

SUSTAINABLE TOURISM: RESEARCH AND REALITY

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Abstract:

Social and environmental impacts, responses and indicators are reviewed for the mainstream tourism sector worldwide, in five categories: population, peace, prosperity, pollution and protection.

Of the ~5000 relevant publications, very few attempt to evaluate the entire global tourism sector in terms which reflect global research in sustainable development. The industry is not yet close to sustainability.

The main driver for improvement is regulation rather than market measures. Some tourism advocates still use political approaches to avoid environmental restrictions, and to gain access to public natural resources.

Future research priorities include: the role of tourism in expansion of protected areas; improvement in environmental accounting techniques; and the effects of individual perceptions of responsibility in addressing climate change.

Keywords:

indicator, development, enterprise, environment, community, social.

INTRODUCTION

Tourism researchers first turned their attention to social and environmental issues almost four decades ago (Allen, Long, Perdue, & Kieselbach, 1988; Brougham & Butler, 1981; Cater, 1987; Cohen, 1978; Farrell & McLellan, 1987; Liu & Var, 1986; Smith, 1977; Turner & Ash, 1975; Young, 1973). Research using the specific term sustainable tourism, however, commenced barely two decades ago (May, 1991; Nash & Butler, 1990). The first decade yielded compilations (Coccosis & Nijkamp, 1995; Hall & Lew, 1998; McCool & Moisey, 2001; Stabler, 1997; Swarbrooke, 1999), and basic frameworks from backgrounds in tourism (Butler, 1999; Clarke, 1997; Hall & Butler, 1995; Hughes, 1995; Hunter, 1997), economics (Driml & Common, 1996; Garrod & Fyall, 1998) and environmental management (Buckley, 1996). The second decade yielded a number of reconceptualisations, and a series of critiques including Sharpley (2000), Casagrandi and Rinaldi (2002), Gössling (2002), Liu (2003), Saarinen (2006) and Lane (2009).

As we enter a third decade, this review takes stock of progress by assessing the scope, focus and outcomes of academic research publication in sustainable tourism, against the practicalities of sustainability in the commercial tourism industry. Its basic premise is that the key issues in sustainable tourism are defined by the fundamentals of sustainability, external to the literature of tourism research. This premise relies on the axiom that both the tourism industry, and sustainability, are real-world phenomena. Therefore, this review does not attempt to deduce internally-generated research themes from analysis of bibliometric patterns in sustainable tourism publications. Instead, it constructs externally-generated themes by applying the key components of sustainability to tourism, and uses these to evaluate the sustainable tourism literature. This yields two outcomes. Firstly, it uses the results of research to assess the current sustainability of the tourism industry. Secondly, by comparing relative research effort against industry significance, it identifies priorities for future research.

This is a review specifically of the tourism research literature. Research in science, environment, resource management, global change, human health, economics and development policy is also relevant to sustainable tourism, but for reasons of space and focus, is not detailed here. The literature of tourism is large, >150,000 items in total, with ~5,000 relevant to sustainable tourism (CIRET, 2012). Because of space constraints, this review can cite <250 individual items, i.e. <5% of the relevant literature. It largely omits topics which

have been reviewed recently, such as water consumption and climate change (Gössling et al., 2011; Weaver, 2011). It examines the mainstream commercial tourism industry: recreation, ecotourism and responsible tourism are considered only where relevant. It first defines a framework for evaluation, under five main themes. It then compares the tourism research literature against that framework. For each theme, it summarises outcomes of all relevant research to date, supported by a representative selection of critical citations. Finally, it compares research effort and results against real-world progress and significance.

The five themes used for the evaluation framework are: population, peace, prosperity, pollution, and protection. The rationale is as follows. The fundamental concern of sustainability is that aggregate human impacts threaten the survival of humans and the ecosystem services on which they depend (Pereira, Leadley, Proença, Alkemade, & Scharlemann, 2010; Persha, Agrawal, & Chhatre, 2011). Impacts have grown, ultimately, because biological evolutionary pressures promote continuing human reproduction and competitive consumption. Sustainability requires modifications to human society so as to reduce its aggregate impacts. Impacts depend on: (a) the size and distribution of the global human population; (b) its social organisation, including economy, governance and civil society; and (c) the consumption, pollution, and/or protection of nature as a result of such social organisation. World population is a key predictor of current and future human impact on the planet. Peace is a global measure of successful social organisation and governance. Prosperity is a measure of economic activity, and a surrogate for *per capita* resource consumption. Pollution indicates increases in environmental impact. Protected areas indicate reductions.

