error and did not reflect the proper projections of glacial decline available in the chapter on *Glaciers, Snow and Ice* in the WG1 report, which was written by cryosphere experts. Had the Asia chapter authors consulted the chapter of WG1, instead of citing an unreliable, non-peer-reviewed source, this error would not have occurred. The second confirmed error relates to the proportion of the Netherlands that lies below sea level. It was reported that 55% of the Netherlands territory is below sea level, when the actual proportion is 26% (with an additional 29% susceptible to river flooding). The erroneous sentence was ironically provided by the Dutch government through its Environmental Assessment Agency, the same agency that criticized the IPCC for such errors.

Although these errors involve but two sentences in a report 976 pages long (2800 pages if one includes all three WG Reports), they should not have occurred. In response, the United Nations and IPCC asked the InterAcademy Council (2010) to convene an international committee to review the writing and review procedures of the IPCC and make any recommendations that would improve the process and authoritative nature of IPCC assessment reports in the future. However, let us put these highly publicized errors into perspective. Neither error was in the WG1 report and therefore has any bearing on the robustness of climate science reported by the IPCC. Neither was reported in the Synthesis Report or the Summary for Policymakers and therefore in no way undermines the core conclusions of the IPCC or has misinformed policy discussions in any respect. Independent reviews of the IPCC AR4 by the Netherlands Environment Assessment Agency (2010) and the US National Research Council (2010a, 2010b, 2010c) concluded that the key findings remained robust.

In short, media discussions about the integrity of IPCC science and whether its fundamental results remain credible are frankly absurd and have often repeated "allegations" of further errors without making any attempt to examine their merit (say by actually consulting the IPCC reports or doing simple checks of the credibility of those questioning global science experts). Some climate scientists followed the media coverage of IPCC controversy closely and found examples of fabricated quotes and misrepresentation of science. In some instances, the errors by the media were so egregious that complaints were filed with press-oversight bodies, and in some cases, retractions were later published (e.g. *The Sunday Times* and *Frankfurter Rundschau*). In other cases, misinformation and defamation of internationally leading scientists went unanswered (Rahmstorf, 2010b).[5] While retractions are helpful, the damage to the public's understanding of the science of climate change by such distortions is not undone.

Weaver (2011) also outlines the results of some public opinion polls on climate change conducted in early 2010 in Australia and the United States as evidence of "media-induced public skepticism" over climate change science. That the media frenzy over "climategate" and "IPCC-gate" has increased public confusion over climate change is almost a certainty. That it has also eroded confidence in the climate science community, at least temporarily, is also evident in some public opinion polls (e.g. Jowit, 2010). However, deeper consideration of one of the latest public opinion polls on climate change in the United States is very illuminating. A Yale University survey on knowledge of climate change and its potential solutions conducted in June–July 2010 (Leiserowitz, Smith, & Marlon, 2010) revealed that while 63% of the US citizens believe that global warming is happening, most do not

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understand why. For example, only 57% know what the natural greenhouse effect is, and only 45% understand that carbon dioxide is one of the gases that traps heat from the earth's surface, yet 49% incorrectly think that the hole in the ozone layer and aerosol spray cans contribute to global warming. Only 50% of Americans understand that global warming is caused mostly by human activities. As a result, the study concludes that many Americans lack some of the knowledge needed for informed decision-making in a democratic society. Positively, despite the recent controversies over "climategate" and the IPCC, this study found that Americans trust scientists and scientific organizations far more than any other source of information about climate change. Most revealing is that Americans recognize their own limited understanding; with only 10% indicating they are "very well informed" about climate change and 75% stating they would like to know more. A large majority (75%) also agreed that schools should teach about climate change, and 68% would support a national program to inform Americans more about the issue. While the public remains confused on the science of climate change, they recognize the salience of the issue. The task for educators is unmistakable. Furthermore, workforce needs assessments in the European Union, United Kingdom, Australia and Canada–United States have identified skill shortages critical to the challenge of implementing climate change mitigation and adaptation within government and business (GHK Consulting, 2009; Government of Australia, 2008; Sequence Staffing, 2009), signifying another important role for education systems to develop appropriate training programs.

