Tourism and Climate Change: Two-Way Street, or Vicious/Virtuous Circle?

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This paper presents the approach and reasoning behind two central conceptual diagrams relating tourism and climate change. The first diagram describes a typical polarisation in tourism and climate change knowledge management. It is argued that this polarisation restricts the collective body of knowledge and obscures important causal links between tourism and climate change phenomena. Developments are proposed in a second conceptual model which counters the tendency of scientists, policymakers, the tourism industry and NGOs to polarise along two research interests by discussing climate's influence on tourism vs. tourism's influence on climate; either of which could be interpreted as a primary limitation to the sustainability of tourism. The paper places into context key perspectives in the tourism–climate change discussions, addresses the difficulty of including system feedbacks between human activity and climate interactions, and draws attention to the underlying drivers of unsustainable trends. New strategic conceptual models are advocated to support long-term non-territorial collaboration, to incorporate adaptation and mitigation in ways which are not mutually exclusive, and to address the following paradox: that the cross-section of the global population driving the demand for tourism resources threatened by climate change are also disproportionately responsible for increased radiative forcing.

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Introduction

Global climate change arguably presents the single most problematic environmental issue of our era (Sugden *et al.*, 2003). Tourism, as the largest world industry, is growing rapidly, and is sensitive to climate changes in various ways (Amelung & Viner, 2004; WTO, 2003). The characteristics the two research areas share (both are intrinsically global, are tightly linked to resource pressures, and require governance at levels which range from the local to the global) indicate they are also phenomena which generate problems that are most difficult to solve.

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Governance for sustainability entails resolving complex, global, social and environmental problems. This requires providing information and infrastructure, dealing with conflict, understanding compliance to social rules, and preparing institutions for change (Dietz *et al.*, 2003). The process of analytic deliberation is often central to facilitating the most productive dialog between interested parties, officials, and scientists, yet is rarely focused upon entire sectors at global scales.

An exercise with conceptual models in knowledge management was performed through facilitated group discussions between tourism and climate change researchers, policy makers, and practitioners at six international meetings (EIFIA, 2004; ESF, 2003; ISB, 2004; NATO, 2003; WTO, 2003). This interaction revealed a frequent polarisation distinction made by meeting participants: this is described by conceptual Model 1 later in this paper. We argue that this division obscures complex underlying drivers of the system, and provides barriers to sustainable tourism proposals which should otherwise receive more systemic support. We suggest that moving beyond the concept of the 'two-way street' (Model 1) is a necessary step towards bringing about sustainable tourism. In this way, the 'vicious circle' (Model 2) relating tourism, its impacts, and climate change, can be broken down analytically and revised as the 'virtuous circle' needed to support the transition towards sustainable tourism. The circle format also provides a schema upon which to place and summarise literature, facilitate discussion, and identify goals for group knowledge management.

Conceptual Models in Knowledge Management

The construction of the 'State and Change' conceptual map (Patterson, 2003) was informed by developments in the areas of adaptive governance, adaptive management (Deitz *et al.*, 2003), integrated assessment (Kasemir, 1999; Rotmans & van Asselt, 2001), and general systems theory (Forrester, 1968; Meadows, 1997; von Bertanffy, 1968). The common link among these is they not only accept, but emphasise the differences in perspectives, interests, fundamental philosophies and test conditions as a means to spark learning and change. The evaluation of the conceptual models will be discussed in terms of two bodies of literature: successful *system transition* (Amelung *et al.*, 2002; Martens & Rotmans, 2002), and *tempos*, i.e. the multiple paces of system change (Tiezzi, 2004).

One of the principal challenges faced by an emerging research group is the formation, articulation, and use of shared conceptual models. Rarely scrutinised, this step in problem solving is critical to the process of study and design of public policy (Adams *et al.*, 2003). A well-formed conceptual model can assist a group in:

- extracting tacit knowledge from network members;
- encapsulating shared knowledge and structuring consensus;
- facilitating productive discourse;
- identifying knowledge gaps;
- defining shared goals and strategies;
- informing others and extending knowledge applications.

Crucially, conceptual models play a critical role in challenging paradigms. A more concerted balance between analysis (breaking down a problem into

its component parts and understanding how they function) and synthesis (the ability to put pieces back together in a creative way to solve problems) is necessary to address difficult and complex linkages such as those which link tourism and climate change (Costanza, 2003). Use of conceptual models can provide a platform for this innovation and re-thinking. An effectively designed conceptual model places the body of research in neutral ground, is inclusive to multiple perspectives, and can be used strategically to neutralise polarising tendencies, or promote new collaborations (Tannen, 1999, as cited by Costanza, 2003). Here we present two such models which can be seen to shed light on sustainability issues related to tourism and climate change.