Each of these factors can be changed through technological, individual or political means; and each of these means can generate either gains or losses in sustainability. Technological advances can reduce resource consumption and waste generation locally, even though they have increased both globally. Market-based measures can modify individual behaviour either to increase or reduce environmental footprints. Governments introduce laws, policies and incentives which can either reduce or increase pollution, environmental protection and social equity. The intentions and outcomes of any such measures are commonly difficult to deconstruct or predict. Organisations may promote measures based on individual choice or social responsibility in order to disperse opposition and forestall regulation (Beder, 1997; Buckley & Pegas, in press; Honey, 1999; Nunez, 2007; Wagner, 2011). In the tourism sector,

Saarinen (2006), Nelson (2010), and Yasarata, Altinay, Burns, and Okumus (2010), showed that industry advocates use the jargon of sustainability and community to strengthen power bases and legitimise current unsustainable practices.

SUSTAINABLE TOURISM RESEARCH

Research on links between tourism and population is limited. At global scale, population growth increases tourism and its impacts, but there is little evidence whether tourism influences population. At local scale, tourism can generate economic growth and population change, mainly through migration (Getz, 1986; Ghali, 1976; Gill & Williams, 1994; Smith, 1977). Some national parks, for example, attract new migrants through tourism opportunities (Wittmeyer, Elsen, Bean, Burton, & Brashares, 2008); but in some cases, resident populations decrease despite growth in tourism (Heberlein, Fredman, & Vuorio, 2002).

Tourism may also have demographic effects at a more local scale. Tourism income can reduce family size by indirect mechanisms such as funding female education and reducing dependence on subsistence labour. At the same time, however, tourism may decrease infant mortality and increase longevity, by funding healthcare. Net effects of tourism on internal population growth rates, unrelated to migration, are thus unclear even at local scale.

Links between tourism and peace are also little studied. Peace dividends include social and environmental as well as economic components. Wars and terrorism decrease tourism, at least in the short term (Larson, Brun, Ogaard, & Selstad, 2011; Llorca-Vivero, 2008; Neumayer, 2004; Spillerman & Stecklov, 2009). Tourism may contribute to peace through improved cross-cultural understanding (International Institute for Peace through Tourism [IIPT], 2011).

The links between tourism, prosperity and sustainability are complex. At large scale, prosperity increases environmental impact. Claims that environmental protection increases with economic growth are an erroneous interpretation of development history (Buckley, 1993): the finance industries are in the richest nations, manufacturing in industrialising nations, and biological extractive industries in developing nations, but this is a pattern, not a causal chain. At local scale, in developing nations tourism wealth buys guns, fishing boats, chainsaws, livestock, and labour, with costs to conservation and equity: prosperity only

improves sustainability if harnessed by pre-existing social institutions (Buckley, 2003a). In developed nations, tourism contributes to urban development, material consumption, and pressure on protected areas.

Distinguishing prosperity from poverty includes considerations of culture and equity, expressed in terms such as social impacts, community participation and pro-poor tourism. These are heavily studied, particularly for developing nations and indigenous peoples (Naughton-Treves, Holland, & Brandon, 2005; Robinson, 1999; Somanathan, Prabhakar, & Mehta, 2009; Stronza, 2001; Stronza & Gordillo, 2008; Weaver, 2010). In the wealthier nations, there are examples from Australia (Fallon & Kriwoken, 2003) and the USA (Ahn, Lee, & Shafer, 2002; Choi & Murray, 2010; Davis & Morais, 2004; Yu, Chancellor, & Cole, 2011).

Especially in less wealthy nations, there may often be cultural, historical and socioeconomic differences between residents and international tourists, and internal divisions within communities. Case studies are available from: Turkey (Ferhan, 2006; Tucker, 2001), Ghana (Akyeampong, 2011), Kenya (Manyara & Jones, 2007), Botswana (Hemson, Maclellan, Mills, Johnson, & Macdonald, 2009; Mbaiwa, 2011; Mbaiwa & Stronza, 2010), Indonesia (Cole, 2006), Fiji (Farrelly, 2011), the Philippines (Okazaki, 2008), Papua New Guinea (Wearing, Wearing, & McDonald, 2010) and Costa Rica (Matarrita-Cascante, Brennan, & Luloff, 2010).