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While public opinion on climate change remains divided to a degree, what of the climate science community? Is there a vigorous "debate" over climate change, as implied in many media stories? The balance of opinion among scientific experts has been the subject of a number of studies. A recent survey by Doran and Zimmerman (2009) of actively publishing climate researchers within the American Geophysical Union found that 97% believed that human activity is a significant contributor to changing global temperature. They concluded (Doran & Zimmerman, 2009, p. 23), "It seems that the debate on the authenticity of global warming and the role played by human activity is largely nonexistent among those who understand the nuances and scientific basis of long-term climate processes". Similar overwhelming levels of agreement were found in a separate survey of publishing climate researchers by Rosenberg, Vedlitz, Cowman, and Zahran (2010). A review of citation data for over 1000 climate researchers by Anderegg, Prall, Harold, and Schneider (2010) resulted in two main conclusions: (1) 97%–98% of the climate researchers, most actively publishing in the field, support the tenets of anthropogenic climate change outlined by the IPCC and (2) the relative climate expertise and scientific prominence of the researchers unconvinced of anthropogenic climate change are substantially below that of those that support the IPCC.

What is the position of the leading national and international scientific bodies? In 2001, 32 national science academies issued a joint declaration confirming anthropogenic climate change and urging the nations of the world to reduce emissions of GHGs (Science Editorial, 2001). Robinson et al. (2006, p. 2) summarized the situation nicely, when they observed "the degree of consensus within the scientific community appears to be proportional to the degree of perceived scientific uncertainty outside of it".

We rely on various experts on a daily basis (from lawyers to doctors to pilots) and demand thorough assessments of their skills and credibility as experts. When one needs heart surgery, does one seek out an auto mechanic? Yet, with respect to matters of climate science, far too many in the media and some politicians are willing to give equal voice to non-experts with no credibility in the field (i.e. non-scientists – *no PhD of any type*, let alone one in some aspect of climate science – and scientists that have *never* contributed to the body of peer-reviewed literature they so readily critique). Analyses of

media coverage of climate change science have repeatedly questioned how the views of such non-experts and pundits (in some cases with overt political agendas) can be given equal weight to thousands of peer-reviewed scientific studies, under the misnomer of the journalistic principal of "balance" (Billett, 2010; Boykoff & Boykoff, 2007; Boykoff & Mansfield, 2008; Gavin, 2010). Boykoff and Mansfield (2008) further commented on differences in the percentage of accurate coverage across tabloid newspapers and the prestige press or broadsheet newspapers in the United Kingdom and the implications for socio-economic inequality and public engagement given their typical readerships.

Issue 4: fickle markets

The discrepancy between environmentally supportive behaviors and environmental attitudes–values (what Weaver [2011] terms "veneer environmentalism") has been observed and well explored since the 1970s (Ajzen & Fishbein, 1977; Stern, 1992) in many areas of environmental decision-making (e.g. water conservation, vehicle purchases, recycling and waste management, energy conservation, house construction) and is not unique to tourism and holiday behaviors. As this literature reveals, the environmental values–behavior gap is not merely the result of insincere concern or hypocritical behavior but also a function of a range of individual and societal constraints.

Although I see no evidentiary basis for Weaver's (2011) concern that pressures from NGOs to incorporate sustainability into consumer decisions about travel and holidays as somehow becoming "a burden too heavy to carry" and "perhaps eventually leading to a decline in interest in sustainability action more generally", I agree with Weaver (2011) that there is little evidence that tourists are willing to voluntarily change travel patterns (e.g. travel less by air, substitute destinations) despite the majority stating concerns about climate change and awareness of GHG emissions generated by travel (see Becken, 2007; Brouwer, Brander, & Van Beukering, 2008; Dargay, Menaz, & Cairns, 2006; Dawson, Stewart, & Scott, 2010; McKercher, Prideaux, Cheung, & Law, 2010). Although this literature and several public opinion polls reveal more of a stated willingness to utilize carbon offsetting to compensate for travel-related GHG emissions (i.e. purchase emission reduction credits from other economic sectors that reduce their emissions), the very low uptake of voluntary carbon offsetting suggests that this is more of an indication of support for policy to require all travellers to pay for emissions and thus overcome the "free rider" problem. Like Weaver (2011), I am pessimistic that the norms of tourism mobility developed over the last 30–40 years will change through some groundswell of voluntary social change. As Becken (2004) suggests, the personal benefits of travel appear to outweigh the nebulous societal costs of climate change, and available evidence indicates that many travellers shift the responsibility of holiday-related GHG emissions to the tourism industry and government (Brouwer et al., 2008; Dargay et al., 2006; McKercher et al., 2010).

