UNEP

UNIVERSITY OF OXFORD

Climate Change Adaptation and Mitigation in the Tourism Sector:

Frameworks, Tools and Practices

UNEP Manuals on Sustainable Tourism

WORLD TOURISM ORGANIZATION
ORGANISATION MONDIALE DU TOURISME
ORGANIZACIÓN MUNDIAL DEL TURISMO
منظمة السياحة العالمية

World Meteorological Organization
Weather • Climate • Water

United Nations Environment Programme

Disclaimer

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the United Nations Environment Programme concerning the legal status of any country, territory, city area or authorities, or concerning delimitation of its frontiers or boundaries. Moreover, the views expressed do not necessarily represent the decision or the stated policy of the United Nations Environment Programme, nor does citing of trade names or commercial processes constitute endorsement.

ISBN - 978-92-807-2921-5

This publication is to be cited as follows:
Simpson, M.C., Gössling, S., Scott, D., Hall, C.M. and Gladin, E. (2008) ***Climate Change Adaptation and Mitigation in the Tourism Sector: Frameworks, Tools and Practices.*** UNEP, University of Oxford, UNWTO, WMO: Paris, France.

Layout and design: Oxuniprint, Oxford University Press.

Climate Change Adaptation and Mitigation in the Tourism Sector:

Frameworks, Tools and Practices

UNEP DTIE
Sustainable Consumption and Production Branch
15 rue de Milan
75441 Paris Cedex 09, France
Tel: +33 1 44 37 14 50
Fax: +33 1 44 37 14 74
Email: unep.tie@unep.fr
www.unep.fr/scp

University of Oxford
Centre for the Environment
South Parks Road
Oxford
OX1 3QY
Tel: +44 (0)1865 285070
Fax: +44 (0)1865 275885
www.ouce.ox.ac.uk

World Tourism Organization
Capitán Haya 42
28020 Madrid, Spain
Tel +34 91 567 81 00
Fax +34 91 571 37 33
omt@unwto.org
www.unwto.org

World Meteorological Organization
7 bis avenue de la Paix
Case postale No. 2300
CH-1211 Geneva 2
Switzerland
Tel.: + 41(0) 22 730 81 11
Fax: + 41(0) 22 730 81 81

Bleached Brain Coral
Credit: Dr Murray C Simpson

Foreword

The tourism industry has a key role to play in confronting the challenges of climate change. The spectacular growth of tourism provides both a challenge and an opportunity. The tourist community itself has responded to this challenge over the past few years and visibly stepped up its response to climate change. There is now a clear understanding that the industry can be part of the solution to climate change, by reducing its green house gas emissions as well as by helping the communities where tourism represents a major economic source to prepare for and adapt to the changing climate.

Building on the results of the 2nd International Conference on Climate Change and Tourism (October 2007) and the "Davos Declaration" this publication responds to an urgent request expressed by many governments, businesses and NGOs: "to provide practical guidance and capacity building for climate change adaptation and mitigation practices in the tourism sector".

This publication, combined with a comprehensive series of international and regional seminars, is designed to provide a pragmatic platform to strengthen the capacity of professionals to understand and respond effectively to the global challenges of climate change in tourism destinations. It is a critical part of the wider UN response to climate change.

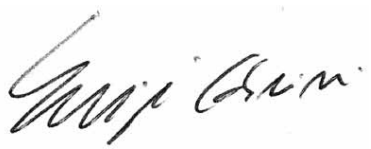
We hope that this publication will support efforts to mainstream climate change considerations into tourism planning and management. We further believe that the tourism sector, through its major contribution to global development, can influence other sectors by sending important signals to governments, industries and the public that climate mitigation and adaptation measures are not only vital for our future, but also make economic sense today.

Sylvie Lemmet
Director

United Nations Environment Programme – DTIE

Professor Gordon Clark
Director

Oxford University Centre for the Environment



Luigi Cabrini
Director Sustainable Developement of TourismDepartment

United Nations World Tourism Organization

Dr Buruhani Nyenzi
Director Climate and Adaptation Branch
Climate and Water Department

World Meteorological Organization

Acknowledgements

This document forms part of the UNEP "Practical Manuals on Sustainable Tourism" publication series. Dr. Stefanos Fotiou (UNEP) was responsible for the conception, technical editing and coordination of the publication. Dr. Murray C. Simpson (Oxford University Centre for the Environment) supervised the authors' team and the reviewing process in cooperation with Helena Rey de Assis from UNEP, Luigi Cabrini and Gabor Vereczi from UNWTO, and Leslie Malone and Dr. Kumar Kolli from WMO.

Authored by:

Dr. Murray C. Simpson, Oxford University Centre for the Environment, England
Dr. Stefan Gossling, Western Norway Research Institute, Norway
Dr. Daniel Scott, University of Waterloo, Canada
Professor C. Michael Hall, University of Canterbury, New Zealand
Ms. Elizabeth Gladin, University of Kent Canterbury, England

We are also grateful to the following people for their assistance in the development of this publication:

Charles Arden-Clarke
Jan Burke
Melissa Bonneton
Catalina Etcheverry
Martina Otto
Clare Perritan
Niclas Svenningsen
Dr. Anna Spenceley
Sue Blackshaw
Corie Law

Wind Turbines
Credit: UNEP

Table of Contents

List Figures

List of Tables

List of Boxes

List of Acronyms

AAC	Autoclaved Aerated Concrete
ACCC	Adaptation to Climate Change in the Caribbean
AFP	Adaptation Policy Framework
AIACC	Assessments of Impacts and Adaptations to Climate Change
APA	Alpine Pearls Association
APELL	Awareness and Preparedness for Emergencies at the Local Level
CBD	Convention on Biological Diversity
CCCDF	Canada Climate Change Development Fund
CDMs	Clean Development Mechanisms
CER	Certified Emission Reduction
CFC	Chlorofluorocarbon
COP-6	Sixth Conference of the Parties
CRiSTAL	Community-based Risk Screening Tool – Adaptation & Livelihoods
CRSTDP	Caribbean Regional Sustainable Tourism Development Programme
eCLAT	Experts on Climate Change and Tourism
EEA	European Environment Agency's
EFIEA	European Forum on Integrated Environmental Assessment
EIAs	Environmental Impact Assessments
EPSRC	Engineering and Physical Sciences Research Centre
EPZ	Environmental Protection Zone (EPZ)
ESF	European Science Foundation
ESRC	Economic and Social Research Council
EU	European Union
FDI	Foreign Direct Investment
GEF	Global Environment Facility
GHG	Greenhouse Gas
GTZ	German Technical Cooperation
GWP	Global Warming Potential
ICCL	International Council of Cruise Lines
ICCT	International Council on Clean Transportation
IISD	International Institute for Sustainable Development
IPCC	Inter-governmental Panel on Climate Change
IUCN	International World Conservation Union
JPOI	Johannesburg Plan of Implementation
KSI	Key Sustainability Indicators
LDCs	Least Developed Countries
NAPA	National Adaptation Programmes of Action
NATO	North Atlantic Treaty Organization
NERC	National Environmental Research Council

NGOs.	Non Governmental Organisation
NSAA	National Ski Areas Association
OBB	Osterreichische Bundesbahnen (Austria)
ODA	Official Development Assistance
OECD	Organisation for Economic Co-Operation and Development
OPC	Ordinary Portland Cement
Pkm	passenger kilometer
PPC	Portland Pozzalana Cement
PPT	Pro Poor tourism
RFI	Radiative Forcing Index
SARS	Severe Acute Respiratory Syndrome
SCCF	Special Climate Change Fund
SIDP	Safer Island Development Programme
ST-EP	Sustainable Tourism for Eliminating Poverty (ST-EP)
STZC	Sustainable Tourism Zone for the Caribbean
SUV	Sports Utility Vehicle
TOI	Tour Operators' Initiative
UKCIP	Kingdom Climate Impacts Programme
UNCCD	United Nations Convention to Combat Desertification
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNWTO	World Tourism Organization
USAID	US Agency for International Development
USCSP	US Country Studies Program
VOC	Volatile Organic Compounds
WCED	World Commission on Environment and Development
WEHAB	Water resources, Energy, Health, Agriculture, Biodiversity, +Human Settlements
WMO	World Meteorological Organization
WRI	World Resources Institute
WWF	World Wildlife Fund

‘Coastal Erosion can be Caused by Sea Level Rise, Environmental Change or a Combination of Both’
Credit: Dr. Murray C Simpson

Introduction

1

1

At the 2nd International Conference on Climate Change and Tourism, convened by the UN World Tourism Organization (UNWTO), the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in Davos, Switzerland in October 2007, there was a request from numerous participants, many from developing countries, for assistance in building capacity for the management of issues relating to tourism developments and climate change impacts. Specific requests were made for training events focussing on adaptation and mitigation techniques, tools and methods. UNEP and UNWTO aim to bring efforts on climate change and tourism into their mainstream environment activities, building on the Davos Declaration (UNWTO 2007a) and demanding action to adapt tourist businesses and destinations to climate change and to mitigate the impacts of tourism on climate change. In addition it builds on the Bali Strategic Plan to enhance the provision by UNEP of capacity building assistance to developing countries and countries with economies in transition (UNEP 2005) as well as broader concerns over the need for global institutional leadership with respect to tourism-related climate change adaptation and mitigation activities, as expressed in the Helsingborg Statement on Sustainable Tourism (Gössling et al. 2008a).

The UNEP Tourism and Environment programme aims to facilitate the local efforts by tourism stakeholders in integrating climate change into their broader institutional, industry, sectoral, policy and national goals and programs, i.e., 'mainstreaming' climate change (mainstreaming climate change refers to the incorporation of climate change adaptation and mitigation into all institutional, private, and not-for-profit tourism development and planning strategies and tourism business strategies). Climate change is a priority issue in the programme of work of UNWTO and within the special area on Sustainable Development of Tourism. UNWTO is actively working on raising awareness on climate change issues in the tourism sector and on integrating tourism into UN and other international policy processes on climate change. The WMO collects and assesses information on the world's weather, climate and water resources and related environmental issues, and aims to predict these for societal benefit, including to mitigate the impacts of natural disasters on climate-sensitive socio-economic sectors such as tourism. WMO's Commission for Climatology Expert Team on Climate and Tourism, in collaboration with UNWTO and UNEP, aims to assess the impacts of climate variability and change on the tourism sector, particularly in sensitive areas such as coastal zones, small islands and mountains; to identify the needs of the tourism sector for weather- climate- and water-related information for management of risk related to climate variability and change, and to promote improved relationships between WMO's 188 National Meteorological Services around the world with local, national and regional tourism and relevant environmental structures.

UNEP, UNWTO and WMO will continue their joint efforts in this field, which will focus specifically on building the capacity of the tourism sector to address the recommendations made by the Davos Declaration. This publication, and the seminar series for which it is prepared, are the first steps towards meeting these needs and contributing to the implementation of the "Davos Declaration" process.

1.1 Objectives

This document forms part of the "UNEP Manuals on Sustainable Tourism" and the UNWTO sustainable tourism policy guidebooks publication series, aiming to provide guidance to tourism stakeholders to integrate sustainability into their decision making processes and operations. It presents an overview of the current science and policy of climate change, followed by self-guidance material on mitigation and adaptation, exploring tools, methods and techniques associated with the management of climate change in tourism. It also identifies examples of good practice from which stakeholders might learn in order to develop their own capacities for implementing climate change strategies.

'Capacity' is the ability of individuals, institutions and organisations to perform functions effectively and sustainably; it is not a passive state but part of a continuing process (UNDP, 1998). Capacity building consists of three basic elements (Alaerts et.al., 1991):

- Creation of an enabling environment with appropriate political and legal frameworks;
- Institutional development, including community participation;
- Human resources development and the strengthening of managerial systems.

This publication, coupled with a comprehensive international and regional seminar series is designed to provide a pragmatic platform to strengthen the capacity of professionals to understand and respond effectively to the global challenges of climate change in tourism destinations. The publication and the seminars focus on capacity building and practical adaptation and mitigation techniques, including tools and methods to address the problems and meet the challenges posed by climate change. It is expected that this will result in the facilitation of tourism stakeholders' efforts to integrate the mitigation of and adaptation to climate change, into broader institutional, policy and national goals and programs in a practical manner. Building the capacity of the tourism sector will enable countries and destinations to implement the Davos Declaration (UNWTO-UNEP-WMO 2007a) recommendations and so address the threats, challenges and opportunities of climate change.

1

1.2 Audience

In the context of this project, capacity building is a "process of developing the technical skills, institutional capability, and personnel to [develop and implement actions], e.g., implement Multilateral Environmental Agreements (MEAs)" (UNEP n.d.). The '1st International Capacity Building Seminar on Climate Change and Tourism', conducted in April 2008 in association with the launch of this publication, aimed to strengthen the capacity of tourism professionals to understand and respond to the global challenges of climate change in ways applicable to their local and national contexts. The requests for capacity building assistance at the Davos conference in 2007 originated predominately (although not exclusively) from representatives of developing countries. The direct and indirect impacts of climate change are particularly acute in such areas, as well as in small island states, and limited attention has been paid to impacts on communities' livelihoods and their national economies.

The main target audience are senior officials and professionals from Tourism Ministries and national tourism administrations, Environment Ministries, National Tourism Organizations, Meteorological and Climate orientated organizations, Non-Governmental Organizations and the Private Sector; with particular emphasis on participants from developing countries and small island states.

1.3 User's Guide

As noted above, this document aims to provide background and guidance for capacity building in conjunction with practical and highly interactive seminars for decision and policy makers, and stakeholders. The document is organised so that, in a relative concise form, it can provide information on some of the key issues that arise in discussions with stakeholders with respect to climate change and tourism, and so can form the basis of regional and national capacity building seminars.

• What is the current situation with respect to climate change and tourism?

Section 2 of this document outlines the present state of knowledge regarding the two-way interactions between climate change and tourism on a global scale. It briefly discusses what climate change is and how it is anticipated to affect tourism, and how tourism is also a contributor to climate change. This last issue is important because capacity building relates not just to how governments, destinations, businesses and communities respond to the threat of climate change but how tourism practices may be affected by adaptation and mitigation measures.

• What do we know and what don't we know with respect to climate change and tourism?

While Section 2 summarizes what we do know, section 3 outlines what we do not know with respect to climate change and tourism. It does this through an analysis of the various regions included in IPCC assessment reports and other key documents such as the Stern Review (2006). Such an analysis should be complementary to that undertaken at capacity building meetings where, in addition to the existing state of global and regional knowledge, stakeholders will need to inventory current knowledge at a national and or destination scale. It may also be possible within similar environments to access knowledge from other locations that can be used as an analogue for developing local responses and decisions.

• Given what we know, how do we respond?

Section 4 discusses adaptation to the direct and indirect impacts of climate change. Adaptations to climate change are the changes or responses made to actual or predicted climatic stimuli or their actual or anticipated consequences. These are usually undertaken in such a way as to minimise negative impacts and possibly identify and take advantage of opportunities or positive changes resulting from climate change. Adaptation occurs at all levels from the individual to the organisation and includes both public and private sectors as well as households and communities. Each of these levels will have their own adaptive capacity, or potential for change. In order to stimulate ideas for change, the section includes various examples of adaptation in the tourism sector from around the world. This is done because each nation, institution, business, community, family or even individual will need to develop their own specific adaptive solutions given their particular set of circumstances.

Section 5 discusses mitigation of climate change. While adaptation is an important response to climate change it does not deal with the problem of preventing climate change. Therefore mitigation refers to the actual reduction in emissions of greenhouse gases. Mitigation can be undertaken through a variety of economic, social, technological and political changes that in the case of tourism can occur not only at destinations but also in the countries of origin, i.e. where the tourist comes from. Destinations, governments, businesses as well as the tourists themselves can undertake many measures to contribute to climate change mitigation in a tourism context and examples of these are provided throughout the section. Again, this is done because although there is a search for global mitigation agreements, mitigation measures in tourism should be implemented at all levels, within supportive national and international policy frameworks. It should

be noted that in some cases mitigation can also support adaptation and vice versa, as in the case of greenhouse gas reductions leading to reduced oil price dependency and price fluctuation-related vulnerability.

• Where to from here?

The final section raises signposts as to potential directions that can be taken with adaptation and mitigation in the tourism sector. However, the final choice of direction will depend on the stakeholders involved and their particular circumstances.

The importance of national and regional capacity building

The critical core of this document is concerned with capacity building. Capacity building is a process; in the case of tourism and climate change a key start to that process is the presentation of a seminar and workshop that can help raise awareness and knowledge and identify future ways in which capacity building should proceed.

Such seminars and workshops can initially be based on a national and/or destination level. In some situations it may be appropriate for neighbouring countries or destinations that experience similar environments, threats from climate change and/or flows of tourists to conduct joint seminars. Seminars should ideally include a range of stakeholders and decision-makers and should be chaired in such a way as to be impartial to sectoral interests and to ensure that external knowledge input is also regarded as credible and impartial. It is important to stress again that this document is only part of the information that is required. New information should also be provided at seminars and workshops so as to update current knowledge and to convey more specific information relevant to each situation.

The questions noted above can be useful ways of organising different parts of a seminar so as to provide focal points for discussions, with respect to the key issues that need to be addressed. Within each overall question, subsidiary questions and issues will be identified. In order to work through the various steps of the capacity building process it is essential that comments and observations be recorded and reported so that knowledge is retained as part of the capacity building process. Furthermore, it is important to recognise that capacity building occurs at different levels; while a seminar may assist in initiating or enhancing capacity building at a national or destination level, many participants will have insights into capacity building at a scale relevant to their own institution, agency,

business, or community. It is important that these insights wherever possible be shared as part of the capacity building process, if not at an initial seminar then at follow up meetings or through other mechanisms that are established for the sharing of information.

Jericoaroara, Brazil
Credit: Helena Rey de Assis

‘Coastal Erosion can be Caused by Sea Level Rise, Environmental Change or a Combination of Both’
Credit: Dr Stefan Gossling

Climate Change and Tourism

2

2

2.1 Introduction

The response of the tourism community to the challenge of climate change has visibly increased over the last five years. The World Tourism Organization (UNWTO), together with the World Meteorological Organization (WMO), the United Nations Environment Programme (UNEP), the United Nations Convention to Combat Desertification (UNCCD), the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the Government of Tunisia hosted the First International Conference on Climate Change and Tourism in Djerba, Tunisia in 2003. The conference aimed to develop awareness among government administrations, the tourism industry and other tourism stakeholders, highlighting both current, and anticipated climate change impacts affecting tourism destinations and the need to carefully consider the consequences of climate change mitigation policies on tourism as well as the responsibility of the tourism sector to be a part of the solution by reducing its greenhouse gas emissions.

Subsequent workshops supported by the European Science Foundation (ESF) (Milan 2003), the North Atlantic Treaty Organization (NATO) (Warsaw 2003), the European Forum on Integrated Environmental Assessment (EFIEA) (Genoa 2004), and the Experts on Climate Change and Tourism group (eCLAT) (Netherlands 2006, Paris 2007), as well as the Helsingborg Meeting on Sustainable Tourism (Helsingborg 2007; cf. Gössling et al. 2008a) and the Marrakech Task Force on Sustainable Tourism Development further contributed to the development of collaborative research and practical case studies by a network of international tourism stakeholders and scientists.

Following the first International Conference on Climate Change and Tourism in 2003, the WMO and UNWTO took steps to strengthen the working arrangement that had been in force between these agencies since 1992. In particular, WMO's Commission for Climatology, at its fourteenth session (Beijing, China, November 2005) established a new Expert Team on Climate and Tourism, which has contributed to the knowledge base and the partnerships that will support sustainable development of the tourism industry.

In March 2007, UNWTO, UNEP and WMO commissioned a review report on tourism and climate change, including impacts and adaptation, changes in tourism demand patterns, emissions from tourism, and mitigation policies and measures. The Executive Summary of this report (UNWTO-UNEP-WMO 2008), was presented during the Second International Conference on Climate Change and Tourism, which took place in Davos, Switzerland, 1-3 October 2007. The conference resulted in the Davos Declaration (UNWTO-UNEP-WMO 2007a), a document asking the tourism sector to "[…] ***rapidly respond to climate change,***

within the evolving UN framework and progressively reduce its Greenhouse Gas (GHG) emissions". The report (UNWTO-UNEP-WMO 2008) and its contents were embraced by the London Minsters' Summit which met during the 'World Travel Market 2007', by the UNWTO 2007 General Assembly, and introduced at the Bali UN Climate Summit. To this end, the Davos Declaration demands the simultaneous implementation of actions to mitigate the impact of tourism on climate change, adapt to current and future climate changes, to develop new or apply existing technology to enhance energy efficiency and to secure financial resources to ensure poorer regions or countries are also able to meet the recommendations.

2.2 Climate Change

The Inter-governmental Panel on Climate Change (IPCC) declared that 'warming of the climate system is unequivocal' (IPCC 2007a). The global mean temperature has increased by 0.76°C between 1850–1899 and 2001–2005 and the IPCC concluded that most of the observed increase in global average temperatures since the mid-20th century is 'very likely' (> 90% probability) the result of human activities that are increasing greenhouse gas (GHG) concentrations in the atmosphere. The IPCC (2007b) predicts that the pace of climate change is 'very likely' (> 90% probability) to accelerate with continued GHG emissions at or above current rates, with globally averaged surface temperatures estimated to rise by 1.8°C to 4.0°C by the end of the 21st century.

Changes in temperatures and other climatic features will vary globally (IPCC 2007b). It is very likely that hot extremes, heat waves and heavy precipitation events will continue to become more frequent. Tropical cyclones will likely become more intense, with larger peak wind speeds and more heavy precipitation associated with ongoing increases of tropical sea surface temperatures. Decreases in snow cover, already observed in some regions, are projected to continue. The regions affected by these extreme events, including many major tourism destinations, will expand. These predicted changes highlight the need for awareness and preparedness for natural hazards at the local level through systematic capacity building and strategies for disaster risk management (UNWTO 2007b)

2.3 Tourism

UNWTO has determined that tourism is a primary source of foreign exchange earnings in 46 out of 50 of the world's Least Developed Countries (LDCs) (UNWTO 2007c, see also UNDP 2005; Hall 2007). Global discourse over Africa and UNWTO's Sustainable Tourism for Eliminating Poverty (ST-EP) initiative re-energised the debate about pro-poor tourism or tourism for poverty alleviation (Hall & Coles

2

2008b: 277; Simpson 2008a; Schilcher 2007). Tourism has the potential to lift people out of poverty through the employment and entrepreneurial opportunities it provides, and the recognition of tourism's role in poverty alleviation has made it a substantial component of the international development and trade agenda (Hall & Coles 2008a, b). The tourism sector also embraces, and has the potential to make a substantial contribution to the achievement of, the United Nations' Millennium Development Goals (UNWTO 2007c). This, however, demands that the sector adapts to climate change, and, as important, reduces its contribution to climate change through emissions of greenhouse gasses, and the overall environmental footprint of tourism. Both aspects require substantial changes in the tourism production system.

2.4 Climate Change Impacts on Tourism

With its close connections to the environment and climate itself, tourism is considered to be a highly climate-sensitive economic sector similar to agriculture, insurance, energy, and transportation. Indeed, climate change is not a remote future event for tourism, as the varied impacts of a changing climate are even now becoming evident at destinations around the world and climate change is already influencing decision-making in the tourism sector. There are four broad categories of climate change impacts that will affect tourism destinations, their competitiveness and sustainability (UNWTO-UNEP-WMO 2008).

Direct climatic impacts: Climate is a principal resource for tourism, as it co-determines the suitability of locations for a wide range of tourist activities, is a principal driver of global seasonality in tourism demand, and has an important influence on operating costs, such as heating-cooling, snowmaking, irrigation, food and water supply, and insurance costs. Thus, changes in the length and quality of climate-dependent tourism seasons (e.g., sun-and-sea or winter sports holidays) could have considerable implications for competitive relationships between destinations and therefore the profitability of tourism enterprises. Studies indicate that a shift of attractive climatic conditions for tourism towards higher latitudes and altitudes is very likely. Uncertainties related to tourist climate preference and destination loyalty require attention if the implications for the geographic and seasonal redistribution of visitor flows are to be projected (UNWTO-UNEP-WMO 2008).

The IPCC has concluded that increases in the frequency or magnitude of certain weather and climate extremes (e.g. heat waves, droughts, floods, tropical cyclones) are likely as a result of projected climate change (IPCC 2007a). Such changes will affect the tourism industry through increased infrastructure damage, additional emergency preparedness requirements, higher operating expenses

(e.g., insurance, backup water and power systems, and evacuations), and business interruptions.

Indirect environmental change impacts: Because environmental conditions are such a critical resource for tourism, a wide-range of climate-induced environmental changes will have profound effects on tourism at the local and regional destination level. Changes in water availability, biodiversity loss, reduced landscape aesthetic, altered agricultural production (e.g., food and wine tourism), increased natural hazards, coastal erosion and inundation, damage to infrastructure and the increasing incidence of vector-borne diseases will all impact tourism to varying degrees. In contrast to the varied impacts of a changed climate on tourism, the indirect effects of climate induced environmental change are likely to be largely negative. Importantly, there remain major regional gaps in our knowledge e.g. of how climate change will affect the natural and cultural resources critical for tourism in Africa (c.f. Simpson and Hall 2008), the Caribbean, South America, the Middle East and large parts of East Asia (Figure 1).

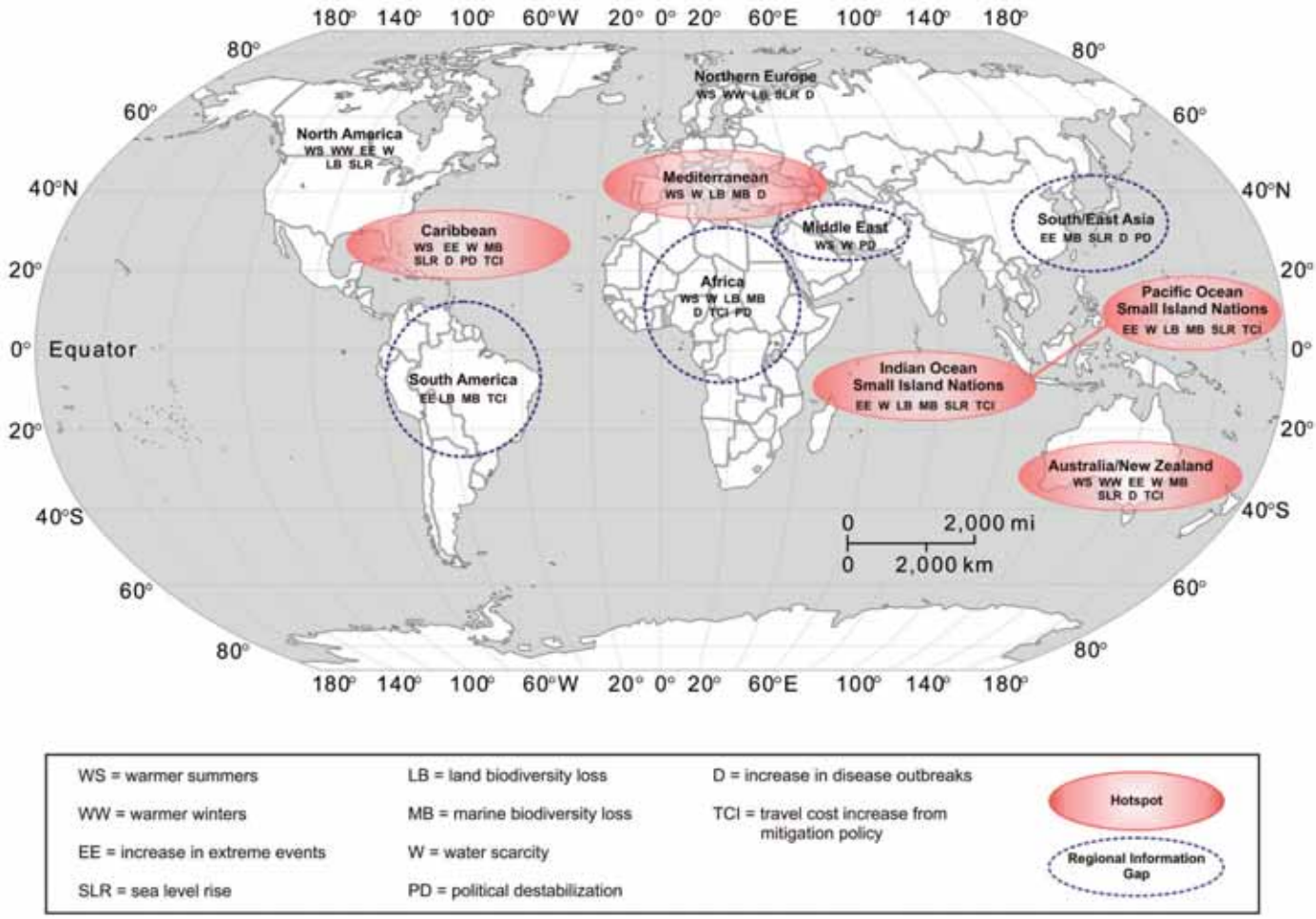
Impacts of mitigation policies on tourist mobility: National or international mitigation policies – that is policies that seek to reduce GHG emissions – may have an impact on tourist flows (Simpson et al. 2008a; Gössling et al. 2008b). They are likely to lead to an increase in transport costs and may foster environmental attitudes that lead tourists to change their travel patterns (e.g., shift transport mode or destination choices). There has been substantial recent media coverage on this topic, specifically as it relates to air travel. Long-haul destinations can be particularly affected and officials in Southeast Asia, Australia-New Zealand, Africa and the Caribbean have expressed concern that mitigation policies could adversely impact their national tourism economy.