Tourism contributes to pollution of atmosphere, oceans and freshwater (Gössling, 2002; Gössling & Schumacher, 2010; Gössling et al., 2011). In 2001, tourism had consumed 0.34% of the world's terrestrial land area, was using energy at $\sim 14,000 \text{ PJ.a}^{-1}$ or 3.2% of the global total, and had contributed $\sim 5\%$ of anthropogenic climate change (Gössling, 2002). Climate change and its links to tourism have been examined intensively over the past five years (Becken & Patterson, 2006; Dubois & Ceron, 2006; Gössling, 2009; Mendes & Santos, 2008; Scott, 2011; Weaver, 2011). The industry makes unrealistic claims over emission reductions (Gössling & Peeters, 2007), carbon offsets (Gössling et al., 2007), and carbon neutrality (Glomsrød, Wei, Liu, & Aune, 2011; Gössling, 2009; Gössling & Schumacher, 2010). Tourist travel continues nevertheless, because of individual desires and cultural factors (Buckley, 2011b; Cohen & Higham, 2011; Dickinson & Dickinson, 2006; Hamilton, Maddison, & Tol, 2005; Hares, Dickinson, & Wilkes, 2010; Verbeek & Mommaas, 2008;

Weaver, 2011), though some tourist destinations and subsectors are already affected by climate change (Buckley, 2008a; Perry, 2006; Pickering & Buckley, 2010; Scott, McBoyle, Minogue, & Mills, 2006).

Tourism produces direct local impacts on air, water, soil and biota; and indirect impacts from manufacture and transport of material items. Impacts derive from atmospheric emissions, solid and liquid wastes, and consumption of water, energy and materials (Aall, 2011; Buckley & Araujo, 1997; Chan & Lam, 2003; Charara, Cashman, Bonnell, & Gehr, 2011; Cummings, 1997; Gössling, 2000, 2002; Smerecnik & Andersen, 2011). In parks and natural areas there are additional impacts from vegetation damage and wildlife disturbance (Buckley, 2004; Buckley, 2011a; Liddle, 1997; Nimon, Schroter, & Stonehouse, 1995). This is one of the most active fields in sustainable tourism research (Acevedo-Gutiérrez, Acevedo, & Boren, 2011; Cunha, 2010; Halfwerk, Holleman, Lessells, & Slabbekoorn, 2011; Higham & Shelton, 2011;

Huang, Lubarsky, Teng, & Blumstein, 2011; Kociolek, Clevenger, St. Clair, & Proppe, 2011; Lian, Zhang, Cao, Su, & Thirgood, 2011; Maréchal et al., 2011; Reed & Merenlender, 2011; Remacha, Pérez-Tris, & Delgado, 2011; Roux-Fouillet, Wipf, & Rixen, 2011; Steven, Pickering, & Castley, 2011; Velando & Munilla, 2011; Wang, Li, Beauchamp, & Jiang, 2011; Zhong, Deng, Song, & Ding, 2011).

Private-sector approaches to sustainability such as self-regulation, corporate social responsibility, ecocertification, and destination marketing and demarketing have been promoted widely, but proved largely ineffective (Ayuso, 2007; Black & Crabtree, 2007; Blanco, Lozano, & Ray-Maqueira, 2009; Buckley, 2002; Buckley, 2011a; Buckley & Pegas, in press; Choo, 2011; Claver-Cortes, Molina-Azoin, Pereira-Moliner, & Lopez-Gamero, 2007; Erkus-Ozturk & Eraydln, 2010; Font & Buckley, 2001; Forsyth, 1997; Kastenholz, 2004; McKenna, Williams, & Cooper, 2011; Priego, Najera, & Font, 2011; Sheldon & Park, 2011). Few tourists select sustainable products specifically (Budeanu, 2007); they expect good environmental management routinely (Mair & Jago 2010). Industry advocates promote self-regulation to avoid government regulation (Nunez, 2007). Property developers lobby for development rights in public protected areas, but with few exceptions (Buckley, 2010), this has proved inimical to conservation.