Where does this leave us in terms of mitigation progress in the tourism sector? It means that unless government policy were to "inspire" changes in travel through regulatory changes or substantive carbon taxes and other pricing mechanisms,[6] emission reductions from tourism will have to come primarily from technological changes for the foreseeable future. Yet, sector-wide GHG emission reduction scenarios commissioned by UNWTO, UNEP and WMO (Scott, Amelung, et al., 2008) indicate that "technology only" scenarios were not enough to reduce emissions through to 2035. So, how will the "aspirational" emission reduction targets of the World Travel and Tourism Council (WTTC, 2009; −25% by 2020, −50% by 2035 – from a 2005 baseline) that were tacitly endorsed "as minimum requirements for progress on effective emissions reductions . . . " (European Travel

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Commission & UNWTO, 2009, p. 17), by the tourism sector be achieved? We will return to that important question under Issue 7: lack of industry commitment.

Issue 5: a house dividing? Adaptation versus mitigation

Weaver (2011) questions the "assumed complementarities" between adaptation and mitigation and envisions conflict over resources between proponents of these two responses to climate change. The optimal combination of emissions reduction (mitigation) and adaptation to reduce the impacts of climate change has been a central policy question since the United Nations Framework Convention on Climate Change (UNFCCC) was negotiated 20 years ago. As Parry (2009, p. 24) indicates, it is widely recognized that "sometimes (adaptation and mitigation) actions can be complementary and at others they can trade-off each other; and it is not clear what mix . . . would best meet targets of impact avoidance. Many scientists would not accept that any such optimal mix exists", as there is no single best policy outcome for all countries and species. Similarly, the optimal balance for individual businesses and economic sectors may be entirely different.

Weaver (2011) contends that "climate change adaptation is a rational business response", that is "capitalism compatible", but ". . . is not directly related to environmental and socio-cultural sustainability". While I fully agree with the first point, I disagree with the second. While, at the enterprise level, investments in climate change adaptation will primarily focus on preserving the sustainability of the tourism enterprise, it does not mean adaptation will not have broader implications for sustainability. Even broader consideration of the enterprise-level examples given reveals this to be the case. For example, investment in snowmaking (which can be produced with renewable energy sources and with very little impact on watersheds – Del Matto & Scott, 2009) that allows ski areas nearer to major urban market centers to remain operational may mean that new terrain at higher elevations does not need to be converted to ski runs, prevent thousands of ski tourists from travelling far further (by car or plane) to enjoy ski holidays and prevent the contraction of ski tourism to a limited number of destinations and the attendant social impacts (job losses and property value declines in communities where winter tourism is lost; greater congestion and development pressures in communities where winter tourism remains viable). All these factors contribute to environmental and social sustainability. As Scott, de Freitas, and Matzarakis (2009) advised, the sustainability of adaptation options will need to be assessed carefully, and government legislation (both existing and forthcoming) will strongly influence enterprise-level adaptation decisions so that they are not divorced from broader sustainability considerations. More recently, there have been attempts to integrate broader sustainability considerations more formally into the assessment of climate change adaptation. For example, Barnett and O'Neill (2010) identified five criteria by which adaptations should be considered maladaptive: (1) increase GHG emissions, (2) disproportionately burden the most vulnerable, (3) bear high opportunity costs relative to alternatives, (4) reduce incentives to adapt or (5) foster path dependency through development trajectories which are difficult to change in the future. The broader business case for climate change adaptation has been made extensively by Huddleston and Eggen (2007), KPMG (2008), Network for Business Sustainability (2009), Sussman and Freed (2008) and World Business Council for Sustainable Development (2008).

Getting beyond the business level to consider even the destination scale, climate change is not only an environmental issue but has widespread economic and social consequences and is therefore inextricably linked to a broader sustainable development agenda. The links between climate change and sustainable development have been discussed for over a

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decade (e.g. Cohen, Demeritt, Robinson, & Rothman, 1998; Robinson & Herbert, 2001), and dealing with climate change is increasingly considered a prerequisite to sustainable development.