Indirect societal change impacts: Climate change is thought to pose a risk to future economic growth and to the political stability of some nations. Any such reduction of global GDP due to climate change would reduce the discretionary wealth available to consumers for tourism and have negative implications for anticipated future growth in tourism. Climate change is considered a national and international security risk that will steadily intensify, particularly under greater warming scenarios. Climate change associated security risks have been identified in a number of regions where tourism is highly important to local-national economies (e.g. Barnett and Adger 2007, Stern 2006, German Advisory Council 2007, c.f. Simpson and Hall 2008). International tourists are averse to political instability and social unrest, and negative tourism-demand repercussions for climate change security hotspots, many of which are believed to be in developing nations, are evident (Hall et al. 2004).

2

Tourism Vulnerability Hotspots: The integrated effects of climate change will have far-reaching consequences for tourism businesses and destinations and these impacts will vary substantially by market segment and geographic region. The implications of climate change for any tourism business or destination will also partially depend on the impacts on its competitors. A negative impact in one part of the tourism system may constitute an opportunity elsewhere. Figure 1 provides a summary assessment of the most at-risk tourism destinations for the mid- to late-21st century. Due to the very limited information available on the potential impacts of climate change in some tourism regions, this assessment must be considered with caution. Until systematic regional level assessments are conducted a definitive statement on the net economic or social impacts in the tourism sector will not be possible (UNWTO-UNEP-WMO 2008).

Figure 1: Climate Change Vulnerability Hotspots in the Tourism Sector



WS = warmer summers	LB = land biodiversity loss	D = increase in disease outbreaks	Hotspot
WW = warmer winters	MB = marine biodiversity loss	TCI = travel cost increase from mitigation policy	Regional Information Gap
EE = increase in extreme events	W = water scarcity		
SLR = sea level rise	PD = political destabilization		

Source: UNWTO-UNEP-WMO 2008

2.5 Contribution of Tourism to Climate Change

Anthropogenic climate change is caused by greenhouse gasses emitted into the atmosphere, primarily through the burning of fossil fuels. Carbon dioxide (CO_2) is the most important greenhouse gas, accounting for an estimated 60% of the warming caused by emissions of greenhouse gas emissions. According to UNWTO-UNEP-WMO (2008), emissions from tourism, including transports, accommodation and activities (excluding the energy used for constructions and facilities for example) account for about 5% of global CO_2 emissions. However, other greenhouse gases also make significant contributions to global warming. In the tourism sector, this is particularly relevant for emissions from aviation. In 2005, tourism's contribution to global warming was estimated to contribute between 5% and 14% to the overall warming caused by human emissions of greenhouse gasses (for more details see section 5).

Of the 5% of the global total of CO_2 emissions contributed by tourism, transport generates around 75%, and in terms of the radiative forcing specific to transport, the share is significantly larger ranging from 82% to 90%, with air transport alone accounting for 54% to 75% of the total (UNWTO-UNEP-WMO 2008). There is tremendous variation in emissions across tourism sectors and within individual trips. Trips by coach and rail account for 34% of all trips, but for only 13% of all CO_2 emissions (excluding emissions from accommodation/activities). Conversely, long haul travel accounts for only 2.7% of all tourist trips, but contributes 17% to global tourist emissions. As for other trips, emissions can be close to zero (for instance a holiday by bicycle and tent) or amount to more than 10 t of CO_2 (South Pole crossing).

By 2035, tourism's contribution to climate change may have grown considerably. A recent scenario developed by the expert team of the technical report in the UNWTO-UNEP-WMO (2008) publication considers different emission pathways, including a 'business as usual' projection based on anticipated growth rates in tourist arrivals, as well as distances travelled by various means of transport. These projections indicate that in terms of the number of trips made, global tourism will grow by 179%, while guest nights will grow by 156%. Passenger kilometres travelled will rise by 222%, while CO_2 emissions will increase at somewhat lower levels (152%) due to efficiency improvements. The share of aviation-related emissions will grow from 40% in 2005 to 52% by 2035. Tourism's contribution to global warming including all greenhouse gasses will be even larger, with an expected increase in radiative forcing of up to 188%, most of this once again caused by aviation. The development of emissions from tourism and their contribution to global warming is thus in stark contrast to the international community's climate change mitigation goals for the coming decades. For example, international delegates at the Vienna

Climate Change Talks (August 2007) recognized the finding by the IPCC that global emissions of GHG needed to peak in the next 10 to 15 years and then be reduced to below half of levels in 2000 by mid-century.

2.6 Climate Change Adaptation in Tourism

The IPCC (2007c) has indicated that all societies and economic sectors will inevitability need to adapt to climate change in the decades ahead, and that adaptation is already occurring in many economic sectors, including tourism. Some countries and regions are more vulnerable than others as their specific economic and geographical characteristics determine their exposure to climate change impacts, sensitivity to those impacts, and their adaptive capacity (IPCC 2007b).

Adaptation to climate change refers to an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC 2007b). Adaptation can be pursued by societies, institutions, individuals, governments and can be motivated by economic, social or environmental drivers through many mechanisms, for example social activities, market activities, local or global interventions (Adger et al 2007). Adaptive capacity is the ability or potential of a system to respond successfully to climate variability and change, and includes adjustments in both behaviour and in resources and technologies. The presence of adaptive capacity has been shown to be a necessary condition for the design and implementation of effective adaptation strategies so as to reduce the likelihood and the magnitude of harmful outcomes resulting from climate change (Brooks & Adger 2005). Adaptive capacity also enables sectors and institutions to take advantage of opportunities or benefits from climate change, such as a longer growing season or increased potential for tourism (Adger et al. 2007).

Developing countries and small island states have been identified as being particularly vulnerable (Table 1).

Table 1: IPCC identification of key vulnerabilities relating to developing countries and small island states

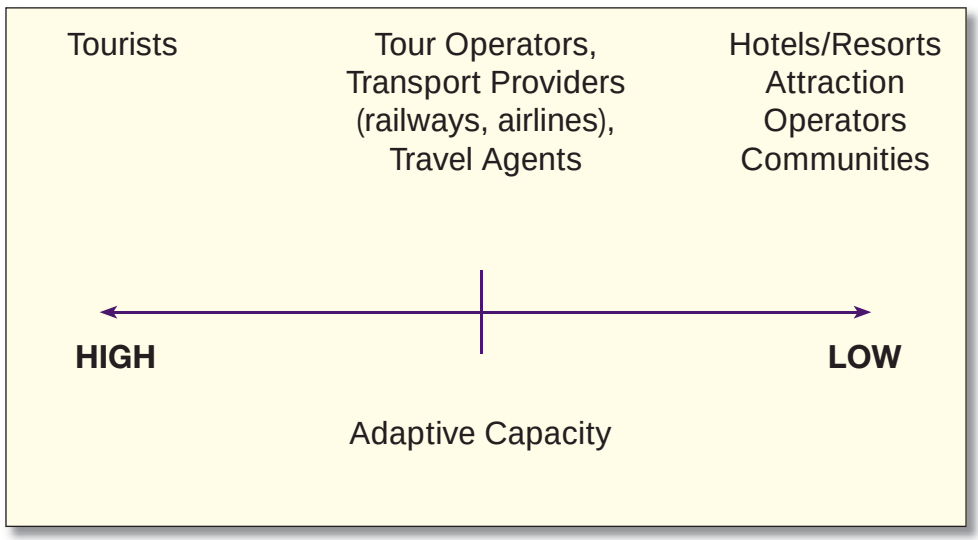
Systems processes or groups at risk	Prime criteria for key vulnerability	Relationship between temperature and risk. Temperature change by 2100 (relative to 1990-2000)
Africa	Distribution, Magnitude, Timing, Low Adaptive Capacity	**0-2°C** Tens of millions of people at risk of increased water stress; increased spread of malaria **>2°C** Hundreds of millions of additional people at risk of increased water stress; increased risk of malaria in highlands; reductions in crop yields in many countries, harm to many ecosystems such as Succulent Karoo
Asia	Distribution, Magnitude, Timing, Low Adaptive Capacity	**0-????°C** About 1 billion people would face risks from reduced agricultural production potential, reduced water supplies or increases in extreme events
Latin America	Magnitude, Irreversibility, Distribution, and Timing, Low Adaptive Capacity	**0–1°C** Tens of millions of people at risk of water shortages **1–2°C** Many endemic species at risk from land-use and climate change **2-3°C** More than a hundred million people at risk of water shortages; low-lying coastal areas, many of which are heavily populated, at risk from sea-level rise and more intense coastal storms **>3°C** Widespread loss of biodiversity, particularly in the Amazon
Small Islands	Irreversibility, Magnitude, Distribution, Low Adaptive Capacity	Many islands already experiencing some negative effects **0-1°C** Increasing coastal inundation and damage to infrastructure due to sea-level rise

Source: Derived from Schneider et al. 2007

The dynamic nature of the tourism industry and its ability to cope with a range of recent shocks, including SARS, terrorism attacks in a number of nations, or the Asian tsunami, suggests a relatively high climate change adaptive capacity within the tourism industry overall (UNWTO-UNEP-WMO 2008). The capacity to adapt to climate change (see Figure 2) is thought to vary between the components of the tourism value chain (sometimes described as sub-sectors of the industry) e.g. tourists, tourism service suppliers, destination communities, tour operators sub-sectors of the tourism industry (Elsasser & Bürki 2002, Gossling & Hall 2006c, Scott 2006, Becken & Hay 2007). Tourists have the greatest adaptive capacity

(depending on three key resources; money, knowledge and time) with relative freedom to avoid destinations impacted by climate change or shifting the timing of travel to avoid unfavourable climate conditions. Tourism service suppliers and operators at specific destinations have less adaptive capacity. Large tour operators, who do not own the infrastructure, are in a better position to adapt to changes at destinations because they can respond to clients demands and provide information to influence clients' travel choices. Destination communities and tourism operators with large investments in immobile capital assets (e.g., hotel, resort complex, marina, or casino) have the least adaptive capacity. The information requirements, policy changes and investments that are required for effective adaptation by tourism destinations require decades to implement in some cases, and so there is a need for rapid action for destinations predicted to be among those impacted by mid- century (UNWTO-UNEP-WMO 2008).

Figure 2: Relative Adaptive Capacity of Major Tourism Sub-sectors



Source: UNWTO-UNEP-WMO 2008

2.7 Mitigation of the Carbon Emissions created by Tourism

Climate change mitigation relates to technological, economic and social changes and substitutions that lead to emission reductions (IPCC 2007c). Mitigation can be realized through technological innovation and market mechanisms, but significant reduction in GHG emissions can only be achieved through behavioural change, given an ever increasing number of human beings participating in tourism. Tourism-related emissions are growing rapidly and climate change mitigation initiatives have to mediate between often conflicting objectives such as the need to reduce long-haul emissions whilst not adversely impacting tourism's role in sustainable development and poverty alleviation (Simpson et al. 2008a).

2.8 Adaptation and Mitigation

Adaptation and mitigation can be complementary, substitutable or independent of each other (Rogner et al 2007). If complementary, adaptation reduces the costs of climate change impacts and thus reduces the needs for mitigation. Adaptation and mitigation are substitutable up to a point, but mitigation will always be required to avoid irreversible changes to the climate system and adaptation will still be necessary due to the irreversible climate change resulting from current and historic rises in GHG and the inertia in the climate system. All of the IPCC reports, and most particularly IPCC's 4th Assessment Report (IPCC 2007d), and the Stern Review (Stern 2006) note that changes in the climate are already causing setbacks to economic and social development in some developing countries with temperature increases of less than 1°C. Unabated climate change would increase the risks and costs very substantially (IPCC 2007b) and so both mitigation and adaptation strategies are required immediately to limit the impact of climate change on the ability to achieve the UN Millennium Development Goals. Ideally, destinations, businesses, and tourism organizations should thus seek to address mitigation and adaptation simultaneously.

Tourist Shelter Damaged by Storm, Tobago
Credit: Dr. Murray C Simpson

Key Knowledge Gaps Related to Developing Countries and Small Island States

3

3

From the perspective of institutions such as the UN Commission on Sustainable Development, capacity-development encompasses a wide range of aspects, including human, technological, organisational, financial, scientific, cultural and institutional dimensions. Capacity building was recognised as one of the means of implementing Agenda 21 and is also a key means of implementation in the Johannesburg Plan of Implementation (JPOI) (UN-DESA n.d.). The JPOI called for enhancing and accelerating human, institutional and infrastructure capacity building initiatives and assisting developing countries in building capacity to access a larger share of multilateral and global research and development programmes. Primarily, capacity building is the process and means through which governments and communities develop the necessary skills and expertise to manage their environment and natural resources in a sustainable manner within their daily activities.

One of the essential elements of capacity building is the development of knowledge: the capacity to enhance skills, utilise research and development and foster learning; and the provision of supporting information: the capacity to collect, access and utilise quality information. In order to do this effectively it is important to provide an assessment of identifiable gaps in our knowledge base with respect to tourism and climate change.

Despite the significant growth in research on tourism and climate change there are considerable gaps in the previously published research regarding the knowledge of climate change adaptation and mitigation, particularly in the context of developing countries and small island states. For example, the widely cited 2006 review on the economics of climate change commissioned by the UK government from Sir Nicholas Stern (Stern 2006) made 19 references to tourism, tourist and recreation and cognate terms in the review with most of these being brief mentions and in the context of developed rather than developing countries and small island states (Hall 2008). More research and analysis of this critical global sector is clearly required. In contrast, tourism is given greater emphasis in the IPCC climate change reports although, both here and with respect to the UNWTO-UNEP-WMO (2008) report there is evidence of far greater knowledge of tourism and climate change with respect to adaptation and mitigation in the developed world than in the less developed countries and island states.

Tourism has become increasingly recognised in the reports of the IPCC Working Group on Impacts, Adaptation and Vulnerability (UNWTO-UNEP-WMO 2008; Hall 2008). Table 2 compares reference to tourism, tourist, recreation and cognate terms in comparable chapters of the 2001 (IPCC 2001) and 2007 (IPCC. 2007b) reports of the Working Group (Hall 2008). It is noticeable that although there are

similar total numbers of references to tourism, tourist, recreation and cognate terms in the regional chapters of the two reports, there is a substantial variation between chapters. In particular there are notable increases in citations in the chapters on Africa and small island states as well as with respect to chapters that deal with issues facing developing countries overall.

Table 2: References to tourism, tourist and recreation and cognate terms in regional chapters of IPCC Working Group II 2001 and 2007 reports on Impacts, adaptation and Vulnerability.

Note: citations refer to references in text, figures, tables and headings with respect to tourism, tourist, recreation and cognate terms. References to terms in bibliographic information at the end of each chapter are not included in tallies of key words.

Regional Chapters	3rd report (2001) citations	4th report (2007) citations
Africa	3	28
Asia	9	7
Australia & New Zealand	22	31
Europe	35	43
Latin America	10	10
North America	92	29
Polar regions	12	12
Small island states	26	49
Chapter totals	209	209
Developing countries & small island states specific	48	94
Developing countries & small island states as percentage of citations	23%	45%

Source: Hall 2008 and additional analysis

Changes in word counts are important as it can be argued that they provide a crude surrogate measure of importance and levels of knowledge on particular subjects that does perhaps broadly correspond to the relative research emphasis on tourism and climate change issues in general at a global level. Further analysis of the IPCC (2007b) identifies some of the major research foci on tourism and climate change that have been linked to the specific circumstances of developing countries and small island states (Table 3). Such an analysis also highlights a number of significant gaps in IPCC analysis and discussion.

Table 3: Dimensions of the tourism and climate change relationships with respect to developing countries and small island states covered in the IPCC Working Group II 2007 report on Impacts, Adaptation and Vulnerability (IPCC 2007b)

Dimension	Specified locations	Chapter source
Sensitivity to climate change	Africa, Asia, Tropical destinations, Small islands	Boko et al. 2007; Cruz et al. 2007; Mimura et al. 2007; Schneider et al. 2007; Wilbanks et al. 2007.
Issues in adaptation to climate change	Small islands	Mimura et al. 2007; Wilbanks et al. 2007.
Coastal tourism	Africa, Americas, Caribbean, Thailand, Maldives, small islands	Boko et al. 2007; Magrin et al. 2007; Mimura et al. 2007; Nicholls et al 2007.
Degradation of coral reef, coral bleaching	Africa, small islands	Boko et al. 2007; Fischlin et al. 2007; IPCC 2007c; Mimura et al. 2007; Nicholls et al. 2007.
Winter tourism	Asia, Bolivia	Adger et al. 2007; Cruz et al. 2007; IPCC 2007c; Magrin et al. 2007; Rosenzweig et al. 2007; Wilbanks et al. 2007.
Skiing/mountain tourism	Asia, Chile	Magrin et al. 2007; Rosenzweig et al. 2007.
Wild faunal diversity/ nature-based tourism	Marine ecosystems, Mediterranean-type ecosystems, Small islands, Southern Africa, Tropical savanna systems	Boko et al. 2007; Fischlin et al. 2007; Mimura et al. 2007.
Extreme events	Mexico, small islands	Magrin et al. 2007; Mimura et al. 2007.

Source: After Hall 2008

One of the greatest problems with assessing the relationships between climate change and tourism is that both direct and indirect effects will vary greatly with location (Gössling & Hall 2006a, b; Wilbanks et al. 2007). Direct effects include the role of climate variables, such as temperature, sunshine hours, precipitation, humidity and storm frequency, and part they play with respect to tourist decision-making and activities, as well as destination choice. Another effect is the extent to which particular environments, such as tropical resorts, also gain some of their appeal from their climatic variables such as sunshine. Finally, indirect effects of climate change such as heat waves, fires, disease outbreaks, landscape change, and natural resource change especially with respect to biodiversity can also have substantial affects on tourism activities, perceptions of a location, and the capacity of firms to do business. However, as Rezenweig et al. (2007: 111) identified, 'as a result of the complex nature of the interactions that exist between tourism, the climate system, the environment and society, it is difficult to isolate the direct observed impacts of climate change upon tourism activity. There is sparse literature about this relationship at any scale'. Therefore, there is a need for the

development of local knowledge capacities, as well the transfer and acquisition of knowledge of adaptive and mitigative capacities from other environments and jurisdictions (Nurse & Moore 2005).

Table 4 highlights the relative level of tourism-specific climate change knowledge and estimated impact of climate change on tourism by region (Hall 2008).

Table 4: Relative level of tourism specific climate change knowledge and estimated impact of climate change on tourism by region.

Region	Estimated impact of climate change on tourism	Relative level of tourism specific climate change knowledge
Africa	Moderately-strongly negative	Extremely poor
Asia	Weakly-moderately negative	Extremely poor
Australia & New Zealand	Moderately-strongly negative	Poor-Moderate (high in Great Barrier Reef)
Europe	Weakly-moderately negative	Moderate (high in alpine areas)
Latin America	Weakly-moderately negative	Poor
North America	Weakly negative	Moderate (high in coastal and ski areas)
Polar regions	Weakly negative – weakly positive	Poor
Small islands	Strongly negative	Moderate (highest with respect to impacts on reef systems)

Sources: Hall 2008 derived from Gössling & Hall 2006a; IPCC 2007b; UNWTO-UNEP-WMO 2008.

Observations as to the regional basis of climate change knowledge with respect to tourism are backed up by comments in the IPCC reports. In the case of Africa, Boko et al. (2007: 450) stresses that ”[…] very few assessments of projected impacts on tourism and climate change are available” and later notes:

> “There is a need to enhance practical research regarding the vulnerability and impacts of climate change on tourism, as tourism is one of the most important and highly promising economic activities in Africa. Large gaps appear to exist in research on the impacts of climate variability and change on tourism and related matters, such as the impacts of climate change on coral reefs and how these impacts might affect ecotourism (Boko et al. 2007: 459).”

Tourism is similarly recognised by the IPCC as one of the most important industries in Asia, although the lack of research is bemoaned. ”Nature-based tourism is one of the booming industries in Asia, especially ski resorts, beach resorts and

ecotourist destinations which are likely vulnerable to climate change; yet only a few assessment studies are on hand for this review" (Cruz et al. 2007: 489). With a situation such as this it becomes all the more important for developing countries and small island states to assess their own vulnerabilities as well as adaptive capacities.

The fact that there are potential 'winners', at least in the short term, as well as 'losers' from climate change in relation to tourism (UNWTO-UNEP-WMO 2008) also reflects on the adaptation capacities of different regions, sectors, actors or firms. Because of their explicit focus on real-world behaviour, assessments of adaptation practices differ from the more theoretical assessments of potential response. Nevertheless, at this stage an understanding of the adaptive capacities and practices of the various elements of tourism in relation to climate change in developing countries are relatively limited (Becken 2005; Gössling & Hall 2006a; UNWTO-UNEP-WMO 2008; cf. Simpson & Hall 2008). In one sense this situation reflects the knowledge gaps that surround a number of areas of tourism and climate change research as described above, and the adequacy of knowledge for policy makers in relation to various dimensions of adaptation, mitigation and impacts.

Climate change is likely to have a long term affect on tourist activities, destinations, and flows as well as the capacities of countries, destinations, and firms to respond to such change (UNWTO-UNEP-WMO 2008). However, while there is the potential to transfer knowledge from one setting to another, the specific capacities of many locations in the developing world to adapt with respect to tourism and climate change has not been sufficiently addressed.

This page has been intentionally left blank

Coastal Tourism infrastructure at Risk
Credit: Dr. Daniel Scott

Adaptation

4

4

4.1 Introduction

Adaptation is a process by which strategies aiming to moderate, cope with, and take advantage of the consequences of climate events are enhanced, developed and implemented (UNDP 2004). This chapter is intended as a guide to the adaptation process, providing detail about frameworks and lessons learned for undertaking adaptation, and strategies available for increasing adaptive capacity. It will provide advice on tailoring adaptation processes to the tourism sector and present case studies of relevance to different tourism stakeholders and local contexts, illustrating techniques, policies, and measures from the tourism sector world-wide.

As outlined in section 2, climate change has far-reaching consequences for tourism businesses and destinations. Knowledge of the capacity of current climate adaptations utilized by the tourism sector to cope successfully with future climate change is currently very limited (UNWTO-UNEP-WMO 2008). Evidence suggests however, that relying on past experience is not likely to be adequate in most destinations, as the future climate and environmental conditions are going to be sufficiently different as to require further adaptation.

Available studies that have examined the climate change risk appraisal of tourism operators (e.g; Elsasser & Bürki 2002; Scott et al 2002; Raksakulthai 2003; Becken 2004; Scott & Jones 2005; Scott et al 2005; Sievanen et al 2005; Wolfsegger et al 2008; Simpson 2008b, UNWTO 2008) have consistently found low awareness of climate change and little evidence of long-term strategic planning in anticipation of future changes in climate. Similar low levels of awareness among policy-makers and practitioners have been found in several other sectors as well (AIACC 2008, Institute for Development Studies 2006). The tourism sector has also figured less prominently than in some other economic sectors in government climate change assessments and is not explicitly addressed in many adaptation frameworks (e.g., the '**W**ater resources, **E**nergy, **H**ealth, **A**griculture, **B**iodiversity, **+**Human Settlements [WEHAB+} framework' for 'Surviving Climate Change in Small Islands' – Tompkins et al. 2005). Consequently, 'mainstreaming' adaptation in the tourism industry and government decision-making remains an ongoing task and is the primary motivation for this chapter.

4.2 The Process of Climate Change Adaptation

A wide range of methodologies and decision tools exist to evaluate climate change impacts and adaptation strategies. The UNFCCC Secretariat has recently updated its Compendium of Decision Tools to Evaluate Strategies for Adaptation to Climate Change (UNFCCC 2005) as part of its continuing support of best practice in climate change adaptation. The compendium provides information on the adaptation frameworks and toolkits developed by several international organizations: US Country Studies Program (USCSP); UNDP Adaptation Policy Framework (AFP); IPCC Technical Guidelines for Assessing Climate Change Impacts and Assessments; United Kingdom Climate Impacts Programme (UKCIP) Climate Adaptation: Risk, Uncertainty; Decision Making, the UNFCCC - Guidelines for the Preparation of National Adaptation Programmes of Action (NAPA); and Assessments of Impacts and Adaptations to Climate Change in Multiple Regions and Sectors (AIACC).

It is not the objective of this handbook to recommend one approach over another, as none have been explicitly applied to the tourism sector and each has comparative strengths and may be more appropriate for use in specific adaptation processes by nations or destinations, particularly if one of these agencies is a collaborator in the adaptation process. Further guidance on the appropriate use of these frameworks, where they have been applied, and training requirements, is provided in the UNFCCC compendium (UNFCCC 2005). In addition, an independent review of adaptation guidebooks has also been undertaken by the Heinz Centre (2007), which may provide further information useful in selecting a particular process for implementation.

The five-year Nairobi Work Programme on impacts, vulnerability and adaptation to climate change initiated through the UNFCCC (2008) also continues to develop and disseminate valuable state-of-the-art information to countries working to improve their understanding of climate change impacts and vulnerability and to increase their ability to make informed decisions on how to adapt successfully. Information available through two of the nine work areas are particularly valuable for nations and destinations undertaking adaptation processes. The 'Methods and Tools' work area is designed to promote the development and dissemination of a broad range of methodologies and tools for impact and vulnerability assessments, as well as adaptation planning, measures and actions, and integration with sustainable development. A total of 15 submissions are available from the UNFCCC (2008) as well as a synthesis document that includes a summary of the lessons learned from the application of methods and tools, as well as opportunities, gaps, needs, constraints and barriers.

4

The 'Adaptation Planning and Practices' work area provides information on adaptation approaches, strategies, practices and technologies for adaptation at the regional, national and local levels in different sectors, as well as on experiences, needs and concerns. The searchable database contains 23 submissions and is intended to facilitate the dissemination of information on past and current practical adaptation actions and measures, including adaptation projects, short- and long-term adaptation strategies, and local and indigenous knowledge. Five submissions from WMO, UNWTO, OECD, Spain and Parks Canada are categorized as specifically relevant to the tourism sector. Submissions from nations with similar tourism sectors or that anticipate simlar climate change challenges may also be highly informative for users of this guidebook.
The United Nations Development Programme (UNDP) framework provides four guiding principles for adaptation that are highly relevant for tourism (UNDP 2005):

a) Place adaptation in a development context

The impacts of climate change could negatively affect a country's sustainable development in diverse ways, including water resources, energy, health, agriculture, and biodiversity – all of which can influence the tourism sector. Consequently, the process of adaptation in the tourism sector cannot be undertaken in isolation and needs to be placed within the broader context of a country's sustainable development policies and strategies and consider impacts and adaptations in other sectors.

b) Build on current adaptive experience to cope with future climate variability

The tourism sector has tremendous experience coping with climate variability (see Table 10 for examples) and much more assessment of its coping range is required as a starting point for adaptation. A wide range of tourism stakeholders need to be involved in the adaptation process to take full advantage of their diverse experience and expertise with adapting to current climate variability.

c) Recognise that adaptation occurs at different levels in particular, at the local level

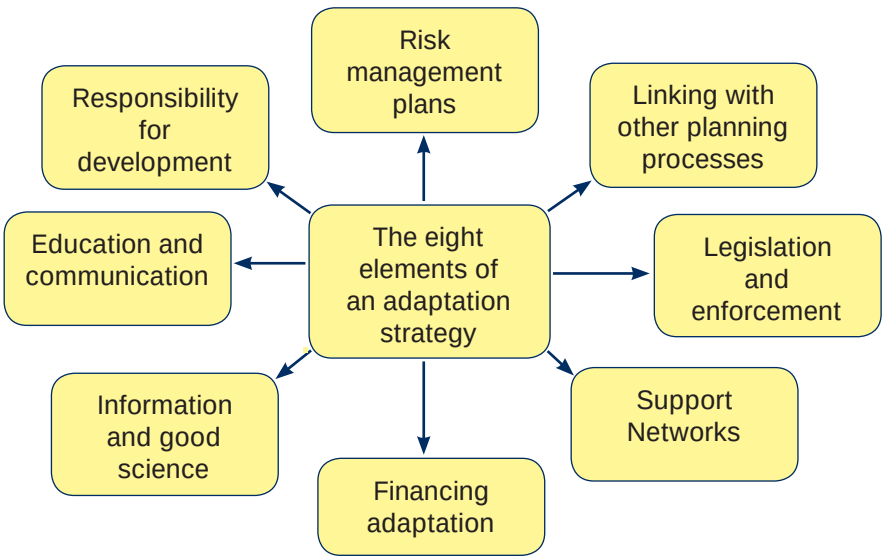
Adaptation can be undertaken strategically at the national level, such as with the Australian 'Tourism Action Plan on Climate Change', but implementation often takes place at the local destination, business or project level. Climate change is not just a challenge for governments and in the tourism sector, involvement of tourism industry is critical, as their operations are and will be affected principally.

d) Recognise that adaptation is an ongoing process

Most adaptation frameworks recognize that adaptation will be an iterative process of implementing and evaluating strategies as climate conditions continue to evolve over the course of this century.