Conceptual Model 1: Tourism and climate change as a two-way street

The first conceptual map presents a rough sketch of how tourism–climate change interactions look when broken down analytically as a directional, linear, assessment (Patterson, 2003). Typically, tourism and climate change has been considered as 'a two-way street'; climate influencing tourism, and tourism influencing climate (Figure 1).

The top half of the diagram reflects the various ways in which tourism influences climate such as studies of energy consumption, emissions, etc. Tourism policy interventions, therefore, concern mitigation, attempting to reduce radiative forcing due to tourism. The lower half of the diagram represents conclusions about climate's influence on tourism, based on tourist arrival projections, behavioural and perceptional studies. Interventions thus identified are of an adaptive nature.

Studies embracing either position can be grouped according to categories (Table 1), but rarely address adaptation and mitigation simultaneously. Although it is almost automatic for tourism researchers to divide the body of tourism–climate change interactions for this reason, this tendency poses significant problems for dealing with system feedbacks. Namely, there are several discontinuities between 'streets', which are not likely to be resolved while dividing information in this way.

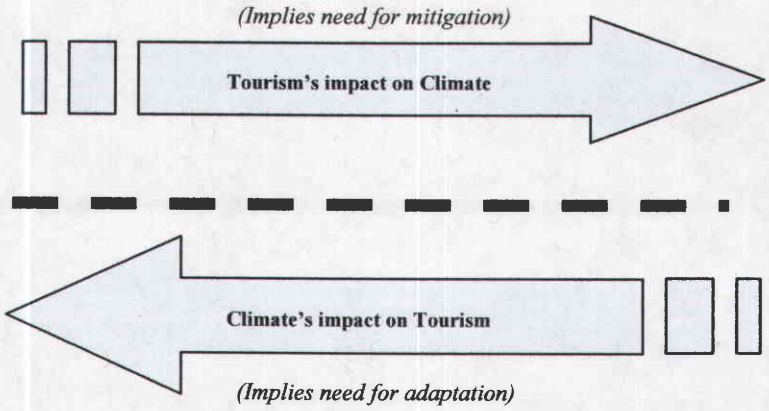

Figure 1 Model 1: The tourism–climate change system is typically illustrated as a two-way street

Table 1 Tourism and climate change research categorisation. Studies which address adaptation rarely simultaneously address mitigation, and vice versa

Category	*Examples*
Destination types	Urban; Biome; Protected Areas; Community; Coastal; Mountain
Geographic regions	Transects; Regional comparisons; Continental
Tourism segments	Annual; Seasonal; Day-visitors; Short-haul; Long-haul
Environmental	Water; Landscapes; Extreme events; Vegetation; Hydro-cyclic; Physical Infrastructure; Historical Assets
Issues of concern	Health; Vulnerable Areas; Ethics – Intra and Inter-generational Equity
Policy structures	Levies; Tradeable Permits; Voluntary Agreements
Methodology	Theoretical; empirical; qualitative; quantitative
Models	Descriptive (numeric); prognostic (forecast); planning (optimisation)

When attention is focused on climate's influence on tourism, adaptation is viewed as the appropriate response. When tourism's influence on climate is the primary concern, discussions centre on mitigation. Thus, when finances, time, or resources for problem solving are limited, adaptation and mitigation appear almost as mutually exclusive options. Concerns for economy and environment appear to be diametrically opposed. Under this conceptual model, win-win solutions are precluded; to advance in one direction means that less progress is made in another.

One example of an errant conclusion is that since mitigation success requires cooperation with other actors, the most risk averse solution appears to be to accept climate change and invest solely in adaptation. If the consequences of adopting either of the strategies were known to be equal, or if we knew with reasonable certainty the extent of these consequences, the disproportionate emphasis on adaptation would be more likely to bring about sustainable tourism solutions. However, the current scientific consensus is that climate change will have grave systemic repercussions for sustainability, which manifest in the global environment by complex non-linear interactions left unaccounted by economic 'optimisation' strategies. These are unlikely to be reflected in this kind of cost–benefit analysis.