Weaver (2011) considers mitigation "incompatible with pro-growth ethos of free market capitalism and its implicit technological utopianism". Outside of tourism this is not the case, with the Stern Review (Stern, 2006) concluding that climate change mitigation was a "pro-economic growth strategy". Furthermore, if climate change mitigation was fundamentally incompatible with pro-growth capitalism, would all OECD nations have signed the UNFCCC or would the G8 nations agree in principle to reduce emissions 50% by 2050 (G8 2009)? Indeed, most governments have been careful to present climate change mitigation as a transformational opportunity for society and the economy (one necessary in this century with or without climate change due to "peak oil") and avoid any neo-Malthusian thread. Furthermore, at the enterprise level, the rationale for investing in mitigation extends beyond the obvious financial benefits of improved fuel efficiency, to managing regulatory and reputation risks. For example, in their 2010 survey of climate change preparedness and GHG emission disclosure, the Carbon Disclosure Project (2010) found 86% of Global 500 and 70% of S&P500 companies believed that they can seize new commercial opportunities and improve relations with customers, employees and other stakeholders by addressing climate change and sustainability issues (78% and 66% respectively also identified significant risks).

Like all other economic sectors, tourism and its individual enterprises will need to decide how best to adjust to this evolving policy milieu and meet any regulatory obligations imposed on them. Investment choices in mitigation versus adaptation are likely to be very highly influenced by government policy so that the overt rivalry envisioned by Weaver (2011) is likely to be muted within the tourism sector. Indeed, the "fault line" example provided by Weaver (2011) actually has little to do with any policy discussion within the tourism sector. The International Air Passenger Adaptation Levy (IAPAL) was proposed by a negotiating group of least developed countries as a mechanism to raise funds for climate change adaptation in their nations, as an alternative to the very limited funds being raised through the Clean Development Mechanism. The IAPAL was not proposed or endorsed by the tourism sector; in fact, the vast majority in the sector remain completely unaware of it. However, IATA, whose members would have had to collect the levy and add it to their pricing structures, predictably opposed it.

Issue 6: distracting from the intensity perspective

That climate change content in a sample of recent tourism planning texts is limited is indeed a reflection of the past focus on local-destination level intensity issues. This does not mean that this conceptualization of tourism sustainability will remain common in the future. The proverbial climate change genie cannot be put back in the bottle, for it has revealed (or "put to the fore") an important deficiency in past conceptualizations of sustainable tourism that focused almost exclusively on local/destination scale intensity issues. From a systems perspective or even a full accounting of the "triple bottom line" of sustainability, it is necessary to incorporate the environmental and social impacts of the travel phase of tourism, unless the tourism sector is willing to forego counting the economic benefits of the travel phase on its balance sheet. Tourism cannot claim the economic and social benefits of travel and conveniently ignore the associated environmental and social impacts. Indeed, that climate change indicators were included in UNWTO's *Indicators of Sustainable Development for Tourism Destinations* (UNWTO, 2004) and that at least two forthcoming

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texts on tourism and the environment and sustainable tourism have one or several chapters dedicated to climate change may be early signs that this conceptualization has begun to evolve.

While the potential for other sustainability dimensions to be neglected because of a new focus or regulatory requirement on climate change is conceivable, Weaver (2011) offers no evidence to support that this has occurred or that the potential has "greatly increased". Tourism businesses or destinations that are sustainability leaders will simply add climate change to a broader list of issues to take on. Conversely, there is also reasonable potential that sustainability laggards in the tourism sector will be forced to improve some aspects of sustainability through new climate change legislation.

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Issue 7: lack of industry commitment

I agree with Weaver (2011) that the tourism sector engagement in climate change had been largely rhetorical. As Scott, Peeters, and Gössling (2010) indicated, without any decline in aviation emissions through 2035 and no detailed plan to significantly reduce emissions elsewhere in the sector, it is impossible to see how the "aspirational" emission reduction targets (−25% by 2020, −50% by 2035 – from a 2005 baseline) of the WTTC could be achieved. In the absence of a credible plan, there is no other way to interpret these tourism industry targets than as rhetoric. A similar absence of credible plans to achieve the carbon neutral goals identified by a number of destinations (Gössling, 2009) is largely greenwash, as this is not about avoiding regulation (as sectoral emission reduction targets would be set by the national governments that in some cases are establishing these carbon neutral goals) but marketing pure and simple. The Maldives has defended their carbon neutral tourism plan as "not greenwash, just imperfect progress" (Goodall, 2009), but it came under strong criticism, as it conveniently omitted accounting for emissions related to travel to the destination (tourism's largest GHG emission contribution).