Environmental policies, management measures and technologies can reduce many tourism

impacts (Buckley, 2009b). Regulatory instruments provide the foundation of sustainability in tourism as in other industry sectors. Success is often limited by poor implementation, in both developed and developing nations worldwide (Berry & Ladkin, 1997; Buckley 2008a; Buckley 2011a; Dinica 2009; Godfrey, 1995; Hall 2010; Hunter & Shaw, 2007; Ioannides, 1995; Logar, 2010; Martin-Cejas & Sanchez, 2010; Mycoo, 2006; Soteriou & Coccossis, 2010; Tosun, 2001; Wall, 1993; Warnken & Buckley, 1998; Zubair, Bowen, & Elwin, 2010). These relatively standard and straightforward planning, regulatory and technological approaches are key to reducing the pollution and associated impacts from large-scale and mainstream tourism development in urban and peri-urban areas, and resort clusters in coastal and montane destinations.

Case studies of such approaches are widespread. There are >35 such studies at individual sites. Early examples include Owen, Witt, and Gammon (1993) in Wales, and Hall and Wouters (1994) in the sub- Antarctic. There are also >15 case studies focussing on subsectors rather than sites. Examples include: marine wildlife tours (Moore & Rodger, 2010; Wilson & Tisdell, 2001); birding festivals (Lawton & Weaver, 2010); cruise tourism (Hritz & Cecil, 2008), and events and conventions (Mair & Jago, 2010; Park & Boo, 2010). There are much larger compilations using the terminology of ecotourism (Buckley, 2003a; Gössling & Hultman, 2006; Stronza & Durham, 2008; Zeppel, 2006); responsible tourism (Spenceley, 2008); community tourism (Nelson, 2010; Saarinen, Becker, Manwa, & Wilson, 2009) and conservation tourism (Buckley, 2010).

Tourism in public protected areas is heavily studied, with a focus on: visitor numbers (Buckley, 1999; Lindberg, McCool, & Stankey, 1997; Shultis & More, 2011); fees and concessions arrangements (Alpizar, 2006; Barborak, 2011; Buckley, 2003b; Chung, Kyle, Petrick, & Absher, 2011; Crompton, 2011; Mmopelwa, Kgathi, & Molefhe, 2007; Peters & Hawkins, 2009; Reynisdottir, Song, & Agrusa, 2008; Thur, 2010; Uyarra, Gill, & Côté, 2010); access (Kaltenborn, Haaland, & Sandell, 2001; McCool & Stankey, 2001); management tools (Buckley, 1998; Buckley, 2009a; Buckley, 2009b; Eagles, McCool, & Haynes, 2002); and interpretation (Ballantyne, Packer, & Hughes, 2009; Ballantyne, Packer, & Sutherland, 2011; Blangy & Nielsen, 1993; Bramwell & Lane, 1993). Interpretation can indeed reduce impacts, but only if stringent conditions are met (Coghlan & Gooch, 2011; Littlefair & Buckley, 2008). Otherwise, interpretation does not change either attitudes (Tubb, 2003) or impacts (Boon, Fluker, & Wilson, 2008; Littlefair & Buckley, 2008).

Tourism can support conservation through private reserves, communal conservancies, and contributions to public protected areas, but only under some circumstances, and with associated environmental costs (Balmford et al., 2009; Buckley, 2009c, 2010; Buckley, 2011a). In some countries, over 50% of parks funding is now derived from visitor fees, though more typically it is around 10% and in many countries, 0%. Leasing tourism operating rights on communal land tenures may or may not contribute to community wellbeing and biodiversity conservation, depending on the legal details of land and wildlife ownership and the structure, cohesion and internal governance of community organisations (Akyeampong, 2011; Buckley, 2008b, 2010, 2011a; Jamal & Stronza, 2009; Meguro & Inoue, 2011; Saarinen et al., 2009; Stronza & Durham, 2008). Similar considerations apply where tour operators lease rights from private landowners or land trusts (Buckley, 2010; Chancellor, Norman, Farmer, & Coe, 2011) or from public national parks (Barborak, 2011; Buckley, 2010; Bushell & Eagles, 2007; Svensson, Rodwell, & Attrill, 2009).

The significance of sustainability indicators in tourism is long recognised (Butler, 1991). Many have been proposed (Castellani & Sala, 2010; Ko, 2005; McCool, Moisey, & Nickerson, 2001; Miller, 2001; Roberts & Tribe, 2008; Tsaor, Lin, & Lin, 2006). Few of these address actual impacts (Hughes, 2002), reflecting scarcity of ecological data (Buckley, 2004, 2011a). Indicators based solely on tourist, resident or operator perceptions may be incomplete, since people may not always perceive, understand or care about their impacts (Budeanu, 2007; Dodds, Graci, & Holmes, 2010; Miller, Rathouse, Scarles, Holmes, & Tribe, 2010; Puczko & Ratz, 2000). There seems to be only one attempt to quantify any sustainability indicator for the tourism sector worldwide, focussing on pollution (Gössling, 2002). Such limited progress applies in all sectors, not only tourism (Bohringer & Jochem, 2007).