The various adaptation frameworks identified above contain a number of common key elements that should be considered for any adaptation strategy. Tompkins et al. (2005) summarize many of these common elements in Figure 3. Importantly, while all of these elements are necessary, the degree to which they are emphasized depends on the specific adaptation process and the stakeholders involved. Where climate change has been identified as a known risk, but little information exists to evaluate the types and severity of climate change impacts on the tourism sector (see the regional knowledge gaps identified by UNWTO-UNEP-WMO 2008 in Figure 1), then substantial investment in information and science may be required. In other nations and destinations where the nature of climate change risks are well established, the implementation of a formal planning process to engage tourism stakeholder and allocating responsibilities would be more appropriate focus.

Figure 3: Essential Elements of an Adaptation Strategy



Source: Tompkins et al. 2005 - “Surviving Climate Change in Small Islands”

4

The Assessments of Impacts of and Adaptation to Climate Change in Multiple Regions and Sectors (AIACC) project was developed to enhance the scientific and technical capacities in developing countries to assess the impacts of climate change and design effective adaptation responses (AIACC 2007). The lessons learned from the 24 projects undertaken by AIACC in Africa (11), Asia (5), Latin America (5), and small island states (3), are summarized below and were key considerations that informed the 'Framework for Climate Change Adaptation in the Tourism Sector' set out in section 4.3:

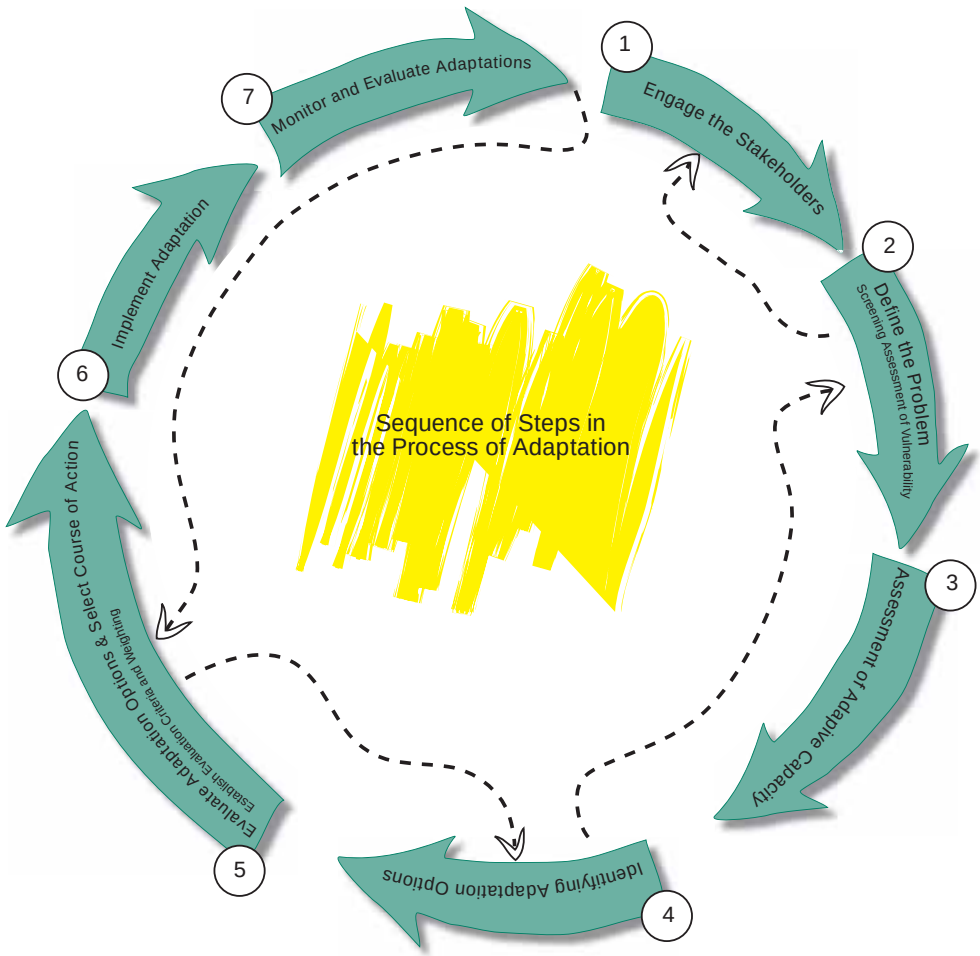
1) Adapt now: The injunction to commence the process of adaptation was one of the main findings. In all case studies, an 'adaptation deficit' to climate variability was found, one which climate change threatens to worsen. Therefore, further adaptation to current risks can yield immediate benefits.
2) Create conditions to enable adaptation: Numerous barriers were found to impede adaptation, including: competing priorities for scarce resources, lack of knowledge, weak institutions, degraded natural resources, inadequate infrastructure, insufficient financial resources, and poor governance. Enabling the process of adaptation was one of the most important adaptations that governments can make.
3) Integrate adaptation with development: The objectives of climate change adaptation and development are strongly complementary and so to be effective adaptation processes must engage policy-makers from ministries responsible for development, finance, land and water management, and public health.
4) Increase awareness and knowledge: Nearly all case studies highlighted knowledge as a critical constraint on adaptation and emphasized the generation and communication of new information for managing climate risks as high priorities.
5) Strengthen institutions: In many case studies, key functions for managing climate risks and undertaking adaptation were inadequate or absent due to weak institutions. Thus, strengthening institutions or in some cases revitalizing traditional institutions and ways of making decisions are essential for facilitating adaptation.
6) Protect natural resources: Natural resources that are in a degraded state are more vulnerable to climate change and therefore rehabilitating and protecting natural resources such as wetlands, fisheries, biodiversity, and forests are critical adaptation strategies in many developing nations.
7) Provide financial assistance: Limited financial resources is commonly cited as a major adaptation barrier and innovative solutions will need to be sought to obtain financing from multiple sources, both internal and external to developing nations.
8) Involve those at risk: Involving stakeholders at potential risk (the intended beneficiaries of adaptation) was found to increase effectiveness of adaptation processes, demonstrating the importance of participatory approaches to adaptation.
9) Use place-specific strategies: Adaptation is place-based and the local context will determine what specific approaches and initiatives will be most effective.

4.3 Developing and Implementing a Climate Change Adaptation Process

There is no single 'correct' procedure to undertake climate change adaptation in the tourism sector. The seven step process outlined below, 'A Framework for Climate Change Adaptation in the Tourism Sector', represents an integration of the common recommended components from the frameworks developed by UNEP (1998), UNFCCC-NAPA (2001), UNDP (2004) and USAID (2007) and knowledge gained from the AIACC project (2007). These frameworks have each been applied in several developing nations and in several economic sectors; however, none have been used in an adaptation process explicitly focusing on the tourism sector. This framework thus represents best practise as determined from lessons learned in other economic sectors.

The seven step process identified in Figure 4 should not be considered a linear sequence, but rather an iterative cycle of problem definition, adaptation implementation, and evaluation of outcomes, that has feedbacks between the steps as identified.

Figure 4: Sequence of Steps in the Process of Adaptation



Step 1 – Getting the Right People Involved in a Participatory Process

All of the four frameworks emphasize that a vital aspect in determining the eventual success of the adaptation process is to get the right people involved and to involve them in a participatory process. The purpose of multi-stakeholder processes is to promote better decision making through an inclusive and transparent process that creates trust and a sense of buy-in or ownership among stakeholders. The AIACC project (2007) found that knowledge networks were very incomplete and not well coordinated, resulting in substantial gaps in awareness and understanding of climate hazards and climate change among many key stakeholders. Participatory processes were recommended as one strategy to improve the function and development of knowledge networks, by generating and importantly communicating knowledge that is relevant, credible and co-produced by stakeholders.

Tourism is a highly diverse economic sector and the perspectives of many local, national and, where applicable, international stakeholders should be sought, both those directly involved in the tourism sector or whose livelihoods are affected by tourism (government ministries, local government, tourism industry representatives, tourism labour representatives, local businesses and communities), and those in other sectors that might be affected by tourism adaptations (e.g., transportation, energy or agriculture), whose adaptations might affect tourism (e.g., insurance industry, health sector), or that have other relevant expertise (e.g. universities, non-governmental organizations). Table 5 illustrates the diversity of stakeholders involved in the initial stakeholder workshop on 'Adaptation to climate change in the tourism sector in the Fiji Islands' and stakeholders that have made formal written submissions to the Australian 'Tourism Action Plan on Climate Change'.

Table 5: Diversity of Stakeholders Involved in Tourism Adaptation Processes in Fiji and Australia

Fiji	Australia
Ministry of Tourism	Air Transport Action Group
Department of Environment	Australian Capital Territory Government
Meteorological Service	Australian Hotels Association
Disaster Management Office	Australian Ski Areas Association
Department of Town and Country Planning	Australian Tourism Export Council
Ministry of Health	Business Events Council of Australia
University of the South Pacific	City of Melbourne
Pacific Islands Applied Geoscience Commission	Conservation Volunteers Australia
World Wildlife Fund for Nature – South Pacific	Ecotourism Australia
Local Municipal Councils	Great Barrier Reef Foundation
Department of Lands	Great Barrier Reef Marine Park Authority
South Pacific Regional Environment Programme	Griffith University
Ministry for Agriculture	Northern Territory Government
Ministry of Fisheries and Forestry	Queensland Government
SPTO	Queensland Tourism Industry Council
Fiji Visitor Bureau	Restaurants and Catering Australia
Fiji Hotel and Tourism Association	South Australian Government
Native Land Trust Board	Sustainable Tourism Cooperative Research Centre
Fiji Trade Investment Board	Tony Charters & Associates
United Nations World Tourism Organization	Tourism & Transport Forum
United Nations Environment Programme	Tourism Tasmania
	Western Australian Government

4

Stakeholders that should be considered and invited for inclusion in the adaptation process include:

- **Representatives of Government Departments, Regional and Local Authorities, and Quasi Government Organizations e.g.**
  - National Meteorological Services
  - Tourism Development Companies (Active in the region)
  - Parish Council
  - Waste Management Department (Water and Solid)
  - Protected Area and / or Parks Management (Marine and / or Land)
  - Water Supply Department or Company (Local, Regional and National)
  - Urban and Rural Development Departments
  - Energy Department and / or Supplier
  - Ministry of Transport and Local Transport Agency
  - Ministry in charge of Statistics (National, Regional and Local)
  - Port Authority

- **Representatives of Private Sector and Non-Governmental Organizations e.g.**
  - Tour Guide, Camping, Caravan, Villa, Apartment Associations
  - Local Chamber of Commerce
  - National Inbound Tourism Association and equivalent Local representatives
  - Local Architect Association
  - Tourism Employee Associations and / or Unions
  - Relevant Academic Institutions involved in associated research
  - Local Product Supplier Associations and Other Users of the Destination i.e. Community Fishers, Farmers, Arts and Crafts, Informal Sector.
  - National Heritage Trust and equivalent Local Trust (Natural and Cultural)

There are a wide range of resources available for best practices in participatory planning exercises. The World Bank Participation Sourcebook (World Bank 1996) and the UNFCCC compendium (UNFCCC 2005) offer advice on identifying stakeholders and best practice in participatory planning and decision making, based on a number of participatory approaches undertaken in developing nations.

However, Tompkins et al. (2005) emphasize that 'tried and tested methods used in-country' for stakeholder consultation and engagement should always be used first.

It is a common enough experience that not all stakeholders may want to engage in a newly initiated adaptation process immediately and so this should be anticipated and the process should proceed to step two with the stakeholders that are willing to participate. The reasons for certain stakeholders not wanting to engage are varied (lack of knowledge about potential implications of climate change, concerns over time commitments, etc.). By proceeding to step two and undertaking a screening level assessment of the vulnerability of the tourism sector, there will be new information to offer to those stakeholders initially unwilling to engage in the adaptation process.

Protocols for communications (e.g., identifying target audiences, reporting process outcomes, mechanisms – web sites, media releases, workshops) and decision-making within the adaptation process should be established in consultation with involved stakeholders.

Box 1: Communication to Facilitate Adaptation in the Local Tourism Community

Awareness of climate change adaptation among local tourism operators has generally been found to be relatively low. Consequently, there is a real need for effective communication between the climate change science community and tourism operators at the regional and local scale. The South West Climate Change Impacts Partnership (2007) in England developed an outreach brochure that explained to tourism business owners how climate change affects their business and provides a checklist for planning for climate change impacts. Similar regionally specific initiatives, perhaps in conjunction with climate change adaptation workshops, would be highly valuable in many other tourism destinations.

Step 2 – Screening for Vulnerability: Identifying Current and Potential Risks

The next step is to understand how climate change may affect your region and what risks this would pose for the tourism sector. Understanding climate impacts is an essential early step and the assessment should include examination of physical risks to tourism resources (e.g., biodiversity, water supply) and infrastructure (e.g., coastal resorts), business and regulatory risks (e.g., changes in insurance coverage), or market risks (e.g., changes in international competitiveness through transportation costs). Both UNEP (2005) and AIACC (2008) specify that both current (e.g., extreme climatic events – both sudden and slow onset) and potential future risks (e.g., changing climate means and variability) be assessed. Synthesizing information from existing national or regional climate

change assessments may prove valuable at this stage to understand recent and projected climate changes and the implications for natural and human systems that are highly relevant to tourism. Because tourism has not been adequately considered in many previous climate change assessments, a scoping assessment of the range of tourism specific risks may also be needed to supplement existing information and to ensure knowledge gaps are addressed. This could take the form of data collection and collation through a series of relevant indicators further developing and extending some of those designed for the Sustainable Tourism Zone for the Caribbean (STZC) (Simpson and Ladle 2007) see Table 6. Where little information is available, canvassing stakeholders about how recent climatic extremes have affected aspects of tourism operations (e.g., warmer tourism seasons, prolonged dry period, extreme events which can serve as analogues for conditions expected under climate change) is a good place to begin. What do these analogue experiences reveal about existing climate sensitivities and what analyses have been undertaken to better cope with future incidences? Some additional issues to consider when beginning a vulnerability assessment are outlined in Table 7 Depending on the answers to these questions, the assessment may be able to be conducted 'in-house' within government departments, through a multi-stakeholder assessment team, through consulting agencies or university-based researchers, or some combination of these.

Table 6: A Selection of Indicators for Sustainable Tourism Destinations in the Caribbean Relating to Climate Change

•	National standards exist for the construction of new buildings to be set-back from the shoreline
•	A climate change risk assessment for tourism industry has been completed
•	An assessment of destination's adaptive capacity to climate change has been completed
•	A system to measure and monitor carbon emissions in destination is being used
•	Percentage of energy consumed in the destination from renewable sources
•	Percentage of beaches where erosion is monitored at least annually
•	Percentage of coastline with visible signs of erosion
•	Effective erosion protection measures in place in vulnerable areas (i.e. that do not have direct or indirect negative effects elsewhere)

Source: Adapted from Simpson and Ladle 2007

Table 7: Some Issues to Consider When Undertaking a Vulnerability Assessment

General Process and Scope	Budget and Political Support
• How much time is available for the assessment?	• What is the available budget and what are the contributions of each stakeholder?
• What questions do you want the assessment to answer?	• Who will manage the assessment process and budget?
• Do the stakeholders involved have the technical capacity to perform the assessment in house'?	• What level of political support exists for the assessment and does it need to be strengthened to ensure results are considered?
• Which specific decisions do you want the assessment to support?	• Is there political will for the assessment at every level of the legislature i.e. national, regional and local?
• What type of climate scenarios do the stakeholders want to examine?	• Are different departments and ministries working together in a trans-disciplinary manner?
• How will the technical findings be communicated to all relevant stakeholder groups?	• Has a plan been formulated to extend the budget to cope with implementation of any strategies derived from the vulnerability assessment?
• How inclusive of stakeholders is the assessment to be?	

Adapted from ICLEI 2007

If key stakeholders were unwilling to engage in the adaptation process initially, another attempt to engage them should be made at this stage by communicating the results of step two (Figure 4). Communicating the potential impacts of climate change has proven to be an effective strategy for generating public and stakeholder interest, as well as galvanizing support for future adaptation. Before beginning any communication activities, the target audiences and their basic interests should be identified in order to effectively tailor the message of relative vulnerability to key audiences (ICLEI 2007). Resources for developing effective climate change communications are available from Environment Canada (Scott et al. 2000) and the Climate Change Communication Initiative in the UK (DEFRA 2008).

4

Step 3 – Assessment of Adaptive Capacity

Adaptive capacity refers to the 'property of a system to adjust its characteristics or behaviour, in order to expand its coping range under existing climate variability, or future climate conditions' (Brooks et al 2005). Enhancing adaptive capacity requires the design and implementation of adaptation strategies and responses in order to either reduce the likelihood of adverse events or lessen the scale of negative. Importantly adaptation requires the capacity to learn from past experience in order to cope with current or future events, both known and unknown (ibid).

Adaptive capacity cannot be measured directly, but the social, educational, institutional, place-specific and other factors which determine adaptive capacity can be assessed (ibid). This assessment of adaptive capacity requires the identification of both the systems and the hazards involved i.e., "who adapts and to what?" (Brooks et al 2005). The IPCC (2001) identifies eight determinants of adaptive capacity, namely:

(i) available technological options,
(ii) resources,
(iii) the structure of critical institution and decision making authorities,
(iv) the stock of human capital,
(v) the stock of social capital including the definition of property rights,
(vi) the system's access to risk-spreading processes,
(vii) information management and the credibility of information supplied by decision makers,
(viii) the public's perceptions of risks and exposure.

While the potential range of climate change impacts in the tourism sector are increasingly being understood, as indicated, there is very limited understanding of the adaptive capacity of destination communities to address these changes. The adaptive capacity of communities is determined by the inter-relationships between communities and their infrastructure, ecosystems and physical changes, social features such as availability of social networks and institutional features such as decision-making processes and policy/regulatory interventions.

The IPCC determinants and research conducted in destinations lead to a selection of key factors that could be assessed in this step of the process. These factors will of course vary from destination to destination but may include the following examples:

- any new technologies relevant to tourism and climate change (e.g. coastal defences)
- level of available resources (money, human - skills and population, time);
- natural resources available relevant to assist in adaptation strategies (e.g. beach sand, fresh water);
- levels of biodiversity and resilience of biodiversity to environmental change;
- number and structure of local and regional authorities and record of successfully developing, implementing and regulating relevant policies (planning controls and enforcement, EIAs, etc)
- social structures – number of community groups and NGOs and how long in existence? history of working collaboratively?
- the destination's record in responding to crises (e.g. hurricanes / cyclones, storm surge);
- existence of disaster response plan (has this ever been implemented and how successful was it's implementation?);
- awareness and knowledge within the destination and its stakeholders of the different risks and opportunities posed by climate change.

Step 4 – Identifying Adaptation Options

Work with tourism stakeholders to compile a list of alternative technologies, management practices or policies that may enable them to better cope with the anticipated impacts of climate change. This adaptation portfolio building stage should include both preparatory and participatory activities (USAID 2007). Preparatory activities should begin by identifying current adaptation strategies and policies in place to address current climate related risks. Reviewing recent climate change reports from other communities and regions expected to face similar risks may be valuable for identifying additional adaptations utilized successfully in other tourism destinations. Finally, a review of national assessment documents (as in step 2), the AIACC database, and pilot project reports of major donor organizations could also be completed. Participatory activities may include holding workshops or smaller focus group meetings with stakeholders. Where it is difficult or overly costly to bring a wide range of stakeholders to a workshops field interviews with stakeholders by an adaptation team or Delphi techniques with key stakeholders and potential implementing partners can also be used to identify adaptation options. National and international experts in climate change risk assessment and adaptation should also be consulted to share information and experience from other nations and to help identify any potential gaps in the stakeholder generated adaptation portfolio.

4

Box 2: Stakeholder Identified Adaptation Options for the Caribbean Tourism Sector.

The Adaptation to Climate Change in the Caribbean (ACCC) project conducted a workshop (Grenada 2002) with tourism stakeholders from across the Caribbean region. Three working groups were established:
WG 1: Capacity Building
WG 2: Technical Studies
WG 3: Adaptation Options
The working groups identified major strategies for mainstreaming climate change into tourism decision-making in the region, under the criteria of 'Adaptation and Development Planning Actions' and 'Institutional & Technical Capacity Building Actions'. The strategies of relevance to tourism and climate change include:

- Assisting countries to evaluate and update national tourism plans to include climate change adaptation strategies;
- Developing management plans for coastal and wetland attractions to demonstrate approaches to using adaptation mechanisms against climate change impacts;
- Conducting environmental audits and retrofit programme for hotels and marinas to add climate change component;
- Strategic planning for inland tourism development zones to provide alternatives to coastal tourism land use policies in selected countries;
- Assistance with emergency planning and management of hurricane shelters for yachts & other recreational craft in selected yachting destinations;
- Upgrading procedures for Environmental Impact Assessments to incorporate hazard risk and climate change vulnerability assessment (add climate change to terms of reference).
- Training of National Agencies in monitoring climate change effects on coastal resources, natural systems beneficial to tourism and natural attractions (beaches, reefs, wetlands)
- Improving socio-economic data collection systems to measure climate change direct and indirect impacts on environmental goods & services benefiting tourism, e.g. scuba diving and visits to attractions
- Developing a regional climate change Champions programme (with national components)
- Conducting vulnerability assessments of the yachting sector in selected countries
- Building response capacities for climate change among yachting trades and scuba diver associations in selected countries
- Designing & implementing standards for minimum floor level heights and other flood resistant measures for buildings in coastal & flood plain areas
- Providing technical assistance in design standards for marina piers and bulkheads
- Assistance to build technical and administrative capacity for managing coastal areas

Source: Jackson 2002

Step 5 – Evaluate Adaptation Options and Select Course of Action

The adaptation portfolio building stage is likely to identify a long list of potential adaptations that may be difficult to fully analyse with limited timeframes and budgets. It is recommended that a second round of stakeholder consultation be done to present the full initial list of stakeholder identified adaptations, and determine criteria by which to evaluate adaptations and refine the portfolio of adaptations to be considered for implementation. A range of criteria can be used to evaluate adaptation strategies. Criteria applied in various AIACC (2007) projects included: net economic benefit, timing of benefits, distribution of benefits, consistency with development objectives, consistency with other government policies, cost, environmental impacts, spill-over effects, capacity to implement, and social-economic-technological barriers. Similar evaluation criteria set out by US AID are described in more detail in Table 8. Some criteria may require the additional detailed analysis be undertaken of each adaptation.

Table 8: Potential Evaluation Criteria for Adaptation Options

Cost	Costs to implement and maintain; cost sharing possibilities
Effectiveness	Capacity to solve problems or realize opportunities derived from climate change impacts (e.g., economic benefits, costs avoided, lives saved)
Ease of Implementation	Potential legal, political, institutional, barriers
Acceptability to Local Stakeholders	All stakeholder identified adaptations are attractive to some stakeholders, but may not be equally attractive to all stakeholders for political, economic, social or cultural reasons
Acceptability to Financing Agencies/Ministries/ Donors	Are the financing agencies/ministries involved willing to support the option
Endorsement by Experts	Is the option consistent with international best practice
Timeframe	Are short-term or long-term strategies more desirable; How does the timeframe needed to implement the option compare with that available (e.g., are there specific project or funding time horizons);
Institutional Capacity	How much additional capacity building and knowledge transfer is required to implement the adaptation
Size of Beneficiaries Group	Does the adaptation provide small benefits to a large number of stakeholders and people or large benefits to a small number
Potential Environmental or Social Impacts	Are there possible adverse impacts on the environment or people (e.g., are additional GHG emissions likely)
Capacity to Sustain Over Time	Once implemented, can the adaptation be successfully sustained

Adapted from: USAID 2007

It is recommended that stakeholders select the specific set of criteria to be used and develop a weighting scheme for the criteria by rating the level of importance of each of the criteria. Are all criteria to be considered equal or are certain criteria of greater importance and therefore 'weighted' in an evaluation? A system of rating scores for each criterion should be agreed to before undertaking the evaluation (e.g., will each criterion be evaluated on a set scale: 1 = low to 5 = high). The rating can be based solely on stakeholder and expert judgement or more detailed research and rigorous analysis. A matrix can be constructed to display how each adaptation was rated according to the agreed upon evaluation criteria (Table 9). The completed matrix can then be used to compare the full range of options and develop a short-list of options for implementation. This process is highly transparent and gives stakeholders ownership of the process of evaluating and selecting adaptation options to implement.

Table 9: A Hypothetical Adaptation Portfolio Evaluation Matrix for a Destination with Growing Water Supply Shortages

Adaptation Optins	Selected Evaluation Criteria* (1=Low, 5=high					Evaluation Score
	Affordibility	Effectiveness	Acceptabil-ity to Lacal Stakeholders	Ease to Implement	Capacity to Sustain	
Water conservation programs at resorts	5	3	5	5	5	23
Fee structure for water use	3	5	1	2	4	15
Close golf course and curtail other high water uses during dry season	2	3	2	1	3	11
Limit new tourism development	2	4	3	2	3	14
Mandatory onsite water collection and storage systems	4	5	5	3	4	21
Construct desalination plant	1	5	5	3	2	16

* - all criteria considered equally important and not weighting factors are applied

Step 6 – Implementation

Implemention of the adaptation options selected in step 5 requires that the roles of implementing stakeholders, resource requirements, and timelines be specifically defined. USAID (2007:18) recommends that an implementation plan be developed with the following components:

- Strategic plan outlining actions and timelines of involved stakeholders;
- Capacity building needs assessment and training plan;
- Financial / business plan covering expenditure needs and revenue sources;
- Outreach / communication plan;
- Sustainability plan;
- Plan for monitoring the performance of adaptations.

As indicated in Figure 3 (Tompkins et al. 2005), adaptation plans cannot stand alone and must relate to other existing planning processes and policies (i.e., 'mainstreaming' adaptation).

Step 7 – Monitor and Evaluation Adaptations

Climate change adaptation represents a long-term investment of human and financial resources. To ensure the optimal realization of this ongoing investment, the final step in this process is to continuously evaluate the effectiveness of the implemented adaptations. Again, several evaluation criteria are possible (e.g., cost, ease of implementation, delivered intended benefits, adverse impacts). The evaluation criteria and related indicators should be selected by stakeholders in step six as part of the monitoring and performance plan. Complete evaluation may prove difficult for some time however, as the long-term risks posed by climate change that required the adaptation may not be realized for many years (even decades). As evaluation of the implemented adaptation strategies becomes possible, this continues the iterative process of adaptation (Figure 4) by informing how the initial strategy will need to be refined – do different adaptation options need to be implemented, do new adaptation options need to be identified, or does the problem first need to be redefined?

4

Box 3: Bottom-Up Community Approaches Climate Change Adaptation: Lessons from the Cook Islands

Best Practices: Participatory Assessment

- Have some action to offer – communities often consulted without results from any previous work
- Have local counterpart in community as project coordinator; government or agency as advisor
- Use facilitators from each village/community group, also consider different focus groups
- Undertake facilitator training –neutrality emphasis
- Develop tools to make consultation process efficient: 3 hours maximum is realistic
- Document past issues/analogues
- Work in local language

Best Practices: Adaptation Implementation

- Document traditional knowledge and use for awareness raising
- Undertake necessary baseline assessments once priority area identified –ensure information can be shared with community users in a meaningful way e.g. water system GIS maps for leak repair
- Assist with development of policy based on priority area
- Link to other processes & action in communities–synergies e.g. disaster preparedness
- Ownership through community/individual contribution to adaptation solution e.g. tanks
- Sustainability plan
- Monitoring –e.g. quarterly health inspections on tanks
  Concerns, Gaps, Needs, for Community Approach
- Future climate change may bring different impacts from present day climate related issues
- Merging downscaled scenarios with local data is difficult
- Breakdown in observational data-early warning
- Awareness is expensive
- Burden of justification for adaptation implementation –Community has identified a climate related problem, prioritized a solution that fits them, but a lot of work to prepare a project in terms of verification of scientific basis for project rationale
- Despite increased baseline data and indications of impacts, lack of co-financing can mean priority area under climate change not targeted for adaptation action
- Recommended community role in adaptation not being acted on (e.g. housing design), need a driver, resources and awareness raising
- Limited input of traditional management systems e.g. coastal vegetation, marine reserves
- Replication beyond pilot scale

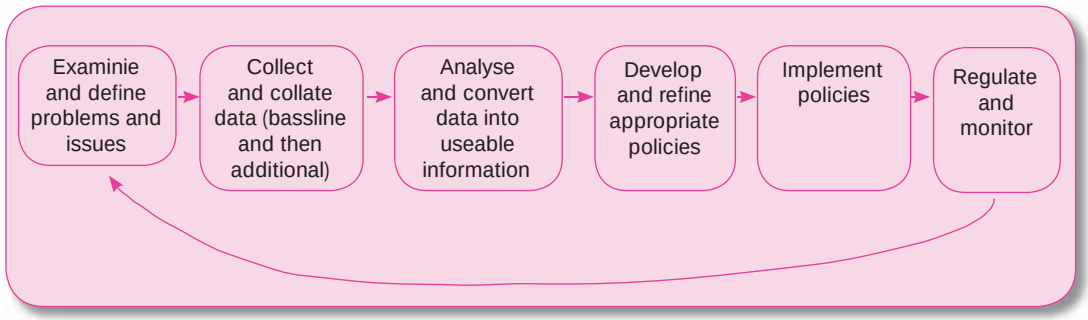
Source: Carruthers 2007

4.4 The Importance of Data

Although the need for sustainable destination management is gradually being accepted and there are a number of initiatives based on this premise e.g. the Sustainable Tourism Zone for the Caribbean (STZC) and Agenda 21 programmes such as those in Calvia and Rimini, the climate change relevance, links, and response to key climate change issues needs to be further strengthened. In the context of climate change the importance of the collection and collation of data to achieve effective sustainable destination management in developing countries and small island states cannot be overstated. A key data management tool is the systematic use of indicators. UNWTO has been working for more than a decade on sustainable tourism indicators. The Guidebook on Indicators for Sustainability for Tourism Destinations (UNWTO 2004) contains reference on measurement techniques for a broad range of issues related to the environmental resource base of destinations, and has a specific section addressing climate change issues. The World Meteorological Organization, through its 188 Member countries, provides the basic weather, climate and water-related data that underpin all climate change research and assessments. WMO develops indices and indicators relevant to climate variability and change, particularly for extremes (including hazards).