Conceptual Model 1 places a great weight on 'economic optimisation' – the idea that you can select among system attributes and control system parameters, addressing risk and volatility with least cost. Because tourism is a powerful tool of development, and responds rapidly to economic changes, to many this imparts an illusion of control of the broader system. Yet as most profoundly stated by Meadows (1997) complex systems defy control: their inherent unpredictability means that as advanced as models, calculations and measurements may be, this only leads to the most general understanding. Goals to make the tourism–climate change system 'behave', by modifying system attributes (choosing adaptation or mitigation), are achievable objectives – but only in the short run.

Meadows pointed out that, in the short run, optimisation is very different from shaping our collective environment in the long run. The difference is in

the extent and depth of collaboration among individuals who orientate their efforts toward the problem at hand. To make this shift for tourism and climate change, new policy thinking and tools must first, support long-term non-territorial collaboration; second, incorporate adaptation and mitigation in ways which are not mutually exclusive; and third, address the following paradox: that the cross-section of the global population driving the demand for tourism resources threatened by climate change are also disproportionately responsible for increased radiative forcing (Ceron & Dubois, 2003; Patterson, 2005). Model 1 does not draw adequate attention to these goals.

Another reason why Model 1, albeit explicative, is not complex enough to encompass tourism and climate change interactions is that the mechanisms which allow us to conceptually transition from one direction of the street (or social goal) to another are unclear (Patterson, 2003). If policy choices are to include both adaptive and mitigative measures, the decision to reorient attention from one direction to another cannot be based on quantitative information. This results in subjective standards more inclined towards political forces than scientific principles or research.

An especially notable incongruity is that of temporal scale. Climate effects on tourism, (categorised as principally a business concern), have a time horizon of between three to five years. In contrast, tourism's impacts on climate change (principally categorised as an environmental concern) are expected over time periods of decades. This contrasts with the extremely short-time horizon for media awareness (in terms of a few days, and often associated with only extreme events). This is quite incompatible with the time horizon needed to raise awareness for instituting long-term policy and infrastructure changes. Issues of intra-generational equity thus present such long-run challenges as to be intractable when interests are posed in diametric opposition as in Model 1.

A most prominent shortcoming with conceptual Model 1 with respect to sustainability is that it fails to remind us that whether that of tourists or tourist policy makers, human activity constitutes an important feedback to the tourism–climate change system. It is not enough to weigh the costs and benefits of mitigation against those of adaptation. A new conceptual model is necessary.

One reason why this has not been accomplished to date is that, even in conceptual problem-solving, it is easy to exclude factors which constitute feedback, despite that understanding feedback is often critical to characterising system dynamics. Feedback is frequently associated with circular logic, and rigorous linear thinking does not do well with uncertainty and paradox (Rotmans & van Asselt, 2001). Counteracting this tendency requires gathering of interdisciplinary scientists and policy makers, designing conceptual models and accounting for path dependence and feedback at multiple scales (i.e. how they are nested among various layers of the system) (Levin, 1999; Low *et al.*, 2003). The mix of causal and consequential factors within the same model relating climate change and human activity, while rare, is increasingly necessary to address sustainability challenges.

Conceptual Model 2: States and changes in tourism–climate system

The design of the second model aims to join, rather than divide, the two perspectives offered by Model 1; that of the tourist and tourism industry's effect on

climate, and that of climate's impact on the tourism industry and destinations. Furthermore, it is designed to reflect that the tourism–climate system is dynamic, has multiple scales and feedback to be considered, and that important system drivers underlying these dynamics are not discussed in current research. Advancing the state-of-the-art with respect to sustainability issues at the intersection of tourism–climate knowledge means referring separate factions of investigation to what is ostensibly a broader, self-organising, non-linear, feedback system (Figure 2).

Martens and Rotmans (2002) define a *system transition* as a gradual, continuous process of structural change within a society or culture. Rather than being deterministic, transitions adapt, learn, and anticipate new paths through exposure to time. The ways in which intervention takes place in a system transition can influence the scale, speed and direction of it, but system control should be considered to be limited and temporary. *Tempo* (i.e. the multiple paces of system change) (Tiezzi, 2004) is relevant to two distinct dimensions of system transition as reflected in this diagram; first, multiple spatial scales as defined at a given moment in time and, second, multiple states through time-steps which are measured in a single space.

The first of these two considerations (the multiple spatial scales of investigation) are reflected by the concentric circles in Figure 2 (see also Table 2). The design of this model allows researchers or stakeholders to specify the applicable spatial scale of their work, awareness or concerns from individual to global measurement/application.