Nonetheless, that the tourism sector has largely engaged with the climate change issue rhetorically to date and not taken substantive action to address its emissions or begin the complex process of adaptation is not a rationale for abandoning the enterprise. By that logic, Weaver's (2011) conclusion that the sector's efforts to achieve sustainable tourism over the last 15 years have been slow and unimpressive would mean that the entire field of sustainable tourism should also be abandoned. Measured progress on climate change is the rule, rather than the exception, across economic sectors and not unique to tourism.

Concluding thoughts

Weaver (2011) contends that "tourism's expanding engagement with climate change, as it is currently unfolding, is not necessarily conducive to the interests of tourism sustainability". I contend that how tourism responds to climate change is absolutely critical to sustainability of tourism and should the sector retreat from engagement in climate change, it would be to its substantial detriment.

Even if one remains agnostic about the climate change science synthesized by the IPCC, climate change is a decision-making reality that will not go away. If one's regulators, investors, insurers and clients accept the scientific evidence on climate change and what it means for environmental and human systems, then the risks and opportunities of climate change are relevant to one's business or the destination one invests in, works in or studies. For government, NGO and business decision-makers, climate change is a new strategic reality they must confront. For example, earlier this year the US Securities and Exchange

Commission (2010) provided new guidance on the disclosure requirements of material risk associated with climate change regulation at national and international levels, its physical impacts on business and the indirect consequences of regulation on business trends, such as changes in the demands for goods and services. If it is not institutional investors that will want this information, it will be banks or insurance companies. KPMG's (2008) assessment of the regulatory, physical, reputational and litigation risks of climate change posed to 18 major economic sectors versus their level of preparedness found tourism to be one of six sectors in the "danger zone" (along with aviation, transport, health care, the financial sector and oil and gas). Can tourism really afford less research and engagement if the sector is already considered one of the least prepared?

The risk management literature identifies distinct types of risk management failures in business, and primary among those is the failure to take known risks into account. By reducing our investment in improving knowledge of the risks and opportunities posed by climate change, the tourism community would be setting itself up for such a failure. A critical role for tourism academics, therefore, is to help our industry and, more importantly, governments and destination communities (including locally owned small and medium enterprises) interpret climate change science and make appropriate decisions on the risks and opportunities.

Finally, as Lew (2010) aptly pointed out, tourism cannot ignore the long-term nature of sustainability, even though it is more intellectually challenging and problematic for decision-makers with much shorter planning time-horizons. It is only by examining longer time-horizons that we consider the varied societal and economic conditions in which international tourism may operate. Analyses of current GHG emission trajectories and mitigation commitments by the international community have lead several recent studies to recommend that society should be preparing to adapt to $+4^{\circ}$C global warming (Allen et al., 2009; Anderson & Bows, 2008; Meinshausen et al., 2009; Parry, Lowe, & Hanson, 2009). A $+4^{\circ}$C world would entail great risks for tourism regionally, and potentially globally, for as the World Business Council for Sustainable Development reminds us, "business cannot succeed where societies fail". That climate change raises uncomfortable questions about sustainable tourism is not a justification for retrenchment, but rather demands greater reflection on the future of tourism development in a carbon-constrained global economy.

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Notes

1. A similar analysis of four leading climate change journals (*Climatic Change*, *Climate Policy*, *Global Environmental Change*, *Mitigation and Adaptation Strategies to Global Change*) found tourism-focused papers represented 0.8% of papers published in the same timeframe.
2. See also Buckley, 2008, Moreno & Becken, 2009, and Uyarra et al., 2005.
3. There are 20 members and associate members of the Caribbean Community (www.caricom.org).
4. Another 15 PhDs on various aspects of climate change and tourism are known to be ongoing in nine different countries, which will further improve the research capacity in this field.

5. Those interested in critiques of media portrayals of "climategate" and the IPCC errors are referred to insightful websites such as RealClimate.com or deSmog.com.
6. There is no evidence that mitigation policies for international aviation, as currently proposed, would have any substantial impact on tourism arrivals through 2020 (Gössling, Peeters, & Scott, 2008; Mayor & Tol, 2007; Pentelow & Scott, 2010).

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