In a recent report, 'The International Policy and Market Response to Global Warming and the Challenges and Opportunities that Climate Change Issues Present for the Caribbean Tourism Sector' (Simpson et al. 2008a), information was gathered from interviews of key regional stakeholders regarding the knowledge gaps currently present in the Caribbean region. The areas where these key stakeholders believe support is required highlighted critical information and assistance requirements. The themes and individual subject areas identified by the stakeholders focusing on 'requirements' and 'knowledge gaps' overlapped and coincided in many areas. Some of the most acute and most frequently mentioned were the areas of data, monitoring, policy development and implementation. This finding is consistent with adaptation assessments in many other sectors, as the importance of 'good science' and 'data' are emphasized in all of the multi-sectoral frameworks used to inform this guidebook (UNEP 1998, UNFCCC-NAPA 2001, UNDP 2004 and USAID 2007) as well as synthesis works from adaptation in developing countries (Tompkins et al 2005 and AIACC 2007). Figure 5 below illustrates these key areas that are in critical need of development in order to strengthen the position of developing countries and small island developing states in the face of a changing climate and global warming.

Figure 5: The Climate Change and Tourism Information and Implementation Nexus: data and policy process requirements for developing countries and small island developing states

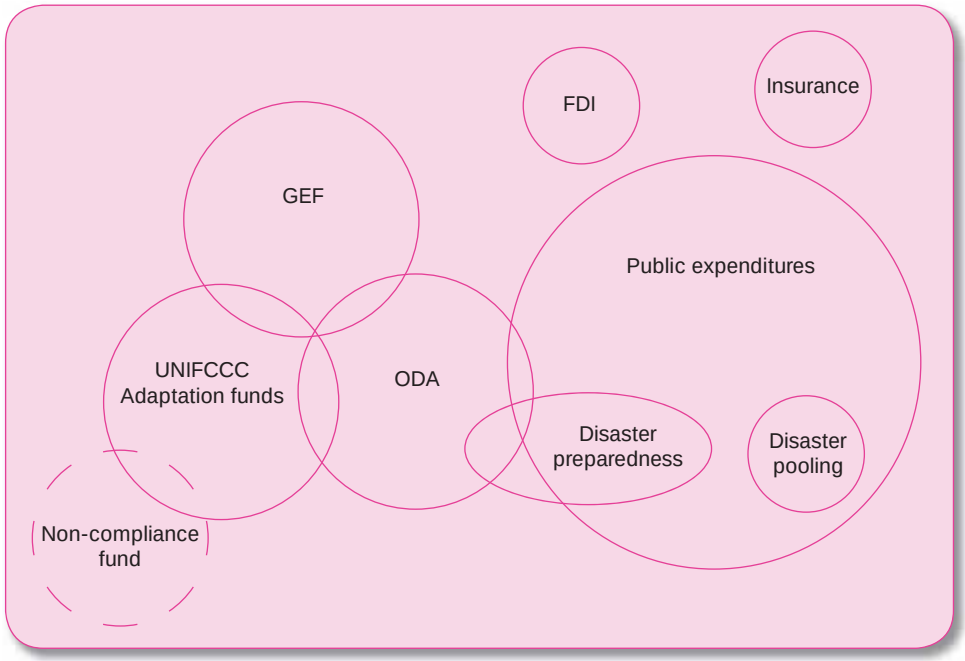


Source: Adapted from Simpson et al. 2008a

4.5 Financing Climate Change Adaptation

An essential element of adaptation activities is where the resources will be found to support it. Figure 6 presents the broad range of current and potential future sources of support for adaptation, both within and without the UNFCCC, as summarized by Bouwer and Aerts (2006). The size of the circles represents the relative potential importance for adaptation activities generally, although this is highly uncertain in an era of rapidly evolving climate policy where adaptation is expected to be increasingly important in future.

Figure 6: Potential sources of financing for adaptation in developing nations



Source: Bouwer and Aerts (2006)
GEF = Global Environment Facility, FDI = Foreign Direct Investment, ODA = Official Development Assistance

The UNFCCC (Articles 4.1, 4.3 and 4.4) identifies that developed countries should take the lead in meeting the incremental costs of climate change adaptation, and specifically assist developing nations that are particularly vulnerable to the adverse effects of climate change with meeting the costs of adaptation. Commitments to finance adaptation in developing nations are not outlined in the UNFCCC, however at the sixth Conference of the Parties (COP-6) in 2001, three funds were created to specifically support adaptation: the Special Climate Change Fund (~$50 million), the Least Developed Countries Fund (~$32.5million), and the Adaptation Fund. These funds are disbursed through Global Environment Facility (GEF). GEF can fund the costs of capacity building and research in relation to adaptation, including: studies of possible impacts of climate change, identification of options for adaptation, and appropriate capacity building. GEF also has a special SIDS programme and their biodiversity operational area also has some relevance to tourism. More recently, the Adaptation Fund was established to finance adaptation projects and programmes in developing countries that are Parties to the Kyoto Protocol. The Fund is to be financed with a share of proceeds from CDM project activities (2% of the share of proceeds from CDM projects will be diverted to the fund) and receive funds from other sources. At COP-13 in Bali, Indonesia the Adaptation Fund Board was selected and the World Bank invited to serve as the trustee for the fund.

A multi-agency report representing UNDP, UNEP, World Bank, OECD, African Development Bank, the Asian Development Bank and other international and national organizations (African Development Bank, et al. 2003), emphasized that unless climate change adaptation measures are taken, it will be more difficult to meet some of the UN Millennium Development Goals by 2015, and that consequently adaptation also needs to be incorporated into development activities funded by Official Development Assistance. A number of development organizations have responded. For example, the Canadian International Development Agency CIDA) established the CDN$110 million (over 6 years) Canada Climate Change Development Fund (CCCDF) for developing nations.

4.6 Climate Adaptation in the Tourism Sector

The tourism sector has adapted its operations to climate zones world-wide. As Table 10 illustrates, a diverse range of technological, managerial, policy and behavioural adaptation measures are currently in use by tourism stakeholders to deal with climate variability at the destination level. Additional details on many of these diverse adaptations can be found in the case study boxes referred to in Table 10. Climate adaptations are rarely undertaken in isolation, but commonly involve multiple adaptations that are specific to the destination climate and its tourism products. The location specific nature of climate adaptation creates a complex mix of adaptations being practiced in the tourism sector across the globe. Section 4.7 provides a number of case studies of adaptation in diverse tourism destinations.

Table 10: A Portfolio of Climate Change Adaptations Utilized by Tourism Stakeholders

Type of Adaptation	Tourism Operators/ Businesses	Tourism Industry Associations	Governments and Communities	Financial Sector (investors/ insurance)
Technical	-Snowmaking (Box 9) -Slope contouring -Rainwater collection and water recycling systems (Box 6,8) -Cyclone-proof building design and structure (Box 5, 13)	-Enable access to early warning equipment (e.g. radios) to tourism operators (Box 13, 14) - Develop websites with practical information on adaptation measures	-Reservoirs, and desalination plants (Box 6, 7, 8) - Fee structures for water consumption (Box 6, 7) -Weather forecasting and early warning systems (Box 13)	-Require advanced building design or material (fire resistant) standards for insurance - Provide information material to customers (Box 9, 11)
Managerial	-Water conservation plans (Box6, 7, 8,) -Low season closures -Product and market diversification (Box 9, 10) -Regional diversification in business operations (Box 15) -Redirect clients away from impacted destinations	-Snow condition reports through the media - Use of short-term seasonal forecasts for the planning of marketing activities (Box 11) - Training programmes on climate change adaptation - Encourage environmental management with firms (e.g. via certification)	-Impact management plans (e.g., 'Coral Bleaching Response Plan') (Box 11) -Convention/ event interruption insurance (Box 10) -Business subsidies (e.g., insurance or energy costs)	-Adjust insurance premiums or not renew insurance policies -Restrict lending to high risk business operations
Policy	-Hurricane interruption guarantees (Box 10) - Comply with regulation (e.g. building code) (Box 5, 13)	-Coordinated political lobbying for GHG emission reductions and adaptation mainstreaming - Seek funding to implement adaptation projects	-Coastal management plans and set back requirements (Box 5, 14) -Building design standards (e.g., for hurricane force winds) (Box 4, 5, 13)	-Consideration of climate change in credit risk and project finance assessments
Research	-Site Location (e.g., north facing slopes, higher elevations for ski areas, high snow fall areas (Box 15))	- Assess awareness of businesses and tourists and knowledge gaps	-Monitoring programs (e.g., predict bleaching or avalanche risk, beach water quality) (Box 11, 12)	-Extreme event risk exposure (Box 4, 14)
Education	-Water conservation education for employees and guests (Box 6, 8)	-Public education campaign (e.g., 'Keep Winter Cool')	-Water conservation campaigns (Box 7,8) -Campaigns on the dangers of UV radiation	- Educate/inform potential and existing customers (Box 9, 11)
Behavioural	-Real-time webcams of snow conditions -GHG emission offset programs (see chapter 5)	-GHG emission offset programs - Water conservation initiatives (6, 7, 8)	-Extreme event recovery marketing (Box10)	- Good practice in-house

Source: Adapted from UNWTO-UNEP-WMO 2008

4

Adaptation processes focusing on the tourism sector have been undertaken at very different scales, each offering practical insights for government policy-makers and destinations beginning to undertake climate change adaptation. UNEP and UNWTO are working with the government of Fiji to reduce the vulnerability of the tourism sector by implementing adaptation initiatives. A Global Environmental Facility (GEF) funded feasibility study was undertaken in 2006. The barriers that were identified in the feasibility study related to low awareness, especially among industry, lack of coordination between government agencies, lack of integration of climate change aspects into existing legislation (e.g. building codes), insufficient enforcement (e.g. Environmental Impact Assessment), and poor environmental practices (and insufficient funds to make larger investment, such as sewage systems) (Becken & Hay 2007). The processes involved participants from key Government agencies, industry representatives, research organisations, NGOs and international aid agencies. A full proposal for a 3-year project to further develop and demonstrate adaptation initiatives was submitted to GEF. In 2007, a similar GEF funded project with similar objectives was initiated in the Maldives with World Tourism Organisation (UNWTO) and the United Nations Development Programme (UNDP) entitled 'Implementing Tourism Adaptation to Climate Change in the Maldives'. Also at the national scale, as part of its National Climate Change Adaptation Framework established in 2007**,** Australia has set up a process to identify and evaluate adaptation options in nine major sectors deemed the most vulnerable to the impacts of climate change, including tourism. A Tourism and Climate Change Taskforce was established in August 2007 to guide the development of the Tourism Action Plan. No details on this process were yet available when this report was prepared. When completed, these national projects will provide highly valuable knowledge and experience about adaptation to climate change in the tourism sector.

Relatively few climate change adaptation processes have thus far been initiated at the destination scale. The City of Aspen (USA), which is an internationally known winter ski tourism destination, collaborated with the Aspen Global Change Institute and 25 local stakeholders to assess the potential impacts of climate change on the local ecology and snow that are key tourism resources, and identify possible adaptation options (Aspen Global Change Institute 2006). Similarly, the National Capital Commission in Ottawa, Canada has completed a screening level assessment of potential climate change impacts its core tourism assets and its three main festivals, and developed a portfolio of existing and potential adaptation options (Scott et al. 2005). To date, neither of these processes has progressed to the implementation stage.

4.7 Additional Adaptation Case Studies

Box 4: Adaptation to Increased Storm Events

Tourism Destination and Situation: Vilankulo town, Inhambane Province, Mozambique

Climate Change Impact: Extreme wind events (cyclones) and storm surges leading to structural damage and shoreline erosion.

Adaptation Techniques, Policies or Measures: The tourism town of Vilankulo is the gateway to the Bazaruto archipelago. Recent tidal events and cyclones have damaged an existing sea wall protecting the town. The World Bank proposes to finance a new sea wall, and is exploring ecological options for protection (e.g. vegetated sand dunes) rather than heavy infrastructure. Destruction of coastal infrastructure in KwaZulu-Natal in South Africa in 2007 revealed that infrastructure protected by naturally vegetated coastal dunes, were better protected than those with sea walls.

Organization(s) Implementing Tools, Techniques, Policies or Measures: World Bank, Ministry of Tourism in Mozambique, Mayors office of Vilankulo

Box 5: Adaptation to Extreme Events

Tourism Destination and Situation: Coastal Tourist Resorts Fiji

Climate Change Impact: Extreme wind events (cyclones) and storm surges leading to structural damage and shoreline erosion.

Adaptation Techniques, Policies or Measures: To prevent damage from storm surges and sea-level rise, resorts are now built at least 2.6 m above mean sea level and 30 m off the high tide mark (these standards might be reviewed in the future). The building code prescribes that structures need to withstand wind speeds of 60 km per hour. Again, the building code is under review. Individual businesses (at least the larger resorts) have evacuation plans, insurance cover and procedures before the start of the cyclone season, such as staff training, water and food storage, first aid kits, trimming of trees and a direct line to the Meteorological Service for early warnings.

Organization(s) Implementing Tools, Techniques, Policies or Measures: A range of Government Departments (e.g. Town and Country Planning, Ministry of Health, Fiji Meteorological Service) and tourism businesses.

Box 6: Adaptation to water shortages

Tourism Destination and Situation: Island of Phuket, Thailand

Climate Change Impact: Existing seasonal water shortages brought about by precipitation variability are anticipated to be exacerbated by future climate change.

Adaptation Techniques, Policies or Measures: Structural elements of the multi-year water supply plan include the construction of new dams, development of abandoned mines as water sources, expanded water transmission and water recycling systems. In addition to these structural adaptations, the Tourism Authority of Thailand is also planning non-structural adaptations, such as a revised fee structure for water consumption and water conservation campaigns.

Organization(s) Implementing Tools, Techniques, Policies or Measures: Tourism Authority of Thailand, together with other national agencies and local governments.

Box 7: Adaptation to inadequate and variable water supply

Tourism Destination and Situation: Island of Majorca, Spain

Climate Change Impact: Annual and seasonal precipitation is anticipated to diminish, exacerbating water shortages

Adaptation Techniques, Policies or Measures: In response to water shortages during summer droughts in the mid-1990s, the Spanish government implemented an emergency annual 10 million m3 water transfer from the Spanish mainland via tanker ship. The long-term adaptation strategy was the construction of two large-capacity desalination plants and additional water transfers (via pipeline) from the mountainous north side of the island. Water conservation programs were also developed for the tourism sector and other water users, including: universal water meters, water audits, public awareness/education campaigns, and pricing measures. The island's parliament agreed to the introduction of a tourism 'eco-tax' in 2002, charged on per-night basis and weighted according to the standard of accommodation. Tourist Areas Restoration Fund was established as a means of raising funds for environmental conservation and rejuvenation schemes, which includes investment in water management such as a network for the utilization of treated water. The controversial eco-tax was later abolished.

Organization(s) Implementing Tools, Techniques, Policies or Measures: National government of Spain, Consellería de Medi Ambient (Govern Balear), Consell Insular de Mallorca, local municipalities.

Box 8: Water Impact and Adaptation in Tobago and Fiji (Becken 2005, Simmons 2005)

Tourism Destination and Situation: Tobago, the Caribbean and Fiji, South Pacific

Climate Change Impact: Water shortages for accommodation providers and tour operators due to increasing incidence of droughts

Adaptation Strategy / Strategies: Adaptation measures at the resort level involved both actions on supply and demand, such as: small-scale infrastructure improvements (e.g., rainwater collectors, increasing storage tank capacity, converting toilets to saltwater supply, and adding diesel powered desalination capacity), water conservation (including the application of water-saving devices and guest and employee education, revised landscaping practices and limited use of pools), sustainability planning (e.g., considering long-term weather forecasts), water source management (e.g., in the case of springs), monitoring health and environmental protection (quality of water), recycling (use of treated water for irrigation).

Organization Implementing the Adaptation Strategy: Conducted by individual accommodation providers and tour operators

Box 9: Adaptation to variable natural snowfall

Tourism Destination and Situation: ski resorts in New England region of the USA

Climate Change Impact: Further diminished natural snowfall, increased mid-winter melts and more variable ski season.

Adaptation Techniques, Policies or Measures: Snowmaking is the most widespread climate adaptation used by the ski industry and has become an integral component of the ski industry in New England (98% of skiable terrain) and many other ski regions (eastern North America, Australia, Japan, and increasingly Europe). Slope contouring and landscaping have been used to reduce the amount of snowmaking required. Where possible the development of new ski terrain in climatically advantaged locations (north facing slopes, higher elevations) has been undertaken. Product and market diversification are also common adaptation strategies. Many ski resorts have made substantial investments to provide alternate activities for non-skiing visitors (e.g., snowmobiling, skating, dog sled-rides, indoor pools, health and wellness spas, fitness centres, squash and tennis, games rooms, restaurants, retail stores). A number of former 'ski resorts' have further diversified their business operations to become 'four season resorts', offering non-winter activities such as golf, boating and white-water rafting, mountain biking, paragliding, horseback riding and other business lines (spas, conference facilities).

Organization(s) Implementing Tools, Techniques, Policies or Measures: ski resort companies, local and state governments.

Box 10: Adaptation to extreme temperatures and risk of tropical storms

Tourism Destination and Situation: Caribbean Region and Gulf of Mexico

Climate Change Impact: increased summer temperature extremes, changes in demand seasonality, and potential for increased frequency or strength of hurricanes.

Adaptation Techniques, Policies or Measures: The Caribbean Tourism Organization and individual member states have begun to actively market themselves as four-season destinations in the late 1990s with multi-million dollar advertising campaigns that target the honeymoon market and budget-conscious families. In combination with marketing messages that downplay the region's summer heat are upgraded air-conditioning, discounted room rates, and new hurricane interruption policies at many resort companies, including Sandals Resorts, Club Med, SuperClubs, TNT Vacations and Apple Vacations. The hurricane guarantees or waivers differ slightly from company to company, but basically provide a replacement stay of the same duration and equivalent value as the one originally booked. The strategy has proven successful as summer occupancy rates at beach resorts are approaching or equalling winter season in many destinations. The State of Florida allocated US$30 million to 'hurricane recovery' marketing following the devastating sequence of four hurricanes in 2004 and developed a weather insurance program for convention organizers, where it pays the premiums for US$200,000 insurance coverage for rescheduling costs associated with hurricane disruption.

Organization(s) Implementing Tools, Techniques, Policies or Measures: Caribbean Tourism Organization, national governments of several Caribbean Islands, State governments in the USA, corporations in the accommodations sub-sector

Inca Trail, Peru
Credit: Helena Rey de Assis

Box 11: Adaptation to coral reef bleaching events

Tourism Destination and Situation: Great Barrier Reef, Australia

Climate Change Impact: higher average and extreme sea surface temperatures, increase frequency and severity of coral bleaching events

Adaptation Techniques, Policies or Measures: Development of the Coral Bleaching Response Plan by the Great Barrier Reef Marine Park Authority in order to: improve ability to predict bleaching risk, provide early warnings of major coral bleaching events, measure the extent of bleaching, assess the ecological impacts of bleaching, involve the community in monitoring the health of the Reef, communicate and raise awareness about bleaching, and evaluate the implications of bleaching events for tourism management policy and strategies. The Great Barrier Reef Marine Park Authority and the Australian Ministry of Tourism have also considered other technical adaptations, including spraying cooler water from deeper areas onto ocean surface at peak heat times to cool surface waters and protect the corals from being damaged or using awnings or umbrella-like structures on buoys to shade corals in high visitation tourism areas.

Organization(s) Implementing Tools, Techniques, Policies or Measures: Great Barrier Reef Marine Park Authority, tour operators, Australian Ministry of Tourism

Box 12: Adaptation to changes in phenology of plants important to tourism

Tourism Destination and Situation: Hirosaki, Japan and Ottawa, Canada

Climate Change Impact: further changes in timing of blooms that are important attractions for tourism festivals

Adaptation Techniques, Policies or Measures: Japan's cherry blossom is a national symbol and the basis of a multi-million dollar flower viewing tourism industry. The timing of the peak bloom varies with the seasonal weather and recent warm springs have caused the peak bloom to occur too early for local festival organizers. The local government in Hirosaki have commissioned scientists to 'programme' the cherry bloom at the 'appropriate time' by experimenting with sprays and plant hormone injections as well as piling snow on the base of trees to slow the onset of blossoms.

The annual Tulip Festival has also faced challenges with increasingly warm springs causing a mismatch in the timing of peak tulip blooms and festival dates. In response, the National Capital Commission of Canada has used several adaptations: planted bulbs in shady locations, heavily mulched flower beds, erected snow fences to increase snow cover on flower beds to delay bulb maturation, planted bulbs with different rates of maturation, irrigated flower beds during warm/early springs to delay bulb maturation.

Organization(s) Implementing Tools, Techniques, Policies or Measures: several local governments in Japan, National Capital Commission of Canada.

4

Box 13: Adaptation to change in weather extreme events

Tourism Destination and Situation: Kanniyakumari in Tamil Nadu State of India, Patong in Phuket and Pi-Pi Island in Krabi of Thailand

Climate Change Impact: increases in extreme weather events that require emergency responses

Adaptation Techniques, Policies or Measures: The "Disaster Reduction through Awareness, Preparedness and Prevention Mechanisms in Coastal Settlements in Asia - Demonstration in Tourism Destinations" project aims at increasing the disaster management operational capacity of the main disaster and tourism stakeholders in three tsunami hit tourism destinations. This is being achieved by improving the local authorities' and the private sector's ability to manage natural and man-made disasters and by training the residents and tourists on how to properly prepare and react to disasters, as well as co-operate with the authorities during mitigation efforts. This demonstration project is being implemented by the adaptation of the United Nations Environment Programme's APELL process to the tourism sector.

APELL, standing for Awareness and Preparedness for Emergencies at the Local Level, is a process that was designed in the 80's to create public awareness of hazards and to ensure that communities and emergency services are adequately trained and prepared to respond.

The tourism focused project is designed to improve the ability of coastal communities to deal with disaster by working with all actors (including hotel and restaurant operators, local authorities, rescue agencies), to establish local mechanisms and processes for disaster preparedness and reduction. The outcome will be an APELL "tool kit" for tourism destination and will include awareness-raising materials, local agreed pictograms, training material for hospitality and tourism companies in the destinations, communication strategies, and tools on crisis communication for use by hotel and restaurant operators.

Lessons learnt: The impacts of disasters can be substantially reduced if surrounding communities and emergency services are fully informed about possible hazards, and have been educated about risk management and crisis management plans. Community awareness and involvement are key factors in mitigating and limiting the impacts of disaster; they are also key aspects of the APELL process.

Organization(s) Implementing Tools, Techniques, Policies or Measures: UNEP, International Hotel & Restaurant Association, Swedish Rescue Services Agency, Department of Disaster Prevention and Mitigation of Thailand , National Safety Council of India, local governments in Patong in Phuket and Pi-Pi Island,Thailand

Box 14: Adaptation to natural disasters in the Maldives

Tourism Destination and Situation: Tourism is one of the islands major sources of foreign exchange. However, the Indian Ocean tsunami of 2004 reinforced the islands' vulnerability to natural disasters. The impact from the tsunami was significant for both the private and public sectors. Three foreign tourists died, and 19 resorts were initially closed. Approximately, 1,200 hotel beds sustained serious damage and remained closed for 2005. Direct damage to tourism business and infrastructure was estimated at over $100 million. Approximately 30% of beds were put out of service due to the impact of the tsunami

Climate Change Impact: As a low-lying series of islands (more than 80% of the land area is less than 1 m above mean high tide level) the Maldives are highly susceptible to the effects of climate change including sea-level rise and increased high-magnitude storm events

Adaptation Techniques, Policies or Measures: Following the 2004 the Government of the Maldives announced a Safer Island Development Programme (SIDP) which seeks to provide the infrastructure necessary to adapt to natural disasters including those brought about by climate change. The idea of the Safe Islands concept is to extend the population consolidation approach to incorporate the aspect of extreme vulnerability, and develop measures to mitigate ecological disasters. This will enable the communities to sustain economic and social development by providing ecologically safe zones. These are intended principally to mitigate natural hazards by establishing building and construction codes that would enable vertical evacuation if and when necessary, and provide all basic services in an emergency, including health, communication and transport infrastructure, as well as ensuring a buffer stock of basic food and water.

Characteristics of a Safer Island include:
Environmental Protection: Environmental Protection Zone (EPZ) with revetments, erosion protection measures, sanitation system
Developmental Potential: economic activities in region, potential for land expansion , land availability on island
Geographical Position: strategic location in atoll
Accessibility: Access to island, harbour, regional airport
Social factors: large population, high standard of health and education facilities.
Disaster preparedness: high ground levels, elevated public buildings for emergency evacuations, drainage area for flooding, buffer food stock storage facilities, community awareness of disaster mitigation measures.

A Safer Island should also serve neighbouring islands in the event of a disaster. This overarching policy is intended to be the core of long-term development and is also in line with the government policy of 'building back better' following the tsunami. As of 2007 eleven islands had been designated

Organization(s) Implementing Tools, Techniques, Policies or Measures: Government of the Maldives, Ministry of Planning and National Development, Ministry of Environment and Construction

4

Box 15: Adaptation to anticipated changes in tourism marketplace: 'Climate Change Real Estate'

Tourism Destination and Situation: new ski resorts in the Canadian Rocky Mountains

Climate Change Impact: Further diminished natural snowfall, increased mid-winter melts and more variable ski season in ski regions of Western Canada and the USA are anticipated to cause a contraction in the number of operating ski resort and alter the competitiveness of ski areas.

Adaptation Techniques, Policies or Measures: A group of 4 private investors believe that the negative impact of climate change on ski areas in more southerly and coastal mountain regions in western North America will reduce the number of ski areas and increase their operating costs to make snow. They see an opportunity in this climate change altered marketplace of the future and are investing up to CDN$1 billion over 15 years in the development of a new ski resort and related real estate developments in an area of the Canadian Rocky Mountains (near the town of Revelstoke, British Columbia) that currently receives an average of 15 metres of snowfall a year. Even with projected declines in snowfall, the region is expected to be 'hypercompetitive in the business of recreational real estate' because of its remaining abundance of natural snowfall as other locations see this resource diminish substantially. This strategic investment in 'climate change real estate' is illustrative of the opportunities that climate change will create for forward looking tourism companies and destinations, as impacts alter the competitiveness within the sector over time.

Organization(s) Implementing Tools, Techniques, Policies or Measures: ski resort companies, real estate investors, local government.

This page has been intentionally left blank

100% Pure Biodiesel Boat
Credit: Dr Stefanos Fotiou

Mitigation

5

5

5.1 Introduction

Tourism is a significant contributor to climate change. As outlined earlier, recent evidence suggests that the sector's contribution to global anthropogenic CO_2 emissions is in the order of just 5% (in 2005), but may be higher (from 5% to 14%) if measured as radiative forcing, i.e. the warming caused by CO_2 as well as other greenhouse gases (UNWTO-UNEP-WMO 2008). As this calculation only includes energy throughput, and does not consider the energy needed to construct hotels, airports, highways and runways, it needs to be understood as conservative. Furthermore, it deserves mention that only a minority of the world's population is responsible for these emissions, as for instance less than 2% of the world's population participate in international air travel on an annual basis (UNWTO-UNEP-WMO 2008). Nevertheless, emission reductions should be considered in the context of development and poverty reduction objectives of developing countries and SIDS, many of them depending on international tourism for their tourism revenues and economies in general.

Recent climate negotiations in Bali point increasingly at the highly skewed distribution of emissions in between countries and within individuals. For instance, average per capita emissions in India are in the order of 1.0 t CO_2 per capita per year (2005), while they are in the order of 10 t CO_2 per capita per year in Germany and 20 t CO_2/year in the USA (US Energy Information Administration 2007). Differences are even greater when comparing emissions from individuals. While a large share of the world's population may emit considerably less than one ton of CO_2 per year, it seems likely that the lifestyles of wealthy individuals may cause emissions that are substantially higher than 20 t CO_2/year. This is of importance, as aviation can rapidly push individual emissions upwards. For instance, a journey from the UK to Jamaica may cause emissions in the order of 2 t of CO_2, which can be compared to sustainable emissions of about 3.5 t CO_2 per year by 2020[1]. The figures emphasize that mitigation is to a high degree dependent on individual lifestyles (Gössling et al. 2008c), and it is thus of importance to create 'carbon smart' tourism products, while simultaneously maintaining tourism flows that financially support developing countries.