By differentiating scales explicitly in this way, attention is drawn to the fact that among the scales in Table 2, time-steps are usually not congruent. Societal, economic, and ecological changes can occur at any range of time periods, from an immediate agreement among two cooperating individuals, to coordinated movements among individuals which take decades or more to emerge.

The second tempo relevant to system transition has to do with tracking information at a given site through multiple time-steps. The terms 'stock' and 'flow' in dynamic modelling are useful to understanding the relationship between 'state' and 'change'. The boxes in Figure 2 represent 'states'. These are the aspects of the tourism–climate change system that change relatively slowly over time. They can be described in terms of quantity and quality. Between these stocks lie 'changes'. The arrows in the diagram represent the flows which adjust relatively rapidly, and from which the relationships between the stocks can be discerned. Taking this perspective, research in tourism and climate change can be categorised as attempts to reveal the quantity or quality of these states, or the relationships of change among them.

Table 2 Scale descriptions

Scale	
Individual	Autonomous concerns, perceptions, behaviour and decisions
Site	Location such as beach, park, hospitality facility, hotel, etc.
Destination	A particular region or group of sites with homogeneous marketing characteristics
National	National policy or actions
Trans-national	Policies which influence two or more nations
Global	Global commons as a whole

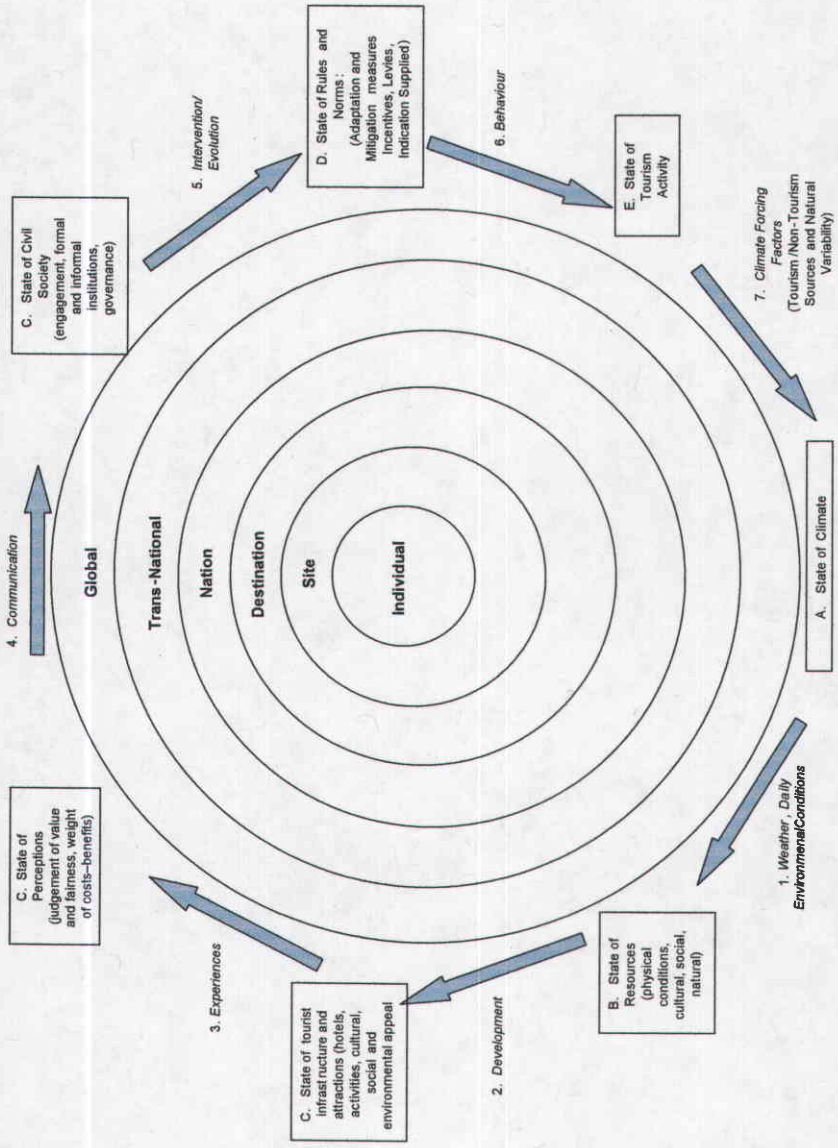

Figure 2 Model 2: The tourism–climate system, modelled as a hierarchical feedback system

Components of the diagram in boxes (marked with letters, below) refer to state changes. Characteristically, they are relatively easily measured with indicators, and are slower to change than the change functions (marked with numbers). Change functions refer to those systemic aspects more inclined to rapid changing, high variability and/or subjectivity. While one can think of many studies and issues which involve various pieces of the diagram, the directionwise approach narrows the focus of tourism–climate change interactions while allowing for a wide variety of spatial scales, state functions and changes to be addressed.