Comparing the tourism research literature against the sustainability framework yields a number of broad-scale conclusions. A single quantitative measure of sustainability in tourism remains elusive, because of difficulties in: definition, what to include; accounting, comparing different impacts in commensurate terms (Buckley, 2009b); and analysis, tracking social and political mechanisms (Honey, 1999). Despite these uncertainties, it is clear that mainstream tourism, like other industry sectors and the human economy as a whole, is far from sustainable. Most tourism enterprises adopt only those practices that improve profits or public

relations (Lane, 2009; Sheldon & Park, 2011; Weaver, 2009). Improvements are driven principally by regulatory changes, often against political resistance and with poor implementation. Market measures are largely ineffective, with little direct public demand for sustainability in tourism (Budeanu, 2007; Miller et al., 2010; Weaver, 2009). Tourists expect operators to minimise impacts routinely, not as a criterion on which to choose between competing providers (Mair & Jago, 2010).

Currently, there are few individual commercial tourism enterprises with positive triple bottom lines, including positive net contributions to local communities and to conservation (Buckley, 2009b, 2010). There are rather more which take voluntary measures to reduce environmental impacts, and make voluntary contributions to community wellbeing. The vast majority take such measures only for legal compliance or cost cutting. Tourism industry advocates lobby against government environmental regulation, proposing self-regulation as an alternative. They also lobby constantly for property development, tour operation and visitor management rights inside public protected areas, all with generally negative consequences for parks and biodiversity conservation.

To improve social and environmental performance across the entire tourism sector, both innovation and adoption are critical. Tourism enterprises often lead new approaches, but mainstreaming needs government legislation: self-regulation and ecocertification are ineffective. Improved sustainability in urban hotels, for example, has been driven by regulations for planning, impact assessment, pollution control, biodiversity and heritage conservation, building construction, energy and water efficiency, recycling, and so on. Voluntary private initiatives contribute principally by leading regulatory change. There is thus no way to avoid the complexities of politics, legislative change, international trade barriers to domestic environmental law (Buckley, 1993), industry lobbying for self-regulation, misrepresentation in the mass media (Lane, 2009), and so on. There is no secret ingredient (Po, 2008).

In forecasting the future of sustainable tourism, the key consideration is that both tourism and sustainability are changing more rapidly than the tourism industry adopts sustainability improvements. The future of tourism depends largely on conflicting social and economic pressures. People want holidays, and on holiday they act hedonistically. The most populous nations are richer, so more people travel. Tourism industry associations promote growth.

Even parks agencies promote tourism, despite impacts. Travel costs, however, are rising with oil prices (Becken & Schiff, 2011). Governments adopt carbon taxes and trading systems which include tourism. Tourism destinations are affected by climate change, despite adaptation (Buckley, 2008b; Lemieux, Beechey, Scott, & Gray, 2011). Amidst these pressures, large-scale voluntary improvements in sustainability are improbable, especially given low public pressure for sustainability and the particular ambivalence to tourism.

CONCLUSIONS

All five of the key themes identified earlier are critical to sustainability; but the influence of tourism, interest by the tourism industry, and research effort to date, differ between them (Table 1). Except for a few unusual enterprises (Buckley, 2010), the tourism industry focuses strongly on economic aspects, with attention to social and environmental aspects confined to legal compliance, political manoeuvring, and marketing and public relations (Buckley 2009b; Hall, 2010; Lane, 2009; Weaver, 2009). Tourism research in environmental journals addresses parks and pollution aspects, but few scientists study tourism (Buckley, 2011a). Peace and population issues are barely addressed (IIPT, 2011).

Research topics significant for sustainable tourism were identified several decades ago (Buckley, 1996; Cohen, 1978; May, 1991). These topics have changed little (Table 2), save for the addition of climate change. There has been extensive publication during this period, but progress has been mixed. In addition, much of the most relevant research is not in tourism journals. In its initial struggle to gain recognition as an independent discipline, tourism research became somewhat self-referential. It could now make greater use of related research in other fields. Cross-disciplinary publication is commonplace in tourism economics, and in tourism and climate change, but not in tourism and environmental management (Buckley, 2011a).