Climate change mitigation includes technological, economic and social changes and substitutions that can help to achieve reductions in greenhouse gas emissions (Hall & Williams 2008; UNWTO-UNEP-WMO 2008; Simpson et al. 2008a).

1 Calculation based on IPCC. The IPCC (2007a) has noted that global emissions of carbon dioxide have to decline rapidly, possibly by as much as 50% by 2050 as compared to 1990, to avoid dangerous interference with the climate system. In 2005, global emissions of carbon dioxide were in the order of 26,400 Mt CO_2 (IPCC 2007b). As humanity now comprises about 6.6 billion individuals, current emissions of carbon dioxide are thus in the order of 4 t per capita per year. With a view to a the growing world population, average per capita emissions of 3.5 t per capita per year are here assumed to be sustainable up to 2020, when they have to decline further.

Mitigation can be achieved by reducing energy use, for instance through changing travel behaviour, by improving energy efficiency, increasing the use of renewable energy, carbon offsetting strategies, sustainable destination planning and management, tour operators' choice of destinations and packaging of travel products, as well as other changes in business practices. While technological innovation has considerable potential to achieve reductions in greenhouse gas emissions, this will, given the high growth rates in global tourism, not be sufficient to achieve absolute reductions in energy use and emissions (UNWTO-UNEP-WMO 2008). Behavioural changes (tourists) as well as structural change (tourism industry) will thus be of importance in reversing the trend of growing greenhouse gas emissions in tourism. Given the great interest in 'green' and pro-development holiday options (see e.g. www.responsibletravel.com, www.ticos.co.uk), it seems clear that for those actors embracing mitigation, there will be new business opportunities. Current societal trends have already created new markets for low-carbon tourism products, and these markets can be expected to grow in the future.

This chapter will provide greater detail about strategies available for increasing the effectiveness of mitigation activities in relation to tourism and climate change. It will present case studies of relevance to different stakeholders and local contexts. It is intended as a guide to mitigation tools, covering techniques, policies, measures through the use of case-studies and scenarios. The following sections focus on the mitigation potential in the transportation and accommodation sectors, as well as mitigation strategies for tour operators, consumers and destinations. Suggestions for concrete action are made after each section, and a summary is provided in section.

5.2 A conceptual framework for climate change mitigation in the tourism sector for businesses and institutions

The overall objective of climate change mitigation strategies, policies and activities in the tourism sector is to contribute to the achievement of "carbon neutrality" in the sector. For business and institutions "carbon neutrality" can be defined by the entire set of polices that an institution or business uses when it estimates its known greenhouse gas emissions, takes measures to reduce them, and purchases carbon offsets to "neutralize" those emissions that remain. Carbon neutrality for a business or institution signifies an entity (organisation) that has a zero net contribution of greenhouse gases to the atmosphere. This includes all activities directly controlled by the organisation, including travel, purchasing of goods and services, and daily behaviour of staff. Carbon neutrality can be achieved by improving the way the organisation operates (e.g. through modified procurement

considerations), by improving efficiency of operations (e.g. communications and meetings) and equipment (e.g. vehicle fleets and building). Carbon neutrality also recognizes offsetting as an option (last resort) to achieve full neutrality.

The tourism sector is composed of a wide range of businesses, from small, local operations that service a single local market to very large transport, hotel and tour operator companies that serve global markets across entire regions and which sell or facilitate millions or tens of millions of tour packages to foreign destinations each year. The industry provides tourists with products and services such as accommodation, transport, food and drink, attractions to visit, and souvenirs to purchase. It is clear that the industry shapes demand through its marketing strategies, but consumers (tourists) ultimately make the final choices.

Recognizing that tourists have an important role in creating business interest in sustainable tourism products, the sector is considering mitigation options and is increasingly being proactive in addressing climate change. In response to the growing awareness of consumers as to the contribution of tourism to climate change, the sector is looking more actively into exploring strategies for becoming carbon neutral. Since there is no blueprint for achieving such a goal in the sector; this chapter aims at identifying the tactical strategies of attaining carbon neutrality, with a special focus on the following sub-sectors: transportation, accommodation and tour operators.

In relation to the carbon neutrality concept, a successful mitigation policy could consider four main steps that any tourism-related business or institution can implement as a practical response to climate change.

- ✓ The first step is to **eliminate** the emission of greenhouse gases by keeping away from certain activities that can be avoided without a considerable change to the tourism product or service quality.
- ✓ The second is to **reduce** the emission of greenhouse gases by focusing on energy efficiency practices in specific activities.
- ✓ The third step is to **substitute** practices that are responsible for a large amount of greenhouse gas emissions with practices that have a lower carbon footprint.
- ✓ Finally the institution or business unit can **offset** remaining emissions to achieve full carbon neutrality.

These four steps should not be considered a linear sequence, but rather an iterative cycle of problem implementation of practices and evaluation of outcomes, which includes feedbacks between the steps as identified

In addition, each business unit or institution of the tourism sector is connected to three distinct but interrelated "activity spaces".

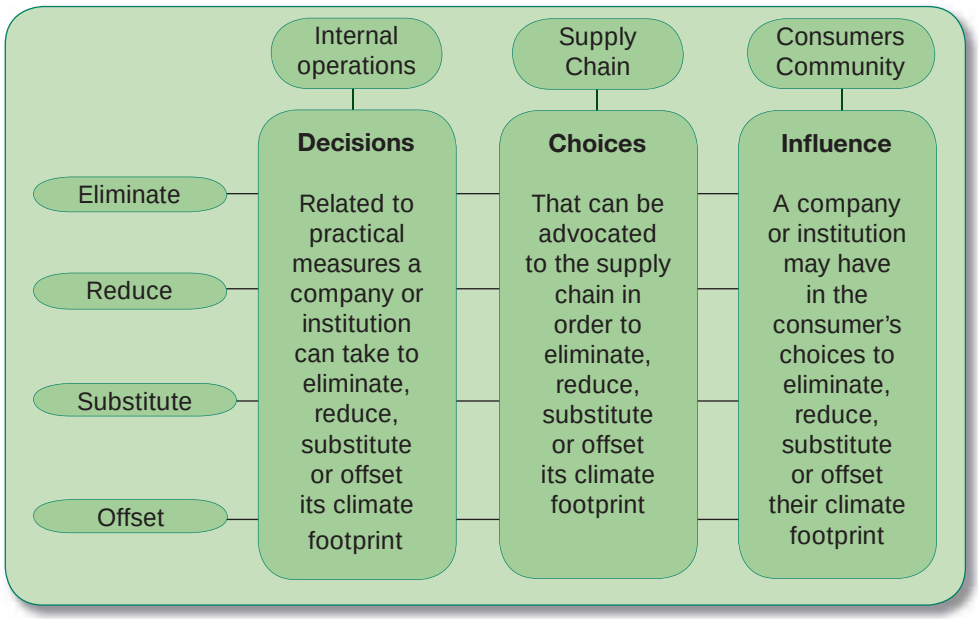
- ✓ In the "**internal operations**" activity space a company or an institution can directly implement practices to achieve carbon neutrality. It is fully the **decision** of the company to implement these practices.
- ✓ In the "**supply chain**" activity space a company or institution could seek to find practices that its supply chain members implement in their internal operations. Although a company can not decide directly the internal operations of its supply chain partners it is through the company's **choice** of partner that the supply chain can be made more sustainable.
- ✓ In the "**community/consumers**" activity space a company can **influence** the choices of its customers and communities through its own activities and strategies.

The combination of these two dimensions (steps and activity spaces) gives a practical framework to propose specific guidelines for each sub-sector of tourism and answer the following sets of questions (see Figure 7):

- ✓ What **decisions** related to practical measures can a company or institution take to eliminate, reduce, substitute or offset its carbon footprint?
- ✓ What **choices** can a company or institution advocate with regard to its supply chain members in order to eliminate, reduce, substitute or offset its own, and their carbon footprint?
- ✓ What **influence** may a company or institution have with regard to consumer choices, to eliminate, reduce, substitute or offset their carbon footprint?

5

Figure 7: Four Steps to Carbon Neutrality for Businesses and Institutions



Within this framework the following sections give practical advice combined with case studies in order to assist tourism stakeholders in the implementation of climate change mitigation practices.

5.3 Transportation sector

Transportation is by far the most important sector contributing to emissions of greenhouse gases from tourism, and within the transport sector, aviation is most relevant. For the majority of trips involving air travel, it has been estimated that the journey to the destination will account for 60-90% of the trip's overall contribution to climate change (Gössling et al. 2005). Any strategy aimed at reducing tourism's contribution to climate change thus needs to take into account transport, and in particular aviation.

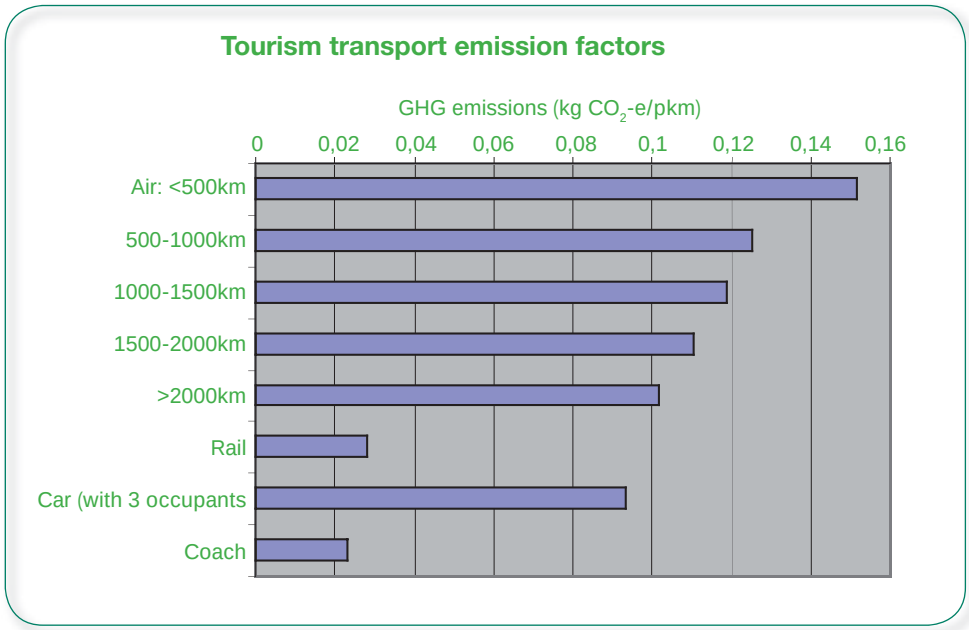
There may be a number of general guidelines in reducing emissions from transport. First, any motorized transport that can be avoided will make a considerable contribution to reducing the overall emissions caused by an individual trip. To illustrate this, a single return flight from Europe to Australia causes emissions of about 4.5 t CO_2 per capita, which will vastly exceed sustainable per capita per year emissions (3.5 t CO_2). One approach for future tourism strategies may be to steer tourism flows in a way that encourages travelers to visit more adjacent

destinations. Likewise, if travelers were to use trains more frequently instead of aircraft or cars, this would considerably reduce the amount of emissions caused. Figure 8 shows that average emissions per kilometer traveled by one person (passenger kilometer, pkm) vary considerably. The general rule is that train and coach are vastly more energy-efficient than transport by aircraft or car. For air travel, short flights are more energy intense if calculated per passenger kilometer, as most energy is used for take-off. However, long flights will, due to the greater number of passenger kilometers traveled, generally lead to higher total emissions.

Flooded Coastal Area, Tobago
Credit: Dr. Murray C Simpson

5

Figure 8: Carbon dioxide emissions for various transport modes



Source: UNWTO-UNEP-WMO 2008

5.3.1 Airlines

There are as yet few airlines that have taken a pro-active approach to climate change. Many low-cost airlines with a very young fleet of aircraft have achieved comparably low emissions per pkm, but this is rather a result of recent rapid growth in the sector than environmental concerns. Overall, there is thus a huge potential for airlines to reduce emissions, even though there are as yet few signs that airlines want to make use of this potential.

Ideally, airlines would embrace the following measures to improve their environmental performance:

a) Seek to maintain a young fleet with regard to the technology used.

For instance, the average fleet age of 15 airlines operating in Sweden has been calculated at 10.3 years (Peeters, personal communication 2007). In the United States, one third of aircraft are older than 25 years. Replacing old aircraft technology with new technology, as for instance used in the new A380 and B787, can reduce specific emissions per passenger kilometer by up to 20-30%. Other technical improvements, such as winglets, should be introduced wherever feasible.

b) Achieve an average load factor (passengers) of at least 80%

In the European Union, airlines now have an average load factor of about 65%. High load factors reduce the specific energy use per traveller. Airlines should thus seek to reduce the number of flights with low load factors, for instance by cooperating with other airlines flying on the same routes at similar times.

c) Reduce operating empty weight by removing excess amounts of water & catering.

The less an aircraft weighs the less fuel it needs. Airlines should thus also seek to limit non-passenger weight, such as the free weight each passenger can carry along, possibly to 20 kg including hand baggage and tax free purchases.

d) Choose more efficient flight paths

Tour operators should seek to sell direct flights without stop-overs. Pricing systems that allow for cheaper flights with a detour and/or non-direct flight should be avoided.

e) Aircraft should be densely seated to carry the maximum certified number of passengers

Airlines should charge comparably high prices to first class passengers using more space. Aircraft should generally reduce engine–on time when on the ground.

f) Airlines should support the inclusion of aviation in the EU ETS and other emission trading schemes

They should support auctioning of allocated emission rights as well as taxation of aviation to a degree equal to surface-bound transport modes.

g) Airlines should seek to adjust bonus programmes

They should reward highly mobile travelers with non-mobility related benefits or coach/rail mobility rather than further free air miles.

h) Airlines should extend their economic scope

They should become financially involved in surface-bound transport systems with lower environmental impacts like rail or coach systems to profit from and contribute to their development.

i) Airlines should seek to engage strategically with climate change

Airlines currently focus on volume growth as a means to increase revenue, but it would be advisable to replace this perspective with one on profitability. Profitability can be increased even in a zero-growth scenario by assessing the ratio of energy use (emissions) to revenue in various sub-sectors (freight vs. passenger transport, short haul versus long-haul, etc.), i.e. by focusing on the sectors that generate high revenue in comparison to emissions. Serious pro-environmental management may also be increasingly rewarded with customer loyalty, while making voluntary carbon offsetting (see section 5.5) more attractive to customers.

Box 16: Reduction of Aviation Emissions: Lessons from Costa Rica

Tourism Destination and Situation: Reduction of emissions from aviation; compensation of remaining emissions through offsets.

Climate Change Impact: Even though Nature Air is not carbon neutral, in the sense that its aircraft still emit greenhouse gasses, the airline uses comparably efficient aircraft and compensates for emissions through solar- and wind farm projects. The airline is comparably small with just 7 aircraft.

Mitigation Tools, Techniques, Policies or Measures:
NatureAir is the first airline to offset all of its emissions. Furthermore, NatureAir operates aircraft with low noise levels. In 2002, the airline started a non-profit organization to teach low income children English reading and writing skills. The program involves efforts to clean up water in smaller communities and collect and recycle garbage. Environmental lessons are given to children.

Organization(s) Implementing Tools, Techniques, Policies or Measures:
www.natureair.com

5.3.2 Cars: tourists, rentals, businesses

Cars are the most widely used means of transport for tourism when both domestic and international trips are considered. Most cars used by tourists are private cars, even though rental cars have become increasingly important, particularly when visitors have arrived by other means of transport such as air, coach or train, and want to remain mobile at the destination. Clearly, both tourists using their own cars as well as car rentals have a considerable influence on emissions through their choice of automobiles. The general rule is that smaller, lighter and less powerful cars driven at lower speeds can substantially reduce energy use and emissions. For instance, one of the most efficient cars currently on the market, the Volkswagen Polo BlueMotion, uses 3.8 L of fuel per 100 km (mixed driving, i.e. city and major roads), resulting in emissions of 99 g CO_2 per km (www.volkswagen.de). Other options include electricity-powered, hybrid vehicles, or cars using biofuels. Electric vehicles, including buses or trolleys, charged with renewable energy cause no air pollution during operations and are thus attractive particularly for tourism within cities or protected areas. Hybrid vehicles recharge batteries, which in turn power an electric motor, reducing overall fuel use. For instance, Toyota's Prius uses 4.3 L fuel per 100 km (mixed driving). Finally, biofuels can reduce emissions of carbon dioxide, as biomass used for the production of biofuels has earlier removed carbon dioxide from the atmosphere. However, the production of biofuels still causes significant CO_2 emissions, as it still involves the

use of fossil fuels (e.g. involving transports, fertilizer). The production of biofuels can also have implications for biodiversity, for instance when old-growth forests are cut down to be replaced with plantations for biofuels. Biofuels are thus a more ambiguous option to reduce the impact of transports on the global climate.

Ideally, tourists, car rentals and businesses should:

a) Promote the use of low-emission cars

Tourists can favour small cars with low emissions (<120g CO_2/km), which can also be promoted by car rentals, for instance by charging comparably low prices or pointing out low additional costs for fuel. Businesses can replace their car fleet by low emission cars, also equipping their employees with 'carbon smart', rather than large cars.

b) Avoid any kind of Sports Utility Vehicle (SUV)

SUVs should come to be understood as cars that have no place in sustainable tourism (with very few exceptions). Tourists, car rentals and tourism businesses should thus generally avoid any kind of SUV, and seek to communicate the reasons for this to customers (car rentals).

c) Replace old cars

Cars should be regularly replaced by newer, more environmentally friendly models to stimulate innovation. Car rentals usually replace cars within a few years, but even tourism businesses and tourists should seek to always use the least energy-intense model on the market.

5.3.3 Railways & coaches

Railways are transport systems that have a range of advantages for travelers, such as the possibility for frequent departures, a high degree of comfort, arrival on time, and options to become virtually carbon free. Railways managers can actively focus on these advantages when marketing rail travel. Coaches are less attractive with regard to these aspects, but they can operate at lower costs and thus be attractive for more price-conscious travelers. Railways and coaches are substantially more energy-efficient than travel by car or aircraft, and both have an important future role to play in achieving low-carbon transports.

Box 17: Sustainable Transport: Lessons from Swedish Railways

Tourism Destination and Situation: Swedish Railways: various measures to attract more travellers and to become climate-neutral.

Climate Change Impact: Emissions from transport are one of the major mitigation challenges. Railways can achieve almost carbon-free mobility. They can also through various measures become more attractive for travellers.

Mitigation Tools, Techniques, Policies or Measures: Swedish Railways uses almost entirely renewable energy (water and wind). Furthermore, the company has vowed to reduce its emissions of greenhouse gases by 30% by 2020 and 60-80% by 2050, as compared to 1990.

Furthermore, Swedish Railways:
- Recycles 99% of old trains;
- Separates wastes onboard the train, and uses compostable packaging;
- Demands its suppliers to engage in environmental management;
- Educates its customers by offering a greenhouse gas emission calculator, as well as environmental reports to cooperate customers, showing the amount of emissions that have been avoided by using trains.

Swedish Railways is also a good example of a railway company seeking to attract more travellers, particularly those currently using aircraft. For instance, all sleepers will be renovated in 2008 to make them more comfortable and silent, with direct connections being offered from Southern to Northern Sweden, as well as abroad. In order to reward customers, Swedish Railways introduced a bonus programme for frequent rail travellers in 2007.

Organization(s) Implementing Tools, Techniques, Policies or Measures: Swedish Railways plans and implements its pro-environmental programme, often in co-operation with tour operators. For instance, Swedish Railways cooperate with tour operators seeking to send tourists by train, even to destinations with a range of up to 1500 km. Departures are also adjusted to weekly rental home changes on certain days of the week.
www.sj.se

Ideally, railways should seek to:

a) Renew infrastructure

Many railways in Europe and elsewhere operate old train systems, which need to be renewed to reduce energy use and to attract customers. For instance, diesel-powered locomotives should be replaced with electric ones, and stations be renovated to become attractive meeting-points. Old carriages should be replaced with modern and comfortable ones to make train travel more attractive.

b) Achieve carbon-neutral operations

All energy used should be sourced from renewable energy, and this should be communicated to customers. Opportunities for a clean & green image are one of the greatest image- and marketing advantages for train systems.

c) Recycle

Trains and carriages should be built in a way to use the greatest amount of recyclable or reused materials possible. All waste on board should be separated and recycled.

d) Develop their strategic advantages over other means of transport

Railways need to make more of their strategic advantages, not least in their marketing, focusing on their potential to i) arrive on time, which few other means of transport can manage to the same degree, ii) depart/arrive in city centres, offering a strategic advantage over travel by air or car, iii) offer net working time advantages for business travellers, i.e. the share of effective time that can be used for work during travel is greater on trains, even if the journey may be longer, and iv) offer opportunities for group travellers such as families to share privacy (compartments) or opportunities for communication/ activities (sitting of groups around table).

e) Develop their service management

Train systems should seek to offer first-class customer services by serving each customer as an individual, by offering comfortable travel opportunities both day and night, as well as providing food & beverages at competitive prices.

5.4 Accommodation sector

Accommodation includes a wide variety of establishments, such as hotels, motels, bed & breakfast, camping grounds, holiday apartments, and second homes. Globally, accommodation is responsible for an estimated 21% of emissions from tourism (energy throughput only; UNWTO-UNEP-WMO 2008). Many enterprises in the accommodation sector have considerable options to reduce energy use, which usually offer economic benefits too. Initiatives in this sector such as using renewable energy or participating in environmental management programmes can also have important repercussions for positive tourist perceptions. The value of initiatives at the level of individual accommodation establishments lies as much in their symbolic power, involving large numbers of tourists in environmentally pro-active behaviour.

Mitigation measures in tourism establishments usually focus on energy efficiency and the use of renewable energy, but can comprise a wide range of other measures, for instance food provisioning (see Box 8: Scandic). Larger hotel chains in particular have good options to considerably reduce energy use, even though the huge numbers of individual accommodation enterprises are more important in terms of emissions. For establishments seeking to reduce emissions, there are organizations that can help to implement energy conservation and efficiency measures. For instance, the International Hotels Environment Initiative (IHEI) was founded in 1992 to support and improve environmental performance by the hotel industry worldwide. IHEI provides benchmarking tools and publishes a quarterly magazine, the Green Hotelier.

5.4.1 Climate change mitigation in accommodation

Energy is used in the accommodation sector for central heating or cooling (air conditioning), warm water (showers), a wide range of electric appliances and lighting. In warm holiday destinations, the single largest energy end-user is air conditioning, while in northern latitudes, central heating consumes most of the energy. In the following, some opportunities for saving energy are outlined.

Room temperature.

In the tropics and other warm destinations, temperatures in guestrooms are comfortable at levels between 20–25°C (UNWTO-UNEP-WMO 2008). However, air conditioning is often adjusted to lower room temperatures than 20°C, even though substantially higher values are generally accepted by tourists. For instance, the management of the Hilton Seychelles reports that 25°C are accepted without complaints by guests, and temperatures have consequently been increased. This has reduced energy costs for air conditioning substantially. Note that other measures can reduce energy use as well. For instance, building design, including positioning, material and insulation can provide an important precondition for maintaining acceptable temperatures (for examples see Boxes 18 & 19). Technical options to further reduce energy use include thermostats, combined with systems to heat or cool rooms only shortly before they are used. It is crucial to locate air conditioning and heating systems properly to avoid inefficient use, such as the infiltration of hot air into cooled space and vice versa. Regular cleaning of filters and coils in air-conditioning units can have an energy-saving effect. It is also possible to introduce systems to shut down air conditioning automatically when balcony doors or windows are opened.

Lighting.

There are some basic measures that can be taken to reduce energy needs for lighting. In the temperate and northern zones, the most cost-effective measure is to use daylight to the largest extent possible, for instance by controlling vegetation growth and including aspects of illumination in the overall design of the hotel (UNWTO-UNEP-WMO 2008). Other low-cost measures include energy-saving lighting systems and motion detectors in floors and common areas. Energy-efficient light bulbs have a far longer lifetime than conventional light bulbs (up to ten times longer). Hotels can also introduce entrance keycards for hotel rooms, which turn lights on automatically when inserted in a slot close to the door.

Restaurants.

Many hotels have restaurants that can make substantial contributions to sustainability and emission reductions. Apart from options to make use of similar measures for mitigation as accommodation establishments in general, restaurants can, through their choice of foods, heavily influence the carbon-intensity of meals served. Food now accounts for approximately one third of emissions caused by households in industrialized countries, and is thus an important factor influencing emission levels. Generally, locally produced food will have a considerably smaller energy footprint. This is particularly relevant in small tropical islands, where food may often be imported by air. Using local resources, for instance by serving mostly local seafood instead of imported meat dishes, is one such measure. Restaurants can also favour organic or certified raw materials and products, and avoid food that is particularly harmful to the environment, such as shrimps produced in mangrove areas converted to ponds. Environmentally oriented restaurants in Europe have also started to serve meals with a greater proportion of vegetables, as meat is far more carbon intense. This is generally well-accepted by guests, and can be promoted as indicating higher restaurant standards. There are also a number of zero-cost measures to reduce the need for energy in restaurants, including (UNWTO-UNEP-WMO 2008):

- Allowing hot food to cool before storing it in refrigerators and freezers
- Not overfilling refrigerators, as best cooling occurs when air can circulate
- Regular checking and cleaning of fans, condensers and compressors
- Ensuring doors fit and close properly, and seals are in good condition
- Ensuring refrigerator compressor belts maintain proper tension
- Defrosting freezers frequently since frost build-ups reduce efficiency.

5

Box 18: Accommodation: Lessons from Tanzania

Small-scale accommodation: Chumbe Island, Zanzibar, Tanzania

Tourism Destination and Situation: Chumbe Island is a privately managed nature reserve, gazetted in 1994 as the 'Chumbe Reef Sanctuary' to protect a highly biodiversity-rich coral reef system. The islet can accommodate a maximum of 14 visitors

Climate Change Impact: Chumbe island's 7 eco-bungalows as well as the visitor centre don't use fossil energy and their entire design is resource autarkic.

Mitigation Tools, Techniques, Policies or Measures: A range of measures have been taken to make Chumbe an eco-friendly destination. In particular, the eco-design of the Bungalows is unique:

- As there is no ground water source in the rocky substrate of the island, each bungalow collects its own freshwater supply from rainwater (captured from the specially designed expanse of roof) during the rainy season. This rainwater passes through a complex filtration system and is stored in spacious underground cisterns (under each living room). The water is then hand-pumped through a solar-powered heating system into hot & cold-water containers for the shower and hand basin in the bathroom.
- The used water from showers and basins is filtered through particulate filters, ending in specially sealed plant beds so that no polluted water will seep into the Reef Sanctuary. These beds are planted with species that are demanding in water and nutrients, and therefore easily absorb any remaining nitrates and phosphates.
- To deal with sewage composting toilets are used. These eco-toilets prevent sewage (from septic tanks) seeping through the porous ground into the Reef Sanctuary, (as this would lead to pollution of the fragile reef ecosystem, encourage algae growth and finally kill coral communities and organisms depending on them). Instead, human waste is quickly decomposed to natural fertilizer when mixed with compost (aerobic composting) in the compost chamber. To ensure the experience for the client is the same as with any regular toilet, specialized designs have been implemented with wind powered vent pipes and gradient storage so that it feels no different to using a regular toilet; except that composting toilets need no flush water at all, thus they also effectively economize on water.
- Lights are powered by photovoltaic panels on the roof that provide ample environmentally friendly 12V energy for normal usage.
- The open design of the bungalows, with minimal barriers to the open air, allows for maximum through-draft for cooling of the bungalows; a form of natural air-conditioning. To enhance this louvres are in place that can be lowered or closed depending on the desired temperature.

Chumbe Island also engages in a range of social activities. For instance, school excursions are part of the island's educational program.

Organization(s) Implementing Tools, Techniques, Policies or Measures: www.chumbeisland.com

Box 19: Accommodation: Lessons from Aruba

Medium-sized accommodation: Bucuti Beach Resort, Aruba, Caribbean

Tourism Destination and Situation: Bucuti Beach Resort in Aruba has engaged in a wide range of resource-saving initiatives. The hotel also offers its guests to offset emissions.

Climate Change Impact: Offsetting helps to address the most significant contribution of a journey to climate change, i.e. emissions caused by travel to the destination.

Mitigation Tools, Techniques, Policies or Measures: A full list of pro-environmental measures can be downloaded at: http://www.bucuti.com/_pdfs/about_us_en/bucuti-env-updates.pdf

Organization(s) Implementing Tools, Techniques, Policies or Measures: www.bucuti.com/en/

Box 20: Accommodation: Lessons from Sweden

Hotel chains: Scandic Hotels - towards climate neutrality

Tourism Destination and Situation: Globally leading hotel chain in efforts to become carbon neutral, to recycle and to deliver sustainable development benefits

Climate Change Impact: Emissions from accommodation and in particular hotels are second only to transports in Swedish tourism. Strong action is needed to reduce emissions from the accommodation sector.