Beginning with the bottom of the diagram, the first box refers to the (A) State of Climate. Next, comes (1), weather and daily environmental conditions that encompass the variability and various environmental components which affect (B), the State of Resources (physical conditions, cultural, social, natural). Use and organisation of these resources leads to (2), development, which influences (C), the State of Tourist Infrastructure and Attractions (accommodation, activities, cultural, social, and environmental appeal). These are what host community and tourist (3) experiences are based upon, and over time these determine (C) the State of Perceptions (judgement of value and fairness, weight of costs–benefits). How these perceptions influence broader social outcomes depends upon (4), communication, and the overall (C), the State of Civil Society (engagement, formal and informal institutions, governance). Next, (5), the intervention/ evolution which takes place determines (D), the State of Rules and Norms: (adaptation and mitigation measures, incentives, levies, indications supplied). All of these influence (6) behaviour, and have impact upon (E), the State of Tourism Activity. Tourism and non-tourism sources and natural variability are (7), the climate forcing factors which drive changes to (A), the State of the Climate.

Systems theorists are interested particularly by actions which trigger others, thereby supporting changes 'spiralling through a system' (Rotmans & van Asselt, 2001), in other words, profound and prolonged shifts leading to new stable states. The 'success' of a transition, according to Rotmans *et al.* (2001), is one hallmarked by multiple causality and co-evolution of independent developments. How deeply policy changes are linked to, and reinforced by, predictable tendencies in economic, environmental, and social systems has much to do with how that change will persist through time, and at what extent. A complete description of system transition in the tourism–climate change system must address tempos of state and scale.

Conclusion

The construction, modification and use of conceptual models is a necessarily participative activity. In the acts of building up, tearing down, and rebuilding again, researchers become fluent in using the jargon, concepts, and tools of measurements necessary to communicate across disciplines and case studies. Active, focused, and participative use of conceptual models can assist a research group in reaching its fullest potential. Because thoughts, actions, and policies crystallise around these conceptual models it is critical that they reflect an adequate level of complexity and are inclusive – both of different perspectives and the range of relevant temporal and spatial scales.

This paper presents two such models which can be seen to shed light on sustainability issues related to tourism and climate change. Previous studies

relating tourism and climate change have tended to adopt one of two perspectives: climate's influence on tourism, or tourism's influence on climate. Problem solving for complex global phenomena such as tourism and climate change requires collective examination of shared concepts and knowledge, drawing out various assumptions and causal links between areas of research interest, and identifying gaps in understanding.

When discussing the tempo of transition in tourism climate change systems, two themes are emphasised: first, addressing various spatial scales; second, using measured time-steps to explicitly examine the causal links between aspects of supply / demand and climate forcing / intervention. Knowledge about a system can be structural (it refers to the quantity or quality of something about the system that changes relatively slowly over time), or functional (meaning that it refers to relationships between elements of structure, ones which change relatively rapidly over time). These terms are similar to 'fast change / slow change' or 'stock / flow' descriptions found in dynamic modelling. The aspect of tempo of system transition is in part reflected by separating out the six system states, from the six system changes. This information is complemented by information about spatial scales, from individual to global extents.

The second conceptual model presented (Figure 2) is possibly a more appropriate framework within which to place recent research, particularly because it orientates the discussions of the problem solving community – away from the academic tendency to depict the most complex problems as polar opposites (Costanza, 2003), away from an idea of short-term optimisation (Meadows, 1997), away from an idea that either adaptation or mitigation can be exclusively successful strategies. Creating conceptual space for systematic feedbacks (both at temporal and spatial scales) is a first and necessary step toward research which addresses sustainability challenges linked to tourism and climate change. From there, conceptual models must support long-term non-territorial collaboration, incorporate adaptation and mitigation in ways which are not mutually exclusive, and lastly, address the following paradox: that the cross-section of the global population driving the demand for tourism resources threatened by climate change, are also disproportionately responsible for increased radiative forcing.

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