The tourism industry does not pay much direct attention to research (Buckley, 2008b; Lane, 2009). If academics can understand what the industry does and why, however, then that information contributes to government policy and regulation which improve sustainability. There is, however, a critical caveat. Whilst academics see information as having intrinsic value and incorruptible importance, most of the world sees information mainly as a means to gain power, fame or money. The products of research become tools of advocates, politicians

and entrepreneurs, no matter how hard researchers strive to remain independent. This is particularly prevalent in contested domains such as sustainable tourism.

Sustainability is shorthand for human and planetary future, yet tourism research treats it as a small subdiscipline. Tourism journals routinely publish rankings of research outputs, yet only one such ranking includes sustainability (Park, Phillips, Canter, & Abbott, 2011); and that is based only on publications in top-tier tourism and hospitality journals, ignoring other social, environmental and sustainability journals. Interest in sustainability amongst tourism researchers seems to be as limited as it is amongst tourism industry advocates, enterprises and tourists. Large-scale social and environmental changes are altering the world in which tourism operates, but few researchers are attempting to grapple with these changes.

With this in mind, Table 2 also attempts to pick some immediate priorities for future research. One longstanding concern (Butler, 1991; Butler, 1999) is to develop quantitative sustainability indicators for the tourism sector. The most difficult component is to establish environmental accounting measures, so this remains a priority for research. Measurement and management of all types of tourism impact remain important. One particular current priority, however, is the ability of tourism to bring about large-scale change in land use, by generating financial and political support for conservation. This is increasingly urgent as the world's nations attempt to increase their protected area estate from 10% to 17% of land area over the next decade, in line with the internationally agreed Aichi targets, as a buffer against climate change. Finally, responses to impacts continue to include regulatory, corporate and technological measures, but individual reactions to responsibility in light of global change seem to form a particularly promising field for future research.

Sustainability is as important in tourism as in any other sector of the human economy, and equally difficult to achieve (Casagrandi & Rinaldi, 2002). As noted by Sharpley (2009), there is "limited evidence of its implementation in practice". As long as the language of international politics is couched in terms of sustainable development, however, then the terminology of sustainability, as well as the practicalities of social and environmental management, will remain critically important in tourism research as well as reality. This review identifies some immediate priorities for academic research aimed to improve the sustainability of the tourism industry in reality.

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Table 1. Sustainability Significance, Industry Influence and Research Effort

	Parks, biodiversity, conservation	Pollution, climate change	Prosperity, poverty alleviation	Peace, security, safety	Population stabilisation & reduction
Significance for sustainability	*****	*****	*****	*****	*****
Influence of tourism sector	*****	****	***	**	*
Attention by tourism industry	**	***	*****	**	-
Effort by tourism researchers	*	**	*****	*	*
Effort by science researchers	***	*****	*	*	-

Key: Number of stars indicates the scale or importance of factors in each row, for the components in each column. *****, most; *, least; -, none or negligible.

Table 2. Issues in Sustainable Tourism Research and Practice

Issue	Fields and topics	Practical interest	Research progress	Research priority
<i>IMPACTS (+&-)</i>				
Site-scale, social & ecological	Park management, recreation ecology, cultural and community change	Med	High	**
Land-use change	Parks politics, conservation agreements, private and community reserves	High	Low	***
Resource consumption: general	Energy and water conservation	High	Med	*
specific	Rare species used for souvenirs etc	Low	Low	**
Wastes and pollution	Water chemistry, microbiology	Med	Med	**
Climate change	Climatology, climate impacts	Med	Low	**
<i>RESPONSES</i>				
Individual	Cultural contexts, values, behaviours, responsibility	High	Low	***
Social, government	Policy, planning, EIA, legislation	Med	Med	**
Social, corporate	Self-regulation, certification, (de)marketing	High	High	*
Technological	Energy, water, materials conservation, waste treatment, recycling	High	High	*
<i>INDICATORS</i>				
Economic	Regional economies, poverty	High	High	*
Social	Net gains, equity, welfare	High	High	**
Environmental	Lack of data, incommensurable parameters	High	Low	***
Sustainability (combined)	Scope and definitions, incommensurable parameters	Low	Low	**

Research priorities: *, lowest; ***, highest. Priorities reflect degree of prior research effort as well as significance of topic for sustainable tourism.