Mitigation Tools, Techniques, Policies or Measures: Scandic Hotels are one of the earliest hotel chains to focus on environmental sustainability. The hotel chain announced its ambitions to become more resource efficient as early as in 1994. By 2008, 106 of the 130 Scandic hotels are certified with the Nordic Swan, a Scandinavian ecolabel, and one with the EU Flower. The chain has recently announced plans to become carbon neutral by 2025, further reducing energy use and expanding its use of renewable energy.

Furthermore, Scandic Hotels:

- Introduced its environmental rooms in 1995, with some 17,000 hotel rooms now being 97% recyclable;
- Has stopped using disposable packaging, for instance for soap and shampoo, saving 400 million items of disposable packaging in 11 years;
- Reduced energy consumption by 24% and water consumption by 13% in 1996-2006
- Offers an organic breakfast in its Swedish hotels, with 20% of the food offered being certified by the Swedish quality label for ecological foods, KRAV; an important part of the breakfast items in Norway, Denmark and Finland are eco labelled with the countries' respective type 1 organic label (the biggest difference between the breakfasts are that in Sweden there are guidelines for a eco labelled breakfast, while in the other countries only the

single items can be labelled.)
- Offers only organic and fair trade coffee in its Swedish, Danish and Finnish hotels, while in Norway all coffee is organic (UTZ-certified in Danmark and Finland);
- Separates up to 26 fractions of waste in Sweden, reducing unsorted waste in all its hotels by 67% 1996-2006;
- Buys environmentally certified products to the largest extend possible;
- Has educated 11,000 members of its staff in pro-environmental management.

Organization(s) Implementing Tools, Techniques, Policies or Measures: Scandic introduced its pro-environmental strategy more than a decade ago, in 1994, and has since then made considerable progress in achieving its goal of becoming the most resource-efficient hotel chain in the world. Measures taken range from broad ones such as the implementation of an environmental management system at the individual hotel level that includes management, technology and behavioural changes, to detailed steps such as changing of purchasing routines focusing on certified organic, -renewable, -environmentally friendly or -fair trade products. www.scandic.com

Hurricane Ivan Damage to Tourism Communications and Infrastructure, Tobago
Credit: Dr Murray C Simpson

Box 21: Accommodation: Lessons from India

Upscale hotels: The five star Orchid Hotel, Mumbai, India

Tourism Destination and Situation: The Orchid, a Five Star Hotel, was opened in September 1997, focusing on economically viable pro-environmental measures. The hotel, belonging to Kamat Hotels Ltd., is interesting in that it takes a strictly profit-oriented approach to environmental measures, providing figures of financial savings through pro-environmental management on its website. Simultaneously, the approach taken is a whole-systems perspective, including all aspects of the environment, consistently focusing on best practice.

Climate Change Impact: The Orchid Hotel shows that it is economically feasible to implement a wide range of environmental practices, including virtually any aspect of the lifecycle of the hotel. This shows that five star hotels can financially benefit from environmental management, make huge contributions to resource savings, create markets for innovative and green technology, and involve their guests in pro-environmental management.

Mitigation Tools, Techniques, Policies or Measures: The hotel has engaged in a wide ranges of measures to reduce it's impact on the environment, many of these unique:

Architecture & Constructions:

- Passive Energy Conservation Efforts in Design
- Depressions and protrusions in the facade reduce surface radiation.
- The building is designed with 72 rooms facing the atrium, reducing the heat load.
- A skylight detailed in a manner of doubly layered domes reduces heat load and noise levels yet admitting maximum natural light in the atrium space.
- The swimming pool is located on the rooftop with 4 feet of water body, which acts as an insulator from the heat.
- Cement used for constructions is PPC (Portland Pozzalana Cement) containing 15-20% fly ash, as compared to OPC (Ordinary Portland Cement).
- Internal partitions are made from so-called "Quite Easily Done" wall panels, which are made from fertilizer waste, instead of using red bricks made from topsoil.
- Autoclaved Aerated Concrete is used for external walling and wet walling. AAC is eco-friendly as it manufactured using approximately 60% fly ash. It has thermal insulation properties and a better sound absorption coefficient than ordinary bricks.

Reduce, reuse, recycle:

- All taps contain aerators, which increase the water's force and reduce outflow, saving up to 50% of water. The restaurant has taps operating on timers.
- Geberit Concealed Cisterns use only 6 litres of water per toilet flush as against 15-20 litres used in conventional flushes, while the use of Geberit Urinal Flush Valve's infra red detectors ensures a definite flush after every use preventing the unwanted flushing of timer set systems.

- Wastewater is treated and then reused in areas like air conditioning & gardening.
- Drip irrigation reduces water use for gardening.
- Aquazone is a system using ozone to destroy micro organisms including bacteria, virus, spores, fungi etc. The water is safe for drinking and free from chlorine.

Interior design:

- Window frames, master control panel in the guestrooms and shutters are made from rubber wood. After producing rubber sap and the tree is cut down and cannot be used for other purposes.
- Medium Density Fibre Wood is used instead of real wood throughout the hotel. MDFW is manufactured from cotton stalks, which grow to a height of 5-6 feet, and are cut down after yield and the usually not used for other purposes.
- The restaurant uses recycled wood from old buildings.
- Triple glazed windows with added reflective glass block heat from the sun, reducing energy for air-conditioning.
- All lambs are PL lamps or fluorescent tubes.
- All rooms have key card light switches, so that all lights and air conditioning are switched off once the guest leaves the room.
- Mini bars sense the load inside the refrigerator and cool it accordingly. Mini bars are CFC free.
- Electronic Reduced Voltage Soft Starter cum Energy Saver for A/C Compressor reduces energy use for air conditioning.
- Air conditioning uses R22 instead of CFC refrigerants, a far more climate friendly alternative.
- Attached to the air-conditioning system is a tank to store cold energy during off-peak hours. This stored energy is then used during the peak hours /periods reducing compressor overloading and cutting power consumption.
- The heat generated from the air conditioners provides hot water to the guestrooms, laundry, toilets and kitchen.
- Hangers in guestrooms are made from sawdust.
- Only herbal products are used in the hotel, which have not been tested on animals.
- Paints used in the hotel are eco-friendly. The exterior of the hotel is painted with water based paint with negligible VOC (Volatile Organic Compounds) content of only 0.0125% and the paint used for interiors has 0% VOC.

Educating customers:

- The control panel in the guestrooms has a feature known as the green button. On pressing the green button the thermostat of the air-conditioning unit is stepped up by two degrees. The saving in electricity resulting from the 2 degrees increase in temperature is translated into Rupees and displayed on the guest folio and profile. A certificate is then issued to the guest who has voluntarily participated in conserving energy.
- Guests who have left their emails are informed about ongoing environmental activities.

Garbage:

- The Orchid seeks to become a “zero garbage” hotel and has taken various measures to reduce the waste being generated. This includes vermiculture on the hotel site to recycle kitchen waste.
- Reusable cloth laundry bags are used instead of standard paper or plastic bags.
- For shopping, designed cloth shopping bags are provided to guests.
- Garbage bags are made from recycled plastic.
- Cut flowers are used sparely, and the hotel uses potted plants instead.

Use of chemicals:

- Anti Cockroach Herbal Treatment has been recently introduced and is the first of its kind in India to eradicate cockroaches. The herbal paste poses no health hazards, as there is no use of any poisonous chemicals. No cleaning is required after the treatment is done hence there is no wastage of water, detergents etc. It is applied in the form of a paste and placed on nooks and corners in the form of small globules.

Organization(s) Implementing Tools, Techniques, Policies or Measures: The Orchid is part of Kamat Hotels Ltd. The hotel has won 53 environmental awards, creating substantial media coverage. www.orchidhotel.com

Other options to save energy

Showers, pools, and especially laundry operations account for a considerable share of any hotels’ energy bill. Several measures can reduce the energy used for these. For instance, water temperatures in the heating system can be set at 57°C, the lowest temperature at which no growth of harmful bacteria can occur. Shower heads should have reduced flow systems, which reduces the overall amount of water used and heated. All appliances, such as minibars should be renewed every 5 years as new systems usually use considerably less energy. All over the tropics and in many parts of the temperature zones as well, it is economically feasible to use solar heating systems. Heating costs for outdoor swimming pools can be reduced by using solar water heaters, heat pumps and pool covers (UNWTO-UNEP-WMO 2008).

Ideally, accommodation establishments could:

a) Establish environmental management systems (EMS)

EMS help to understand resource consumption and to identify areas where resources can be saved. They also allow monitoring, and thus a comparison of environmental performance over time.

b) Reduce energy use

This can be achieved by replacing old machinery, and installing power-saving devices, such as switch-cards in rooms.

c) Use renewable energy only

Accommodation establishments can either install renewable energy sources, including photovoltaic or solar heating, or they can buy renewable energy from specialized power providers. Own renewable energy infrastructure, such as solar heating on rooftops, can be a visible sign of pro-environmental action, while the use of renewable energy can be communicated through other channels to customers.

d) Reduce the use of materials

There are opportunities to substantially reduce resource use, and in particular packaging. For instance, soap containers can be replaced with dispensers, and one-way packaging for butter or jam can be entirely avoided.

e) Recycle wastes

Hotels can substantially reduce overall waste produced, as well as recycle most of the remaining waste.

f) Rethink food in restaurants

Restaurants can make a major contribution to reducing greenhouse gas emissions by offering locally produced food with a lower share of meat, and by avoiding environmentally problematic resources such as shrimps. Imports of food by air should generally be avoided, which is of particular relevance for hotels in tropical islands, where storages may have to be built to move away from just-in-time imports to slower ones by ship.

g) Constructions

Whenever new accommodation establishments are built, they should be constructed in a way to make them independent of fossil energy sources – it is now possible to use 100% renewable energy for operations if this is considered prior to the commencement of building. Furthermore, new buildings should be constructed using a high proportion of low-carbon, recycled materials, and high levels of insulation to keep rooms cool or warm.

h) Communicate green action

Accommodation establishments are ideal meeting points to provide customers with information about pro-environmental action taken. This can have very positive repercussions for the image of the establishment and help to strengthen customer relationships, as well as to win new customer groups.

5.5 Tour operators

Tour operators play an important role in climate change mitigation as they bundle packages including journey, accommodation and eventually activities that are purchased by tourists. Tour operators can therefore influence emissions to a considerable extent, for instance by offering energy-efficient transport or hotels that engage in pro-environmental action. The importance of tour operators also lies in their role of marketing packages that entail low emissions as attractive offers. Low-carbon packages could contain rail travel to the destination, replacing short haul air travel of up to 1500 km, cycle options at the destination, or energy efficient car rentals at the destination. Another important function for tour operators is to increase the average length of stay, which is a very effective means of reducing the carbon footprint of tourism, provided that the average number of journeys made by a tourist in a given period of time declines.

There are numerous examples of tour operators incorporating alternative transport arrangements into their packages. German tour operator Studiosus, for example, offers “Anreise mit der Bahn” (travel to the destination by train). German transport organisation Deutscher Verkehrsclub has worked with 10 German holiday destinations to provide “new paths to nature” by developing and marketing car-free packages for visitors. Swedish Fritidsresegruppen has successfully offered journeys from Sweden to Italy in 2007, and has now extended the number of railways-based packages to cover travel distances of more than 1000 km.

Box 22: Accommodation: Lessons from Germany

Avanti Busreisen (Avanti Bus Travel), Freiburg, Germany

Tourism Destination and Situation: Avanti Busreisen is a medium-sized bus tour operator in Freiburg, Germany, with approximately 8,000 guests per year on its holiday routes. 8 busses cover distances of up to 2,000 km, with an average occupancy rate of 70%. The company's most successful journey is from Freiburg/Germany to Mailand/Italy, with 60-70 return journeys per year. On this journey, busses are 99% full. In 2009, Avanti will offer a 70-day tour to the Olympic Games in Peking by bus from Germany.

Climate Change Impact: Trains and coaches have the lowest emissions of all motorized means of transport.

Mitigation Tools, Techniques, Policies or Measures: Avanti Busreisen does not only achieve high occupancy rate, it also operates only the newest busses (Euro 3, 4, 5 norms). The high comfort of the busses, as well as integrated planning with overnight stays makes it possible to attract clients that favour the bus trip over a trip by air. The company reports emissions of 32 g CO_2 per pkm, which can be compared to about 120-140 g CO_2 per pkm for travel by air.

Organization(s) Implementing Tools, Techniques, Policies or Measures: www.avantireisen.de

Tour operators may also introduce energy- or emission labelling of packages in their marketing materials to influence travel behaviour. By indicating the emissions caused by a particular journey, it becomes possible for travellers to choose low-carbon products.

Ideally, tour operators could:

a) Re-think their choice of destinations

Tour operators can re-structure the choice of destinations they offer, by replacing more distant ones with closer ones where this is feasible (similar attraction value)

b) Avoid promoting long-haul destinations

The small share of long-haul destinations visited by tourists is a major contributor to emissions. Tour operators should thus seek to avoid promoting destinations that are particularly distant.

c) Support low-carbon holiday options and carbon labelling

Tour operators should seek to primarily market low-carbon holiday options, which can be recommended to guests. If all packages and journeys are also carbon-labelled, i.e. indicating the emissions caused by the consumption of

the respective package/journey, this will support informed decision-making towards low-carbon tourism.

d) Develop new low-carbon products

Tour operators should seek to strategically develop attractive low-carbon packages (e.g. train-based holiday options). With recent interest in such low-carbon packages increasing, this can also help to attract new customers.

f) Offer high standard carbon offsets

Tour operators should offer high standard carbon offsetting for journeys by air, selling Gold Standard Certified Emission Reductions. These should be included in all journeys as mandatory or "opt out" (the customer can choose not to offset). Tour operators should match the customer's payment with an identical amount of money, effectively sharing the cost.

Bicycles, Amsterdam
Credit: Emerson Goncalves

5.6 Consumers (Tourists)

Though it is clear that the industry shapes demand to a large extent through marketing, tourists still make the final choices as to where to visit. It is likely that a greater awareness of the dangers of climate change will affect tourist attitudes and lead to changes in travel behaviour, particularly as such changes become more obvious, e.g., cold- or heat waves, late winter and early spring, the absence of snow in traditionally snow-rich areas, flooding or extensive rain in usually dry periods.

Tourists have an important role in creating business interest in restructuring towards a sustainable tourism system through their choice of destinations, favouring environmentally friendly means of transport, and choosing environmentally certified hotels, as well as eating in restaurants providing local and/or organic food. Tourists can also demand transportation in new, fuel-efficient aircraft, or to stay in environmentally friendly accommodation, which can put considerable pressure on companies to work towards sustainable tourism. These are some of the ways individual tourists can alter and improve the current trends in global tourism.

Tourists can also help to reduce the impact of their travel by participating in carbon offsetting. The term carbon compensation or offsetting means that an amount of greenhouse gas emissions equal to that caused by a certain activity, i.e. a flight, will be reduced elsewhere. Carbon offsetting is growing rapidly, and promoted by many interested parties, from Al Gore's film "An Inconvenient Truth" to influential guidebooks such as Lonely Planet and Rough Guide. Tourists willing to compensate their travel emissions can calculate these with the help of an online calculator. Tourists can then choose to invest either in energy-efficiency measures (e.g. low-energy light bulbs), renewable energy (e.g. solar power), or carbon sequestration (usually forestry projects). There are also some companies that made arrangements with carbon offsetting programmes to compensate emissions generated through business travel of their staff. Carbon offsetting options are also increasingly offered for the attendance of conferences and meetings. For example, for the Davos Conference on Climate Change and Tourism various options were offered to participants; there is an increasing call for offsetting in UN meetings in general, suggested by The UN Secretary General as well.

Box 23: Consumers

Atmosfair: fly less, but compensate the flights you have to make

Tourism Destination and Situation: Atmosfair offers environmentally aware travellers the opportunity to compensate emissions from any given flight by paying an amount of money that is sufficient to reduce emissions equal to those caused by the flight in a renewable energy project.

Climate Change Impact: While flight emissions are not "neutralized", carbon offsetting is still a good option to compensate for these by investment in renewable energy sources and energy efficiency measures. This can also boost the production of low-carbon technology and have sustainable development benefits for developing countries.

Mitigation Tools, Techniques, Policies or Measures: Atmosfair is one of an estimated 80-90 offset providers worldwide (Gössling et al. 2008c). The not-for profit organization has been ranked as one of the best, if not the best voluntary carbon offset providers in many recent assessments. Atmosfair offers its customers a flight calculator, which makes a very accurate assessment of emissions caused by a flight between any two airports, as well as the option to reduce emissions through one of the organization's projects. These are all located in developing countries, and fulfil the criteria of the so-called Gold Standard, a quality label for offsetting projects that puts particularly high demands on the principle of additionality – the fact that the project would not have occurred without the involvement of the offset provider -, as well as sustainable development benefits. Atmosfair's projects include so far the use of solar power for canteen kitchens in India, a micro-dam project in Honduras for rural electricity generation, mechanical irrigation in rural China, and sewage treatment from palm oil production in Thailand. All emission reductions are certified as Certified Emission Reductions through the UNFCCC.

Organization(s) Implementing Tools, Techniques, Policies or Measures: Atmosfair identifies and implements its own projects with various project partners, even though the organization can also implement projects on behalf of clients if these fulfil Atmosfair's high standards on sustainable development and emission reductions.
Source: www.atmosfair

There is still a lot of confusion among tourists about what carbon offsetting is and there is thus an urgent need for airlines, tour operators and other tourism stakeholders to more seriously and pro-actively engage in carbon offsetting (Gössling et al. 2008c). Another problem is the character of the offsetting markets, where a wide range of emission reduction units are offered. Without discussing these in further detail, tourists are encouraged to buy Gold Standard Certified Emission Reductions, which are registered and certified by UNFCCC. The Gold Standard ensures that the projects also have sustainable development benefits (cf. Gössling et al. 2008c).

Ideally, tourists could thus consider:

a) Travelling less often and staying longer

The current trend is to travel more frequently, to cover longer distances, and to stay over shorter periods. Tourists could consider travelling less frequently, and staying longer at their destination.

b) Minimise air travel

Minimise air travel: Any air travel that can be avoided will be a major factor in reducing individual emissions. In cases where air travel cannot be avoided, there may often be an option to favour closer destinations over more distant ones, with similar destination attributes or combined with a longer stay in the destination.

c) Reward airlines with sound environmental management

Tourists should favour airlines that are committed to serious environmental management, using aircraft with new fuel-efficient engines and air frame designs. As yet, opportunities for comparison do not as yet exist, but they may soon be introduced.

d) Offset flights that cannot be avoided

Flights that cannot be avoided should be offset through voluntary carbon offsets. Providers chosen should offer Gold Standard Certified Emission Reductions and use a factor of 2 or higher for the calculation of the warming effect of non-carbon emissions in comparison to CO2.

e) Reward pro-environmental and pro-development tour operators

Tourists should favour tour operators engaging in pro-environmental management (for instance providing carbon labelling or certified packages), and those that try to provide community benefits, particularly when operating in less developed countries or in rural areas.

f) Certified destinations or accommodation

There are now many destinations that seek to be environmentally friendly or to become certified with a variety of labels, from slow food to slow tourism. Tourists should also seek to ask for certified accommodation.

5.7 Destinations

Given the speed at which the global tourism industry has to mitigate its contribution to global climate change, and with the IPCC's demand that global emissions of CO_2 decline from 2015 onwards, destinations have the greatest potential to contribute to fast reductions in greenhouse gasses. This is because destinations, even though they can vary considerably in size, comprise various stakeholders that can work together to achieve emission reductions (cf. Gössling 2008).

Initiatives that can be taken to reduce emissions at the destination level can include destination-wide transport management, such as for instance those offered by car-free resorts, renewable electricity powered transport, free public transport, free shuttle services from railway- or coach stations, cycle paths and –networks, or bonus systems offered to non-car users. Existing initiatives for low-carbon transport include, for instance the Copenhagen Free Bike Program (Denmark). Between May and September, the city of Copenhagen offers visitors the use of free bicycles all over the inner city. The 1300 bicycles can be borrowed at 125 stations all over the inner city for a deposit of about €3 (Visit Copenhagen 2007). Another example is the United Kingdom's National Cycling Network. The network offers over 10,000 miles of walking and cycle routes on traffic-free paths, quiet lanes and traffic-calmed roads. An up-to-date map can be downloaded from the web (www.sustrans.co.uk).

Cruise Ship Emissions, the Carribean
Credit: Dr Murray C Simpson

5

Box 24: Destinations

Sustainable Mobility in the Alpine Pearls of the European Alps

Tourism Destination and Situation: In 2006, 17 Alpine towns in five nations (Austria, France, Germany, Italy, Switzerland) founded the Alpine Pearls Association (APA), and membership has grown to 21 communities in 2007, now also including Slovenia. The objective of the APA was to 'break away from conventional tourist mobility' and emphasize sustainable mobility getting to and once at these holiday destinations to take action on climate change. Travellers are guaranteed mobility without the use of a personal motor vehicle or aircraft.

Climate Change Impact: By addressing the major problem with regard to the development of climate-friendly tourism, transport to and from the destination as well as transport at the destination, APA can make a substantial contribution to reducing regional and per capita emissions from tourism.

Mitigation Tools, Techniques, Policies or Measures: Through the APA, several pre-existing initiatives in each community were combined to offer the traveller a brand of destinations and tourism operators that are committed to sustainable mobility options that comply with the following criteria:

- Super-regional mobility: accessibility to/from each Alpine Pearl is provided via train or bus at minimum of four times per day.
- On-site mobility: When at an Alpine Pearl, guests can expect a mobility system to provide connections to the most important local tourist attractions with a maximum waiting time of 30 minutes each day from 9 am to 8 pm.

Each of the Alpine Pearls provides its own sustainable mobility options. For example, in Wefenweng, Austria, guests can utilize a fleet of electric vehicles. The 'Alpine-Flyer' electric Swiss bike is available in six of the Alpine Pearls. The 'Alpine Pearl Rail Pass' is also now available from OBB in Austria to connect passengers between APA member communities. Arosa (Switzerland) and Werfenweng (Austria) also offer a 'Neutral-Climate Holiday' package, where the unavoidable emissions resulting from rail access and local transportation are calculated with assistance from APA and offset by emission reduction initiatives in another location. Guests receive a certificate guaranteeing that their holiday journey is completely climate neutral

These sustainable mobility projects have been very successful as demonstrated by the changes at Werfenweng (Austria) since it introduced its car-free resort programme. From 1999 to 2004 Werfenweng has seen:

- A 38% increase in overnight stays in the winter season
- A 101% increase in overnight stays within the special interest offer "holidays from the car"
- A 31% increase in overnight stays in the summer season
- An increase in train arrivals from 16 to 25%, resulting in the reduction of 375 tonnes of CO_2 per year
- A tripling of passengers for the Werfenweng 'Dial-a-ride' Shuttletaxi

Organization(s) Implementing Tools, Techniques, Policies or Measures: Alpine Pearls Association. Source: www.alpine-pearls.com

Destinations can also seek to only use renewable energy from sources including wind, photovoltaic, solar thermal, geothermal, biomass and waste (UNEP 2003; Simpson et al. 2008a). Several studies have explored the extent to which renewable energy sources can be used for tourism, in particular in island destinations where energy supply based on fossil fuels is expensive and at risk of supply interruptions. These studies come to the conclusion that the use of renewable energy sources is generally economical and technically feasible (Uemura et al. 2003, Cavallaro & Ciraolo 2005).

One current trend is for destinations to become "climate neutral", with for instance, New Zealand, Norway, and Sri Lanka having decided to become climate neutral (Gössling 2008) and the Caribbean assessing the possibilities on a regional basis (Simpson et al. 2008a). The concept foresees that destinations reduce their energy requirements, replace fossil fuels with renewable energy sources, and compensate remaining emissions by projects saving emissions elsewhere.

Box 25: Carbon neutral destinations

Tourism Destination and Situation: Destinations as entities have a large potential to contribute to reductions of greenhouse gases. They can become role-models in achieving low-carbon tourism products.

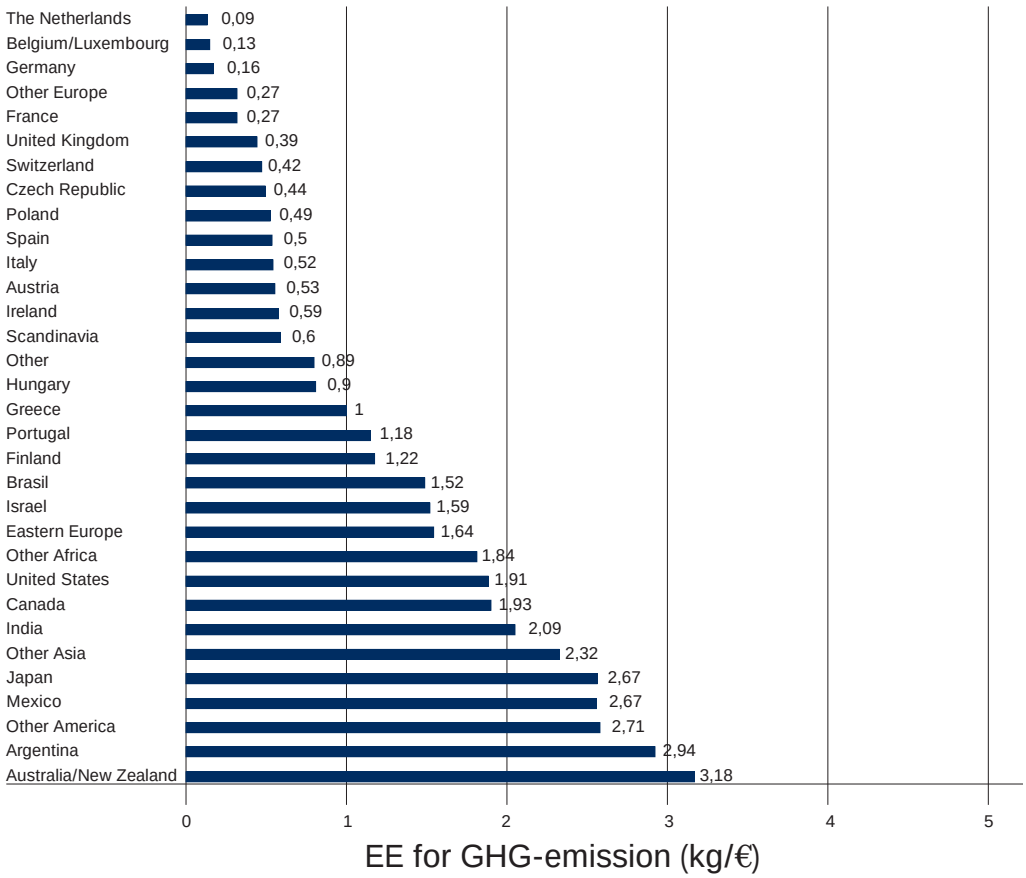
Climate Change Impact: A destination comprises the micro-cosmos of the tourism production system, i.e. transport infrastructure, accommodation, activities, as well as various actors including tour operators, tourism marketing organizations, etc. These can work together in order to reduce emissions from tourism and to create carbon-neutral destinations.

Mitigation Tools, Techniques, Policies or Measures: Gössling (2008) identifies three steps for destinations to become carbon neutral. In step 1 (measurement), the destination will assess its emissions to better understand where these originate and where it is most economic to reduce these. Recent assessments of tourism's contribution to greenhouse gas emissions have focused on three sectors, transports, accommodation and activities. A meaningful system boundary for transports has been suggested to comprise all energy use within the destination, including fuel bunkered for all transports. In step 2 (decarbonisation), the destination would seek to minimize energy use and to switch to renewable energy to the largest extent possible. Economically, this may translate into efficiency- or renewable energy infrastructure investments paying off in less than 10 years. Finally, in a third step (offsetting), destinations would seek to buy carbon offsets for remaining emissions. There are many emission reduction units on offer, with a lower or higher degree of credibility (Gössling et al. 2008c). It is recommended that destinations considering the purchase of carbon credits use Gold Standard Certified Emission Reductions, which are registered by UNFCCC and fulfil the requirements of delivering sustainable development benefits (see also Gössling et al. 2007).

Organization(s) Implementing Tools, Techniques, Policies or Measures: The decision to become a climate neutral destination has to be taken collectively, i.e. by a majority of tourism actors in order to generate strong support for the system

Destination management can also include closer cooperation with destination marketers. Marketing campaigns could, in the future, take issues such as greenhouse gas emissions into account (cf. Gössling et al. 2005, Becken 2007; Becken and Simmons 2008). This can be achieved through assessment of the energy intensity of various markets, guiding tourism promotion strategies. One example is a case study of Amsterdam (Gössling et al. 2005). In order to calculate the eco-efficiency for different markets, greenhouse gas emissions are divided by revenues. Figure 9 shows that domestic visitors cause emissions as low as 0.09 kg CO_2-e per € revenue, while the eco-efficiency is 3.18 kg CO_2-e/€ for Australia/New Zealand, i.e. emissions are 85 times higher per € of revenue for these tourists.

Figure 9: Eco-efficiency by source market for Amsterdam, 2002



Given these differences, one strategy to reduce the environmental impact of tourism to Amsterdam would be to replace markets with an eco-efficiency above average by those markets with an eco-efficiency below average, considering overall revenues from individual markets. For example, the USA have a rather unfavourable eco-efficiency, but a decrease in arrivals from the USA would also entail a substantial loss of revenue as the country accounts for a large share of overall tourist arrivals and hence tourism-derived income. Table 11 shows in which markets there should be no marketing, less marketing, current marketing or strong marketing.

Table 11: CO_2-e emissions and revenues by market, 2002

	Large market	**Small market**
Unfavourable eco-efficiency	Less marketing: USA	No marketing: Japan Australia/New Zealand Canada Asia
Favourable eco-efficiency	Current marketing: United Kingdom Netherlands	Strong marketing: Germany Belgium France Austria Switzerland

Destinations can use such approaches to management in order to maintain revenues, while at the same time reducing emissions. This can also be seen as an adaptation strategy, as the focus on low-carbon tourism is likely to reduce vulnerability to oil price fluctuations as well as emerging climate policy in important source markets such as the EU. A potential advantage is also that destinations will improve their image as a low carbon destination, particularly if combining such approaches with the development of renewable energies.

For larger destinations, the focus on domestic tourists can also be of importance. Particularly in many emerging economies, domestic tourism seems to hold great economic potential, which many destination planners focusing on the wealthy, international tourist seem to be unaware of. Studies have shown that in particular domestic tourism can be beneficial for poor people, as even low revenues can be of great importance in developing countries with low income levels, while social impacts may be considerably lower (e.g. Scheyvens 2007, Wunder 2003). This has to be analysed on a case-to-case basis: wealthy, and particularly upscale international tourists are less sensitive to oil price increases and generate higher government-related revenue whilst domestic tourists are a more stable source of income, as they are less likely to be affected by global or national insecurity situations, and so offer the potential to generate secure income particularly for poor people.

Box 26: Mitigation Initiatives in the North American Ski Industry

Tourism Destination and Situation: As part of the 'Keep Winter Cool' program established by the National Ski Areas Association (NSAA), ski areas in the United States have undertaken a wide range of energy efficiency and renewable energy initiatives to reduce the GHG emissions related to their operations and serve as a model for other tourism sectors.

Climate Change Impact: Ski tourism causes considerable emissions of greenhouse gas emissions, particularly if snow making is involved. Ski tourism is simultaneously one of the most vulnerable sectors to global warming.

Mitigation Tools, Techniques, Policies or Measures: Aspen Ski Company (ASC) (Colorado, USA) was the first resort operator to join the Chicago Climate Exchange (in 2001) and thereby legally committing itself to annual accounting of GHG emissions and a 10% emission reduction by 2010 (based on a 1999 baseline year). To accomplish this objective ASC has undertaken multiple initiatives, including: building the largest solar photovoltaic array in the ski industry constructing an onsite micro-hydroelectric plant (generating 250,000 kWh annually), converting all of its snow-grooming machines to biodiesel, building two of the earliest buildings certified by the US Green Building Council's 'Leadership in Energy and Environmental Design' Program, and most recently began purchasing 100% of its electricity use from wind power generators.
More broadly, the NSAA launched its Green Power Program in 2006 to promote investment in renewable power by the ski industry. A total of 58 ski resorts now purchase renewable energy (primarily wind) for all or part of their operational energy use. Impressively, 28 of these resorts purchase 100% of their energy needs from renewable sources (through renewable energy credits where local grid sources are not available). The NSAA estimates these 28 ski resorts purchased 292 million kWh of green energy in 2006/07, avoiding over 193,000 tonnes of CO2 emissions.

Organization(s) Implementing Tools, Techniques, Policies or Measures: National Ski Areas Association 2007

Ideally, destinations could seek to:

a) **Officially highlight and work towards the goal of tourism sustainability**
If a common, measurable goal towards sustainability is formulated, various actors at the destination level can cooperate to reduce energy and material use, switch to renewable energy sources, for instance through shared investments in wind- or solar power, and to address other issues that are of importance to achieve local sustainability.

b) **Restructure source markets**
Based on an assessment of the carbon intensity and revenue derived from various source markets and tourist groups, destinations should seek to restructure their marketing so as to attract in particular high-spending, low-carbon tourists.

c) **Provide low-carbon public transport**
Destinations can offer carbon-free mobility, such as bicycles, or offer public transport systems that are attractive to travellers.

d) **Achieve carbon neutrality**
Remaining emissions should be offset in a shared effort of all actors in the destination along with tourists, by buying Gold Standard Certified Emission Reductions.

e) **Communicate pro-environmental action**
Destinations should seek to communicate their pro-environmental action to engage tourists and to attract new customer groups.

5.8 Towards low-carbon tourism

Mitigation measures involve a wide range of stakeholders and measures ranging from low-cost initiatives, such as energy-efficient lighting, to measures requiring greater effort and investment, such as purchasing more fuel-efficient vehicles or restructuring energy systems (UNWTO-UNEP-WMO 2008). The generally most substantial measures are those re-directing tourism flows towards low-carbon transport and less distant destinations with extended lengths of stay. While the re-structuring of destinations, as well as climate policy increasing prices for aviation seem to be detrimental to development in poor, tourism-dependent countries, a recent study (Gössling et al. 2008b) has shown that this is not necessarily the case. Rather, most destinations investigated in this study saw increasing tourist numbers even in a strong climate policy scenario, while advantages for countries restructuring their markets towards low-carbon market mixes are potentially large.

In summary, all stakeholders presented here, i.e. transport providers, accommodation establishments, tour operators, tourists and destinations have a huge potential to reduce greenhouse gas emissions, but so far only very few have started to get involved in emission reductions. There is thus a clear demand for leadership in this direction; Table 12 gives an overview of some mitigation action that could be taken by certain stakeholders.

In concluding this section, it seems clear that for those stakeholders who are pro-active in addressing climate change, mitigation will offer a wide range of business opportunities. Given current societal trends, it seems that new markets for environmentally oriented tourists are already emerging, and there are thus opportunities to develop and market new low-carbon tourism products. This, as well as economic considerations, should make it interesting for any tourism stakeholder to get involved in implementing mitigation measures.

Table 12: Overview of potential mitigation actions

Action/ Actor	Air transport	Car Transport	Train/ coach transport	Destination	Accomm.	Activities
Tourists	Minimise air transport; Choose pro-environmental airline; Offset emissions	Avoid car transport; Use energy-efficient cars (<120g CO2/km)	Use train & coach	Stay longer; Favour closer destinations	Choose environmentally certified hotel	Avoid energy intense activity, for instance such involving transport (helicopter flights, etc.)
Tour operators	Cooperate with pro-environmental airline; Offer carbon offsetting	Promote the use of small, environmentally friendly cars	Develop packages based on train/coach transport and other carbon-smart products	Offer destinations close by; Provide carbon labelling	Cooperate with certified hotels	Offer activities that do not involve transports, particularly flights
Destintion Managers and Planners	Restructure marketing (eco-efficiency); Consider domestic tourism; Increase length of stay; Focus on revenue, not growth.	Promote public transport systems; eventually small cars	Cooperate with national railways systems and coach operators to offer attractive transport solutions	Involve all actors to engage in action to become sustainable destination	Promote the use of environmental management systems and eco-certifications.	Develop activities that are low-carbon

Cruise ships after hurricane wilma, Cozumel
Credit: Dr Murray C Simpson

5.9 Additional Mitigation Case Studies

Box 27: Cruise ships reducing their emissions and waste

Tourism Destination and Situation: Caribbean

Climate Change Impact: According to the International Council on Clean Transportation (ICCT), worldwide, ocean going vessels produce at least 17% of total emissions of nitrogen oxide and contribute more than a quarter of total emissions of nitrogen oxide in port cities and coastal areas. They argue out that carbon-dioxide emissions from the international shipping sector as a whole exceed annual total greenhouse gas emissions from most of the developed nations listed in the Kyoto Protocol while ship waste can also affect the resilience of marine ecosystems, such as coral reefs.

Mitigation Tools, Techniques, Policies or Measures: In March 2000 the 15 members of the Florida-Caribbean Cruise Association, which includes the leading ship lines, signed a memorandum of understanding with the Florida Department of Environmental Protection promising, among other things, to embrace new technology in managing waste and designing environmentally friendly ships. New ships, such as the Royal Caribbean's Radiance of the Seas, which sails in Caribbean waters, is powered by gas and steam turbines that the company claims reduce exhaust emissions by 80 to 90 percent. New generation cruise ships, such as those of Holland America are outfitted with cleaner-burning propulsion technology estimated to reduce fuel consumption, and thereby emissions, by as much as 40 tons a week.

In June 2001 the International Council of Cruise Lines (ICCL) announced that its members had adopted mandatory environmental standards for all association cruise ships. The standards, which specify acceptable waste management methods, cover graywater and blackwater discharges; hazardous chemical waste such as photo processing fluid and dry-cleaning chemicals; unused and outdated pharmaceuticals; and used batteries and fluorescent and mercury vapour light bulbs.

Organization(s) Implementing Tools, Techniques, Policies or Measures: Florida-Caribbean Cruise Association in conjunction with regional and national authorities. International Council of Cruise Lines

Box 28: Singapore Energy Smart Building Scheme for Hotels

Tourism Destination and Situation: Singapore

Climate Change Impact: Reducing emissions through energy conservation measures

Mitigation Tools, Techniques, Policies or Measures: In 2007 Singapore launched the Energy Smart Buildings Scheme for hotels as part of the Singapore Ministry of the Environment and Water Resources' push for energy efficiency in the country, since hotels are among the largest energy consumers in the building sector. It is estimated that Singapore hotels account for about 18% of the electricity consumption in buildings.

Hot water production in a hotel often makes up a considerable portion of total energy use. The Regent Singapore used to rely on diesel boilers to produce hot water at a cost of S$29,000 per month. In 2006, a new heat recovery system was implemented. This system uses a small capacity chiller that also acts as a heat pump to produce hot water. A simple return on investment analysis demonstrated that the payback period for this new system was only 1.5 years.

Organization(s) Implementing Tools, Techniques, Policies or Measures: Ministry of the Environment and Water Resources, National Environment Agency, Singapore Hotel Association, hotels

5

Box 29: Six Senses Resorts & Spas

Tourism Destination and Situation: primarily Asia-Pacific destinations including India, Jordan, Oman, Thailand and Vietnam

Climate Change Impact: Six Senses aims to reduce greenhouse gas emissions arising from travel of customers to and from properties as well as environmental impacts of the properties themselves.

Mitigation Tools, Techniques, Policies or Measures: Six Senses is a resort and spa management and development company operating properties and products branded as Soneva, Evason Hideaways, Evason, Six Senses Spas and Six Senses Gallery. Headquartered in Thailand the company owns the multi-award winning Soneva Fushi in the Maldives. It also has equity in several of the properties under management and development.

The Core Purpose of Six Senses is to create innovative and enriching experiences in a sustainable environment. The vision of the company is to be trendsetting and innovative and continue to redefine a responsible leisure lifestyle.

Six Senses Social and Environment Sustainability Policy commits to sustainable development, with environmental responsibility being a core value and fundamental to their business. The company aims to reduce the impact of their businesses, on the environment at both development stage and operational stage. The company's Policy is underlain by the following principles.

- Knowledge and Innovation: Supporting the development of new knowledge and innovation addressing the root causes of global challenges.
- Supporting People and Institutions: Six Senses invests in improving the capacity of people, organizations and institutions to focus on problems and generate long lasting and meaningful results.
- Community Engagement: Six Senses engages and helps the community to improve their living conditions that meet the Millennium Development Goals requirements as a part of sustainable development.
- Partnerships: Six Senses collaborates with the public sector, non-profit sector, private sector, civil society and the philanthropic community in ways that can further leverage our philanthropic investments alone.

Key Sustainability Indicators (KSI) include:

KSI 1: Green House Gas Emissions and Energy Efficiency, Conservation and Management
KSI 2: Waste Management
KSI 3: Water Management
KSI 4: Cleaning Chemicals
KSI 5: Land Use Planning
KSI 6: Resource Conservation

Organization(s) Implementing Tools, Techniques, Policies or Measures: Private company in conjunction with government authorities, Carbon Neutral Company, Green Globe, German Technical Cooperation-GTZ.

Box 30: Linking local and global concerns in Kathmandu, Nepal – Promoting the use of electric public transport vehicles for tourism purposes

Tourism Destination and Situation: Kathmandu is both the tourist gateway to Nepal and the country's largest metropolitan area. In a 2005 survey of tourists on Kathmandu's air quality 41% indicated that they had breathing problems in the city, 58% reported visibility problems during sight seeing, and 69% rated Kathmandu's air quality as 'poor'. 94% of respondents stated that they would prefer to use Electric vehicles for tourism purposes and 79% indicated that they were willing to pay additional fares to promote electric vehicles.

Research indicates that Kathmandu Valley's motorised travel demand increased 8.7-fold in 2004 from nearly one billion passenger-km in 1989 and suggest that it will increase to 27 billion passenger-km by 2025. Although the volume of CO_2 emission from passenger transportation in the Valley is less than it is in most cities in developed regions of the world because of the low per capita vehicle ownership rates the rate has already increased 5.2 times since 1989 due to the increasing number of private cars and motorcycles to 537 thousand tonnes produced in 2004. Promoting a modal shift towards public transport, and electric vehicles in particular, by visitors and local travellers has the potential to curb emissions

Climate Change Impact: Reducing emissions through energy conservation and integrated planning measures

Mitigation Tools, Techniques, Policies or Measures: A co-benefit approach was utilised to link local and global carbon-concerns. This approach was regarded as

- Allowing scaling down carbon-problem to local level by addressing local priorities
- Allowing local decision makers to make forward looking steps without much compromises
- Giving momentum for climate concerns

A package of counter-measures designed to bring about small-scale improvements was identified, including promoting the use of electric vehicles in high population density, tourist and heritage places. The study indicated that the likely advantage of introducing incremental interventions in multiple sectors is less complex in terms of management and political feasibility of implementation. It is estimated that the package of counter-measures to encourage modal shift, increased use of electric vehicles, and progressive tightening of emissions standards can reduce CO_2 emissions by 20%, PM10 emissions by 47%, the number of cars and motorcycles by 132,824, and energy use by 18%. The study also demonstrated that there is a strong synergy between local and global objectives in the Kathmandu Valley including those of the local tourism transport businesses. Because of this synergy, the Valley can also benefit from climate policy-motivated international financial mechanisms such as Clean Development Mechanisms (CDMs) and from other mechanisms introduced by bilateral and multilateral institutions.

Organization(s) Implementing Tools, Techniques, Policies or Measures: Institute for Global Environmental Strategies; START International Secretariat; Nepal Ministry of Science, Technology and the Environment; the David & Lucile Packard Foundation; Kathmandu Electric Vehicles Alliance

Box 31: Sustainability reporting and environmental technology

Tourism Destination and Situation: Spier Leisure, Western Cape, South Africa

Climate Change Impact: Global warming from increased carbon dioxide emissions and biodiversity conservation for carbon sequestration.

Mitigation Tools, Techniques, Policies or Measures: Spier Leisure incorporates a hotel and conference centre, and subcontracted enterprises of a cheetah centre, raptor centre, restaurants and shops. Spier produces an annual report which addresses sustainable development principles, including environmental factors. The business monitors the energy consumption from electricity, petrol, diesel and gas and sets targets to reduce consumption annually. To conserve energy meters have been installed across the estate for each business unit, hot water timers have been reset to be on for 8 hours, rather than 16 hours each day, and energy saving bulbs have been installed in all 155 hotel rooms and some common areas.

Organization(s) Implementing Tools, Techniques, Policies or Measures: Spier Leisure.

Box 32: Re-planting mangroves in coastal zones

Tourism Destination and Situation: Mida Creek Community Boardwalk, Watamu, Kenya

Climate Change Impact: Increased storm events caused by global warming lead to erosion particularly where coastal vegetation has been removed

Mitigation Tools, Techniques, Policies or Measures: In consultation with the local community, and in cooperation with Kenya Wildlife Services, the Mida Creek community has constructed a picnic site and boardwalk in a mangrove forest on the Kenyan coast. The boardwalk was funded by a small grant from UNDP. Local women's groups make honey from hives amongst the mangroves. The site receives about 150 tourists per week, who pay to use the boardwalk, and may also hire one of 5 local guides. Local school children visit and students receive environmental education and contribute directly to conservation programs. Members of the community are aware that mangroves are important breeding and nursery grounds for the fish they catch in the sea. The mangroves are currently threatened by people collecting poles for commercial timber.

Organization(s) Implementing Tools, Techniques, Policies or Measures: Mida Creek, Kenya Wildlife Services, GEF (UNDP)

This page has been intentionally left blank

Solar Panel at Tourist Restuarant, Tibet
Credit: Dr Anna Spenceley

Plan for the Way Forward and Challenges Ahead

6

6

This manual has provided a review of tourism and climate change, showing that both adaptation and mitigation measures are essential to ensure the sustainable development of global tourism. In presenting a wide range of case studies from all over the world, the document provides ample evidence that much can be done to increase the adaptive capacity of the tourism industry, while reducing its contribution to climate change through emissions of greenhouse gasses. Measures are often cost-effective, and they can positively influence the role of tourism as a solution to global problems such as poverty and climate change. In the light of these findings, it appears feasible and desirable for a far greater range of stakeholders in tourism to engage in action addressing adaptation and mitigation, following the leadership of companies and organizations presented here.

However, while these conclusions are generally positive, the task ahead is huge. Thousands of tourism entities now have to be involved in regional-, national-, and global partnerships between tourism sectors, organizations, governments and academic researchers to systematically engage in adaptation and mitigation. To this end, governments and supranational organizations should support the Davos declaration and to provide the financial incentives to make change attractive. The tourism industry needs to realize that global environmental change is a serious threat to medium- and long-term business opportunities. The Davos Declaration has thus called for adaptation- and mitigation-related initiatives in all aspects of tourism practice. Clearly, there are opportunities for most tourism entities to become engaged in adaptation, and opportunities for each and every single tourism entity to become engaged in mitigation. Society in general should embrace the concept of sustainable tourism and support and favour companies taking the lead in efforts to become sustainable.

A summary of suggestions on how to move ahead:

- **Process & Protocol activities for Adaptation and Mitigation**

In order to assess the need for and best practices to adaptation and mitigation, both global and location-specific research and evaluation activities are required, e.g. projecting current and future climate change impacts; assessing vulnerabilities including climate-related hazards (for effective decisions for climate risk management), evaluating resilience and adaptive capacity; and evaluating current and future adaptation and mitigation activities, including possible new opportunities that may arise from climate change.

- **Capacity building**

There is a need to build the capacity for adaptation and mitigation in response to climate change across government bodies and tourism institutions and organisations at national, regional and destination level. To this end, outreach and communications efforts such as this current publication and the associated seminar series, including the 1st International Capacity Building Seminar on Climate Change and Tourism, are viewed as the first steps in building capacity in developing countries and small island developing states where climate change is likely to impact, and be impacted by, tourism.

- **Addressing Gaps in Knowledge**

There are large gaps in the knowledge base in the field of climate change and tourism, as identified in this document and others (e.g. Scott et al 2008, Hall 2008). A research agenda is developing and needs to be intensified, in order to support evidenced-based practical decision-making. This agenda should include assessment of uncertainties in climate change projections themselves, as well as socio-economic uncertainties within the tourism sector.

- **Reducing 'Hotspot' Vulnerability**

Certain regions and destinations are especially vulnerable to the impacts of climate change on their tourist industry, because tourism is so vital to their economic viability, and/or because the impacts from climate change are especially significant. To this end, reducing the vulnerability of the 'hotspots' through short and medium term adaptation and mitigation strategies is imperative, for example small island states at high risk of disruption from sea level rises and increases in tropical storm activity (London 2004) and activity-specific destinations requiring a particular climatic environment, such as winter-sports locations (Wilbanks et al 2007), should be a priority for future program of work.

- **Innovation Strategies**

Climate change adaptation and mitigation occurs at a number of different scales of governance and organisation. Tourism firms themselves have a major role to play in adaptation to climate change as part of systems of innovation. The notion of adaptation as a form of innovation that is understandable in the context of tourism business practice has not been well articulated, but it is an essential component of understanding the capacities of destinations to adapt and respond to the challenges of climate change (Hall 2007). Much of the focus of climate change adaptation is on technical responses to climate change. However, the development and transfer of innovative technology is only a small element of what constitutes innovative tourism business practice (Hall & Williams 2008). Research on innovation in tourism and similar service firms indicate that there are a range of

other measures that firms can adopt to respond to external stimuli and stresses, such as those brought about directly and indirectly by climate change, in order to survive and, ideally, maintain or even increase profit margins (ibid). Innovating at all the various levels of tourism will bring greater potential returns and enhance the likelihood of survival; it will also contribute to the resilience of the destination as whole. As Baumol (2002: 1) noted, innovative activity is "[…] mandatory, a life-and-death matter for the firm and innovation has replaced price as the name of the game in a number of important industries." Moreover the ability to innovate represents a capacity to adapt and attract new markets in light of the turbulence that climate change is anticipated to bring to tourism patterns and flows.

- **Effective Policy Implementation**

The need for sustainable tourism within a context of climate change, and for the necessary policy, legal and financial frameworks to support such development are apparent. However, the processes of establishing any sustainable tourism policy, and identification of successes and barriers of implementation are less clear; the implementation of sustainable tourism policy in general is particularly weak (UNEP 1996, Engels 2003, Mycoo 2006, Dodds 2007, Simpson 2007, Simpson 2008b). In the specific case of climate change, research conducted in the Mediterranean by Dodds and Kelman (2008) identified six policy suggestions for adapting in tourism industries:

- enacting effective control systems to ensure that policies are implemented and monitored;
- improving education and awareness on climate change and its potential impacts; placing sustainable tourism and climate change within broader policy frameworks (i.e. 'mainstreaming');
- implementing economic incentives to encourage adjustment strategies;
- using accountable, flexible, and participatory approaches for addressing climate change in sustainable tourism policies;
- filling in policy gaps while further integrating policies

.

Transdisciplinary working

The agencies, institutions and organisations involved in adaptation and mitigation strategies are many and varied; stakeholders include national governments, regional and local administration; public and private sector; international bodies and researchers. The necessary collaborative and cooperative working across sectors and scales is, potentially, a barrier to success. 'Joined-up', interdepartmental and trans-disciplinary approaches are vital to the successful implementation of adaptive/mitigative strategies. New infrastructures and mechanisms are required to ensure such approaches can prevail (Farrell and Twinning-Ward 2004; UNWTO-UNEP-WMO 2008; Simpson 2008b).

Shoreline Beach Restuarant Damage, Cozumel
Credit: Dr Murray C Simpson

Additional Information Sources

7

7

Australian 'Tourism Action Plan on Climate Change'.

http://www.industry.gov.au/content/itrinternet/cmscontent.cfm?objectID=35E1BA8C-0530-5A02-2A10AD9E82B77DFC

The Tourism Action Plan forms part of the National Climate Change Adaptation Framework which acts as the basis for jurisdictional actions on adaptation over the next 5-7 years. The National Climate Change Adaptation Framework includes actions to assist the most vulnerable sectors and regions, such as agriculture, biodiversity, fisheries, forestry, settlements and infrastructure, coastal, water resources, tourism and health, to adapt to the impacts of climate change.

"Davos Declaration". Climate Change and Tourism: Responding to Global Challenges. 2nd International Conference on Climate Change and Tourism, Davos 2007

http://www.unwto.org/pdf/pr071046.pdf

The Davos Declaration on Tourism and Climate Change presents the conference commitment to the mitigation of greenhouse gas emissions from tourist activities, especially those derived from transport and accommodation activities; adapt tourism businesses and destinations to changing climate conditions; apply existing and new technology to improve energy efficiency and secure financial resources to help poor regions and countries.

Destinet

http://destinet.ew.eea.europa.eu/

DestiNet is an information portal for tourist destinations and stakeholders, aiming to disseminate best practice in sustainable tourism development. The site is hosted within the European Environment Agency's (EEA) environmental information service and points to selected, quality-assessed information of relevance to sustainable tourism, covering: definitions and issues; measurement instruments; economic and institutional integration; stakeholder communication.

"Djerba Declaration" Climate Change and Tourism: Proceedings of the 1st International Conference on Climate Change and Tourism, Djerba, 2003.

http://www.world-tourism.org/sustainable/climate/final-report.pdf

The proceedings of the first UNWTO International Conference on Climate Change and Tourism, held in Djerba, Tunisia in April 2003. The report contains the main conclusions and agenda for action derived from the Conference, as well as the Djerba Declaration on Tourism and Climate Change, a UNWTO background paper, a list of presentations and a summary of the sessions and discussions held. Topics covered include the current scientific thinking on the subject; details of the activities of organisations acting in this field; the impact of climate change on the tourism industry; case studies from around the world detailing the impact of climate change on a variety of tourism activities and in a variety of locations; and an examination of tourism's own contribution to the causes of climate change.

Convention on Biological Diversity: Biological Diversity and Tourism

http://www.cbd.int/programmes/socio-eco/tourism/
This is a programme of the Convention on Biological Diversity (CBD). It supports the sustainable development of tourism activities in vulnerable ecosystems and habitats of major importance for biological diversity. The website contains the International Guidelines and information about their adoption; workshop and ecotourism documents; international case studies and links to related websites.

European Commission - Tourism

http://ec.europa.eu/enterprise/services/tourism/index_en.htm
This site contains information on various European Union (EU) programmes, schemes, funds, and initiatives of interest to the European tourism sector. It aims to present a comprehensive and structured overview of the opportunities the Community offers to help the development of sustainable tourism. As well as links to individual programmes the site also includes access to online documents and reports.

Heinz Centre for Science, Economics and the Environment

http://www.heinzctr.org/Press_Releases/adaptation_survey.shtml
The report provides a review of eight adaptation guidebooks or frameworks using eight different criteria. This evaluation details the comparative advantages of each approach. A survey of adaptation planning exercises in several urban areas is also used to highlight important lessons learned.

International Institute for Sustainable Development. Community-based Risk Screening Tool – Adaptation & Livelihoods (CRiSTAL).

http://www.iisd.org/pdf/2007/brochure_cristal.pdf
CRiSTAL (Community-based Risk Screening Tool - Adaptation and Livelihoods) is a tool designed to assist project planners and managers with integrating risk reduction and climate change adaptation into community-level projects. Developed by IISD in partnership with IUCN, Stockholm Environment Institute and Intercooperation, the tool helps users to systematically understand the links between local livelihoods; enables users to assess a project's impact on community level adaptive capacity; and assists users in making adjustments to improve a project's impact on adaptive capacity..

International Panel on Climate Change

http://www.ipcc.ch/
The Intergovernmental Panel on Climate Change (IPCC) was established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) in order to assess the available scientific, technical, and socio-economic information in the field of climate change. The IPCC is organised into three main working groups: working group I concentrates on the physical science basis; working group II on impacts, adaptation and vulnerability; working group III on mitigation of climate change. The site provides information on each of the working groups, including their remit, structure and future activities; access to the four Assessment Reports; technical papers and other documents.

7

International World Conservation Union (IUCN)

http://www.iucn.org/

The International World Conservation Union IUCN is an organisation formed by government agencies, non-governmental organisations and individuals, working together for the protection of nature through programmes promoting economic, social and environmental sustainability. The website offers links to news and information on current issues; events calendar; various conservation programmes; publications.

Overseas Development Institute: Research on Tourism

http://www.odi.org.uk/tourism/

The ODI focus on tourism promotes propoverty tourism by focusing on how tourism can enhance the livelihoods of the poor. The underlying aim is to expand the opportunities and benefits for poor stakeholders from tourism by applying for pro poor tourism (PPT) strategies. Research details and publications are accessible from the site.

Stern Review on the economics of climate change

http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm

This independent review on the Economics of Climate Change by Sir Nicholas Stern for the UK HM Treasury was published in October 2006. The report covers the science behind human-induced climate change before advancing to the economic effects and how the risks can be assessed and managed. Climate change is taken as a global issue with discussion on mitigation, adaptation and international collective action. Each section has detailed information on the options available in managing new energy technologies such as carbon capture, promoting international cooperation on environmental initiatives, reversing emissions and other aspects of dealing with global warming. The website provides access to the full report plus summaries, annexes, supporting research, press releases and additional papers.

Tour Operators' Initiative for Sustainable Tourism Development

http://www.toinitiative.org/

Tour Operators' Initiative (TOI) is a joint initiative between the United Nations Environment Programme (UNEP), United Nations Educational, Scientific and Culture Organization (UNESCO), World Tourism Organization (UNWTO) and tour operators. There are four main working groups which have material on the site; sustainability reporting, cooperation with destinations, supply chain management and communication. Through TOI tour operators commit to principles of sustainable tourism, and work together to promote and disseminate relevant methods and practices. TOI is an international platform from which to respond to international agendas, and address issues regarding environmental, social, economic and cultural aspects of sustainable tourism. The site includes case studies; events calendar; documentation available for download.

Tyndall Centre for Climate Change Research

http://www.tyndall.ac.uk/index.shtml

The Tyndall Centre for Climate Change Research conducts trans-disciplinary research evaluating and promoting sustainable solutions to climate change. The

Centre was formed in October 2000 in collaboration between nine UK research institutions and three of the UK Research Councils - NERC, EPSRC and ESRC. The Centre's headquarters is based in the School of Environmental Sciences at the University of East Anglia. The site provides information about the Centre's activities and research themes; events; presentations, reports and publications, including online briefing notes and working papers.

United Nations Environment Programme (UNEP): Tourism

http://www.uneptie.org/pc/tourism/
The UNEP Tourism Programme's mission is to ensure that conservation and use of the natural, cultural and man-made environment, through sustainable management, is an integral part of all tourism development. Work in the Programme addresses three main issues: the promotion of sustainable tourism among government agencies and the industry; the development of sustainable tourism tools for protected/sensitive area management; supporting the implementation of multilateral environmental agreements related to tourism. The website provides access to guidance on best practice; UNEP publications and other relevant links.

United Nations Environment Programme (UNEP): Climate Change

http://www.unep.org/themes/climatechange/index.asp
This portal site, part of the United Nations Environment Programme (UNEP) website, includes publications covering scientific, social, economic and environmental aspects of climate change and global warming as well as the full text of scientific reports and links to other resources and a list of publications are available.

United Nations Department of Economic and Social Affairs, (UN-DESA) Division for Sustainable Development

http://www.un.org/esa/sustdev/index.html
Provides information and resources on sustainable development indicators, climate change, sustainable consumption, sustainable tourism and small island developing states.

United Nations Framework Convention on Climate Change (UNFCCC)

http://unfccc.int/2860.php
This website provides information on the United Nations Framework Convention on Climate Change (UNFCCC). There is access to the text of the Kyoto Protocol, a listing of parties and observers, news and press releases; background to the Secretariat; news and events information and the UNFCCC library, with access to the online catalogues and official documents.

United Nations Framework Convention on Climate Change (UNFCCC).

Compendium of Decision Tools to Evaluate Strategies for Adaptation to Climate Change. http://unfccc.int/adaptation/methodologies_for/vulnerability_and_adaptation/items/2674.php
The compendium attempts to reflect the current state of knowledge in adaptation analysis and decision frameworks and tools. It summarizes three broad categories of frameworks, methods, and tools but does not prescribe or recommend methods or tools. It is intended for use by either assessment managers or technical researchers and does not require extensive technical knowledge of

modelling or specific decision-making techniques. Some of the frameworks and tools described in the compendium may require particular expertise, and these requirements are explicitly described.

United Nations International Strategy for Disaster Reduction (UNISDR) http://www.unisdr.org/
The UN/International Strategy for Disaster Reduction is the focal point in the UN System to promote links and coordination between disaster reduction activities in the socio-economic, humanitarian and development fields, as well as to support policy integration. It serves as an international information clearinghouse on disaster reduction, developing awareness campaigns and producing articles, journals, and other publications and promotional materials related to disaster reduction. The website offers access to relevant publications and data, networking and knowledge sharing resources

United Nations World Tourism Organization

http://www.unwto.org
The World Tourism Organization (UNWTO), a United Nations agency, is a global forum for tourism policy issues and a practical source of tourism know-how. It is the leading international organisation in the field of travel and tourism. The site provides information about the UNWTO and its activities; data and statistics of relevance to tourism; a news release service; events listing; online library and bookshop of UNWTO publications. The UNWTO also has a dedicated climate change portal: www.climate.unwto.org
or http://www.unwto.org/climate/index.php

World Bank: Climate Change

http://www.worldbank.org/climatechange
Part of the World Bank's 'Environmentally and Socially Sustainable Network', aimed at delivering expertise and resources in support of the Bank's involvement in international climate change negotiations under the United Nations Framework Convention on Climate Change (UNFCCC)". The site covers key concerns about climate change and information on World Bank programmes and research projects; information on international climate change especially in relation to the developing world; online publications.

World Bank Participation Sourcebook (World Bank 1996)

http://www.worldbank.org/wbi/sourcebook/sbpdf.htm
Primarily intended for readers who have already decided to use participatory approaches in their professional work, this document promotes the recognition that there is a diversity of stakeholders for every activity and that those people affected by development interventions must be included in the decision-making process. The source book provides shared examples of World Bank experiences with participatory approaches.

World Meteorological Organization

http://www.wmo.int/pages/index_en.html
The World Meteorological Organization (WMO), an intergovernmental organization with a membership of 188 States and Territories, became a specialized agency of the United Nations in 1951. WMO aims to provide world leadership in expertise and international cooperation in weather, climate, hydrology and water resources and related environmental issues, and thereby to contribute to the safety and well-being of people throughout the world and to the economic benefit of all nations. The site provides access to information on WMO's programmes and their activities, links to the websites of Members and partnering agencies, publications, news releases, information on upcoming meetings, and information on WMO's governance structures. The WMO Technical Commission for Climatology is found at: http://www.wmo.int/pages/prog/wcp/ccl/index_en.html and activities related to the World Climate Programme are
at:http://www.wmo.int/pages/prog/wcp/index_en.html

World Resources Institute

http://www.wri.org/
The World Resources Institute (WRI) website provides access to information on environmental issues. The WRI works to provide information, ideas and solutions to global environmental problems including deforestation, climate change, biodiversity loss and the sustainable management of natural resources. Resources available include reports, country/region profiles, statistical data, interactive maps, articles and other documents.

WWF

http://www.panda.org/about_wwf/what_we_do/climate_change/index.cfm
Provides information on WWF's work in the area of climate change; includes news notes from the field, fact sheets, newsletters and position papers.

7

Reference books and monographs for further reading (selection)

Hall, C.M., Higham, J. (eds) (2005). Tourism, Recreation and Climate Change. Clevedon: Channel View Publications.
Provides an overview of climate change in relation to tourism and leisure issues and is divided into three parts: The context of tourism, recreation and climate change including assessment and the evolution of the climate change issue in tourism; the effects of climate change on tourist flows and recreation patterns; and adaptation and response issues involved in managing the relationship between tourism, recreation and global climate change.

Gössling, S., Hall, C.M. (eds.) (2006). Tourism and Global Environmental Change. Ecological, Social, Economic and Political Interrelationships. London. Routledge.
Provides a series of reviews of key environments and issues in relation to tourism and global environmental change including mountain tourism, lakes and streams, forest ecosystems, coastal and marine environment, savannah regions, urban areas, biodiversity, disease and biosecurity, extreme events and adaptation and mitigation.

Becken, S., Hay, J. (2007). Tourism and Climate Change – risks and opportunities. Clevedon: Channel View Publications.
Provides an overview of tourism and climate change including introductions to tourism and climate systems, causes of global climate change, methodologies for greenhouse gas accounting, and climate change adaptation, measures and risks.

Scott, D., Amelung, B., Becken, S., Ceron, JP., Dubois, G., Gossling, S., Peeters, P., Simpson, M. (2008) Climate Change and Tourism: Responding to Global Challenges. World Tourism Organization, Madrid and United Nations Environment Programme, Paris.
A report produced for the UNWTO and the UNEP that provides discussion of advances in climate change science and implications for tourism, impacts and adaptation at tourism destinations, implications of climate change for tourism demand patterns, status and trends of emissions from tourism, mitigation policies and measures, and future issues that need to be addressed.

Simpson, M.C., Gössling, S. and Scott, D. (2008) Report on the International Policy and Market Response to Global Warming and the Challenges and Opportunities that Climate Change Issues Present for the Caribbean Tourism Sector. Caribbean Tourism Organization, European Union, Caribbean Regional Sustainable Tourism Development Programme (CRSDT, Barbados.
This report, produced for the Caribbean Tourism Organization, is an output of the 8th European Development Fund (EDF) Caribbean Regional Sustainable Tourism Development Programme (CRSTDP). The report assesses how various policies to stabilize or reduce emissions from aviation may influence tourism development in the Caribbean and examines opportunities to develop new low-carbon tourism products providing leadership potential for creating sustainable carbon neutral destinations.

Glossary

Adaptation
Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation:
– ***Anticipatory Adaptation***—Adaptation that takes place before impacts of climate change are observed. Also referred to as proactive adaptation.
– ***Autonomous Adaptation***—Adaptation that does not constitute a conscious response to climatic stimuli but is triggered by ecological changes in natural s y stems and by market or welfare changes in human systems. Also referred to as spontaneous adaptation.
– ***Planned Adaptation***—Adaptation that is the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve a desired state.
– ***Private Adaptation***—Adaptation that is initiated and implemented by individuals, households or private companies. Private adaptation is usually in the actor's rational self-interest.
– ***Public Adaptation***—Adaptation that is initiated and implemented by governments at all levels. Public adaptation is usually directed at collective needs.
– ***Reactive Adaptation***—Adaptation that takes place after impacts of climate change have been observed.

Adaptive Capacity
The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

Afforestation
Planting of new forests on lands that historically have not contained forests (for a discussion of the term forest and related terms such as afforestation, reforestation, and deforestation, see the IPCC Special Report on Land Use Land-Use Change, and Forestry (IPCC, 2000).

Annex I Countries
Annex I Parties include the industrialized countries that were members of the OECD (Organisation for Economic Co-operation and Development) in 1992, plus countries with economies in transition (the EIT Parties), including the Russian Federation, the Baltic States, and several Central and Eastern European States.

Anthropogenic
Resulting from activities of human beings.

Biodiversity
The numbers and relative abundances of different genes (genetic diversity), species, and ecosystems (communities) in a particular area. (Note: the Convention on Biological Diversity http://69.90.183.227/)

7

Biodiversity Hot Spots
Areas with high concentrations of endemic species facing high levels of habitat destruction (usually >80% of original habitat).

Carbon compensation or offsetting
The process by which an amount of greenhouse gas emissions equal to that caused by a certain activity, e.g., a flight, is reduced, or offset, elsewhere.

Capacity Building
The mobilization of individual and organizational assets from the community and combining those assets with others to achieve community building goals. It is a process of developing the technical skills, institutional capability, and personnel to develop and implement actions.

Certified Emission Reduction (CER) Unit - Equal to 1 tonne (metric ton) of CO_2-equivalent emissions reduced or sequestered through a Clean Development Mechanism project, calculated using Global Warming Potentials.

Clean Development Mechanism - A mechanism under the Kyoto Protocol through which developed countries may finance greenhouse-gas emission reduction or removal projects in developing countries, and receive credits for doing so which they may apply towards meeting mandatory limits on their own emissions.

Climate
Climate in a narrow sense is usually defined as the "average weather," or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands of years. The classical period is 3 decades, as defined by the World Meteorological Organization (WMO). These quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system.

Climate Change
Climate change refers to any change in climate over time, whether due to natural variability or as a result of human activity. This usage differs from that in the United Nations Framework Convention on Climate Change (UNFCCC), which defines "climate change" as: "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods".

CO_2-e, or CO_2 equivalent
The concentration of carbon dioxide that would cause the same amount of radiative forcing as a given mixture of carbon dioxide and other greenhouse gases (cf. Global Warming Potential).

Destination
A location visited by tourists. Can comprise various levels of scale, for instance a local tourism system, a region, or a country. A local tourism destination is a physical space in which a visitor spends at least one overnight. It includes tourism products such as support services and attractions, and tourism resources within one day's return travel time. It has physical and administrative boundaries defining its management, and images and perceptions defining its market competitiveness. Local destinations incorporate various stakeholders often including a host community, and can nest and network to form larger destinations (UNWTO 2004).

Emissions Trading
A market-based approach to achieving environmental objectives, includes the sale or trade of excess emission reductions (those below required targets) in one economic sector or nation, to offset emissions at another source inside or outside the country. In general, trading can occur at the intra-company, domestic, and international levels. The IPCC Second Assessment Report adopted the convention of using "permits" for domestic trading systems and "quotas" for international trading systems. Emissions trading under Article 17 of the Kyoto Protocol comprises a tradable quota system based on the assigned amounts calculated from the emission reduction and limitation commitments listed in Annex B of the Protocol. UNFCCC Definition: One of the three Kyoto mechanisms, by which an Annex I Party may transfer Kyoto Protocol units to or acquire units from another Annex I Party. An Annex I Party must meet specific eligibility requirements to participate in emissions trading.

Extreme Weather Event
An event that is rare within its statistical reference distribution at a particular place. Definitions of "rare" vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile. By definition, the characteristics of what is called "extreme weather" may vary from place to place. An "extreme climate event" is an average of a number of weather events over a certain period of time, an average which is itself extreme (e.g., rainfall over a season).

Global Warming Potential (GWP)
An index, describing the radiative characteristics of well-mixed greenhouse gases, that represents the combined effect of the differing times these gases remain in the atmosphere and their relative effectiveness in absorbing outgoing infrared radiation. This index approximates the time-integrated warming effect of a unit mass of a given greenhouse gas in today's atmosphere, relative to that of carbon dioxide.

7

Greenhouse Gas
Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorbs and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere, and clouds. This property causes the greenhouse effect. Water vapour (H2O), carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4), and ozone (O3) are the primary greenhouse gases in the Earth's atmosphere. Moreover, there are a number of entirely human-made greenhouse gases in the atmosphere, such as the halocarbons and other chlorine and bromine-containing substances which are dealt with under the Montreal Protocol. Beside CO2, N2O, and CH4,the Kyoto Protocol deals with the greenhouse gases sulphur hexaflouride (SF6), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).

Joint Implementation
A mechanism under the Kyoto Protocol through which a developed country can receive "emissions reduction units" when it helps to finance projects that reduce net greenhouse-gas emissions in another developed country (in practice, the recipient state is likely to be a country with an "economy in transition"). An Annex I Party must meet specific eligibility requirements to participate in joint implementation.

Mainstreaming Climate Change
The incorporation of climate change adaptation and mitigation into all institutional, private, and not-for-profit tourism development and planning strategies and tourism business strategies.

Mitigation
An anthropogenic intervention to reduce the output or enhance the sinks of greenhouse gases.

Official Development Assistance (ODA)
ODA is a category of development aid. The term applies to aid from the members of Development Assistance Committee of the OECD to developing nations (Part I List of Aid Recipients).

Radiative Forcing
Radiative forcing is the change in the net vertical irradiance [expressed in Watts per square meter (Wm-2)] at the tropopause due to an internal change or a change in the external forcing of the climate system, such as a change in the concentration of CO2 or the output of the Sun. Usually radiative forcing is computed after allowing for stratospheric temperatures to readjust to radiative equilibrium, but with all tropospheric properties held fixed at their unperturbed values.

Radiative Forcing Index (RFI) – The ratio of total radiative forcing to that from CO_2 emissions alone is a measure of the importance of aircraft-induced climate change other than that from the release of fossil carbon alone.

Reforestation - Planting of forests on lands that have previously contained forests but that have been converted to some other use.

Resilience
Amount of impact a system can absorb without changing significantly its state.

Sequestration - The process of increasing the carbon content of a carbon reservoir other than the atmosphere, for instance forests or oceans. Human biological approaches to sequestration include direct removal of carbon dioxide from the atmosphere through land-use change, afforestation, reforestation, and practices that enhance soil carbon in agriculture. Physical approaches include separation and disposal of carbon dioxide from flue gases or from processing fossil fuels to produce hydrogen- and carbon dioxide-rich fractions and long-term storage in underground in depleted oil and gas reservoirs, coal seams, and saline aquifers.

Sustainable Development
Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED 1987).
United Nations Framework Convention on Climate Change (UNFCCC) - The Convention was adopted on 9 May 1992 in New York and signed at the 1992 Earth Summit in Rio de Janeiro by more than 150 countries and the European Community. Its ultimate objective is the "[…] stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." It contains commitments for all Parties. Under the Convention, Parties included in Annex I aim to return greenhouse gas emissions not controlled by the Montreal Protocol to 1990 levels by the year 2000. The Convention entered into force in March 1994.

Vulnerability
The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.

7

References

Adger, W.N., Agrawala, S., Mirza, M.M.Q., Conde, C., O'Brien, K., Pulhin, J., Pulwarty, R., Smit, B. and Takahashi, K. (2007). Assessment of adaptation practices, options, constraints and capacity. In Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. and Hanson, C.E. (eds) Climate Change 2007: Impacts, Adaptation and Vulnerability. Cambridge. Cambridge University Press: 717-743.

African Development Bank, Asian Development Bank, Department for International Development, United Kingdom, European Commission. Directorate-General for International Cooperation, and Directorate General for Development, Germany (2003) Poverty and climate change. Reducing the vulnerability of the poor through adaptation. World Bank, New York.

AIACC (2007) Climate change vulnerability and adaptation in developing countries. Final Report of the AIACC Project. http://unfccc.int/files/essential_background/background_publications_htmlpdf/application/txt/pub_07_impacts.pdf

Alaerts, G.J., Blair, T.L., Hartvelt, F.J.A. 1991. A Strategy for Water Sector Capacity Building, Proceedings of the UNDP Symposium, Delft 3-5 June, 1991. IHE, Delft, The Netherlands, UNDP, New York, USA.

Asian Development Bank (2005). Climate Proofing: A Risk-based Approach to Adaptation. http://www.adb.org/Documents/Reports/Climate-Proofing/default.asp

Aspen Global Change Institute (2006) Climate Change and Aspen: An Assessment of Potential Impacts and Responses. http://www.agci.org/aspenStudy.html

Australia Government (2007) Tourism Action Plan on Climate Change. http://www.industry.gov.au/content/itrinternet/cmscontent.cfm?objectID=35E1BA8C-0530-5A02-2A10AD9E82B77DFC

Barnett, J., Adger, W.N., (2007). Climate change, human security and violent conflict Political Geography 26 (6); 639-655

Baumol, W. (2002) The Free Market Innovation Machine: Analyzing the Growth Miracle of Capitalism, Princeton: Princeton University Press.

Becken, S. (2004). Climate change and tourism in Fiji: Vulnerability, adaptation and mitigation, Final Report. Suva, Fiji: University of the South Pacific.

Becken, S. (2005). Harmonizing climate change adaptation and mitigation. The case of tourist resorts in Fiji. Global Environmental Change – Part A, 15(4), 381-393.

Becken, S., Hay, J. (2007). Tourism and climate change – risks and opportunities. Clevedon: Channel View Publications.

Boko, M., Niang, I., Nyong, A., Vogel, C., Githeko, A., Medany, M., Osman-Elasha, B., Tabo, R. and Yanda, P. (2007). Africa. In Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. and Hanson, C.E. (eds) Climate Change 2007: Impacts, Adaptation and Vulnerability. Cambridge. Cambridge University Press: 433-467.

Bouwe, LM., Aerts, JC. (2006) Financing climate change adaptation. Disaster 30 (1), 49-63.

Brooks, N. and Adger, W.N. (2005) Assessing and enhancing adaptive capacity. In: B. Lim, E. Spanger-Siegfried, I. Burton, E.L. Malone and S. Huq, (eds.) Adaptation Policy Frameworks for Climate Change, Cambridge University Press, New York, 165-182.

Carruthers, P. (2007) Lessons learnt piloting Community Approaches to Climate Change Adaptation in the Cook Islands. Presentation at the UNFCCC Expert Workshop for SIDS. February 27th 2007, Rarotonga, Cook Islands. http://unfccc.int/files/adaptation/adverse_effects_and_response_measures_art_48/application/pdf/200702_cook_islands_community_adaptation.pdf

Cavallaro, F. & Ciraolo, L. (2005). A multicriteria approach to evaluate wind energy plants on an Italian island. Energy Policy, 33, 235-244.

Chan, W. W. & Lam, J. C. (2003). Energy-saving supporting tourism: a case study of hotel swimming pool heat pump. Journal of Sustainable Tourism, 11 (1), 74-83.

Cruz, R.V., Harasawa, H., Lal, M., Wu, S., Anokhin, Y., Punsalmaa, B., Honda, Y., Jafari, M., Li, C. And Huu Ninh, N. (2007). Asia. In Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. and Hanson, C.E. (eds) Climate Change 2007: Impacts, Adaptation and Vulnerability. Cambridge. Cambridge University Press: 469-506.

Department for Environment, Food and Rural Affairs (2008) Communicate climate change. http://www.climatechallenge.gov.uk/communicate.html

Dodds, R., (2007). Sustainable Tourism and Policy Implementation: Lessons from the Case of Calvia´ , Spain. Current Issues in Tourism, 10 (4): 296-322.

Dodds, R. and Kelman, I. (2008). How Climate Change is Considered in Sustainable Tourism Policies: A Case of the Mediterranean Islands of Malta and Mallorca. Tourism Research International, in press.

Engels, B. (ed) (2003) Sustainable Tourism and European Policies. Report of NGO Workshop – Isle of Vilm, March 23-24. www.bfn.de/fileadm/MDB/documents/skript95.pdf.

Elsasser, H., Bürki, R. (2002). Climate change as a threat to tourism in the Alps. Climate Research, 20, 253-257.

7

Farrell, B., Twinning-Ward, L. (2004). Reconceptualising Tourism. Annals of Tourism Research, 31 (2): 274–295

Field, C.B., Mortsch, L.D., Brklacich, M., Forbes, D.L., Kovacs, P., Patz, J.A., Running, S.W. And Scott, M.J. (2007). North America. In Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. and Hanson, C.E. (eds) Climate Change 2007: Impacts, Adaptation and Vulnerability. Cambridge. Cambridge University Press: 617-652.

Fischlin, A., Midgley, G.F., Price, J.T., Leemans, R., Gopal, B., Turley, C., Rounsevell, M.D.A., Dube, O.P., Tarazona, J. and Velichko, A.A. (2007). Ecosystems, their properties, goods, and services. In Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. and Hanson, C.E. (eds) Climate Change 2007: Impacts, Adaptation and Vulnerability. Cambridge. Cambridge University Press: 211-272.

German Advisory Council on Global Change (2007). World in transition: climate change as a security risk. Berlin, Germany: German Advisory Council on Global Change.

Gössling, S. 2008. Hypermobile travellers. In Gössling, S. and Upham, P. (eds) Climate Change and Aviation. Earthscan, to appear 2008.

Gössling, S., Hall, C.M. (eds.) (2006a). Tourism and Global Environmental Change. Ecological, Social, Economic and Political Interrelationships. London. Routledge.

Gössling, S., Hall, C.M. (2006b). Uncertainties in predicting tourist flows under scenarios of climate change. Climatic Change, 79(3-4): 163-73.

Gössling, S, Hall, C. M. (2006c). An Introduction to Tourism and Global Environmental Change. In Gössling, S. and Hall, C.M. (eds.) Tourism and Global Environmental Change. Ecological, Social, Economic and Political Interrelationships. London. Routledge: 1-34.

Gössling, S., Hall, C.M., Lane, B. Weaver, D. (2008a) The Helsingborg Statement on Sustainable Tourism. Journal of Sustainable Tourism, 16(1), 122-124.

Gössling, S., Peeters, P., and Scott, D. (2008b). Consequences of climate policy for international tourist arrivals in developing countries. Third World Quarterly, submitted.

Gössling, S., Hultman, J., Haglund, L, Källgren, H. And Revahl, M. (2008c). Voluntary carbon offsetting by Swedish Air Travellers: Opportunities and Obstacles. Current Issues in Tourism, submitted.

Gössling, S. (2008). Carbon neutral destinations: a conceptual analysis. Journal of Sustainable Tourism, submitted.

Gössling, S. and Schumacher, K. (2008). Implementing Carbon Neutral destination policies: issues from the Seychelles. Journal of Sustainable Tourism, submitted.

Hall, C.M. (ed) (2007). Pro-Poor Tourism: Who Benefits? Perspectives on Tourism and Poverty Reduction, Clevedon: Channel View Publications.

Hall, C.M. (2008). Tourism and climate change: Knowledge gaps and issues. Tourism Recreation Research in press.

Hall, C.M. Coles, T. (2008a) Introduction: Tourism and International Business – Tourism as International Business. In Coles, T. and Hall, C.M. (eds.) International Business and Tourism: Global Issues, Contemporary Interactions. London: Routledge, 1-26.

Hall, C.M. Coles, T. (2008b) Conclusion: Mobilities of Commerce. In Coles, T. and Hall, C.M. (eds.) International Business and Tourism: Global Issues, Contemporary Interactions. London: Routledge, 1-26.

Hall, C.M., Higham, J. (eds) (2005) Tourism, Recreation and Climate Change. Clevedon. Channel View Publications

Hall, C.M. & Williams, A.M. (2008) Tourism and Innovation. London: Routledge

Hall, C.M., Timothy, D., & Duval, D. (2004) Security and Tourism: Towards a New Understanding? Journal of Travel & Tourism Marketing, 15, (2/3), 1-18.

ICLEI (2007) Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments. Toronto: ICLEI.

Institute for Development Studies (2006) Overcoming the barriers: mainstreaming climate change adaptation in developing countries. Teddington, UK: Tearfund.

IPCC (2001) Climate Change 2001: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change. McCarthy, J.J., Canziani, O.F., Leary, N.A., Dokken, D.J., and White, K.S. (Eds). Cambridge University Press.

IPCC (2007a): Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., Qin, D., Manning, M., Marquis, M., Averyt, K., Tignor, M.B., LeRoy Mil H., (eds.)]. Cambridge University Press.

IPCC (2007b): Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J., Hanson, C.E., (eds.)]. Cambridge University Press.

IPCC (2007c): Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA., XXX pp.
IPCC (2007d): AR4 Climate Change 2007: Synthesis Report http://www.ipcc.ch/ipccreports/ar4-syr.htm

Jackson, I., (2002). Workshop Report and Plan of Action: Adaptation to Climate Change in the Caribbean Tourism Sector Workshop Grenada. OAS. www.oas.org/macc/Docs/TourismReport.doc

London, J.B., (2004): Implications of climate change on small island developing states: experience in the Caribbean region. Journal of Environmental Management and Planning, 47, 491-501

7

Magrin, G., Gay García, C., Cruz Choque, D., Giménez, J.C., Moreno, A.R., Nagy, G.J., Nobre, C. And Villamizar, A. (2007). Latin America. In Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. and Hanson, C.E. (eds) Climate Change 2007: Impacts, Adaptation and Vulnerability. Cambridge. Cambridge University Press: 581-615.

Mimura, N., Nurse, L., Mclean, R.F., Agard, J., Briguglio, L., Lefale, P., Payet, R. and Sem, G. (2007). Small islands. In Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. and Hanson, C.E. (Eds) Climate Change 2007: Impacts, Adaptation and Vulnerability. Cambridge. Cambridge University Press: 687-716.

Mycoo, M. (2006) Sustainable Tourism using regulations, market mechanisms and green certification: a case study of Barbados. Journal of Sustainable Tourism, 14 (5), 489-511.

National Ski Areas Association (2007).
http://www.nsaa.org/nsaa/press/0607/green-power-fact-sheet.asp

Nicholls, R.J., Wong, P.P., Burkett, V.R., Codignotto, J.O., Hay, J.E., Mclean, R.F., Ragoonaden, S. and Woodroffe, C.D. (2007). Coastal systems and low-lying areas. In Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. and Hanson, C.E. (eds) Climate Change 2007: Impacts, Adaptation and Vulnerability. Cambridge. Cambridge University Press: 315-356.

Nurse, L. and Moore, R. (2005). Adaptation to global climate change: an urgent requirement for Small Island Developing States. Review of European Community and International Environmental Law, 14, 100-107.

Parry, M.L., O.F. Canziani, J.P. Palutikof and Co-authors (2007): Technical Summary. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 23-78.

Raksakulthai, V. (2003). Climate change impacts and adaptation for tourism in Phuket, Thailand. Pathumthani, Thailand: Asian Disaster Preparedness Centre.

Rogner, H.-H., Zhou, D., Bradley, R., Crabbé P., Edenhofer, O., Hare B., (Australia), Kuijpers, L., Yamaguchi, M., 2007: Introduction. In Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press.

Rosenzweig, C., Casassa, G., Karoly, D.J., Imeson, A., Liu, C., Menzel, A., Rawlins, S., Root, T.L., Seguin, B. and Tryjanowski, P. (2007). Assessment of observed changes and responses in natural and managed systems. In Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. and Hanson, C.E. (eds) Climate Change 2007: Impacts, Adaptation and Vulnerability. Cambridge. Cambridge University Press: 79-131.

Scheyvens, R. (2007). Poor cousins no more: valuing the development potential of domestic and diaspora tourism. Progress in Development Studies 7(4): 307-325.

Schilcher, D. (2007). Growth Versus Equity: The Continuum of Pro-Poor Tourism and Neoliberal Governance. Current Issues in Tourism 10(2-3): 166-193.

Schneider, S.H., Semenov, S., Patwardhan, A., Burton, I., Magadza, C.H.D., Oppenheimer, M., Pittock, A.B., Rahman, A., Smith, J.B., Suarez A. and Yamin, F. (2007). Assessing key vulnerabilities and the risk from climate change. In Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. and Hanson, C.E. (eds) Climate Change 2007: Impacts, Adaptation and Vulnerability. Cambridge. Cambridge University Press: 779-810.

Scott, D. (2006) Climate change and sustainable tourism in the 21st century. In: Tourism Research: Policy, Planning, and Prospects. J. Cukier (ed.). Waterloo: Department of Geography Publication Series, University of Waterloo. 175-248

Scott, D., Jones, B. (2005) Climate change and Banff: implications for tourism and recreation - executive summary. Report prepared for the Government of Canada Climate Change Action Fund and Town of Banff (Alberta, Canada). Waterloo, Canada: University of Waterloo.

Scott, D. Jones, B., Andrey, J., Gibson, R., Kay, P., Mortsch, L. (2000) Climate change communication: Proceedings of an International Conference. June 22-24, 2000
Waterloo, Canada. Toronto: Environment Canada. http://dsp-psd.pwgsc.gc.ca/Collection/En56-157-2000E.pdf.

Scott, D., Jones, B., Lemieux, C., et al (2002) The vulnerability of winter recreation to climate change in Ontario's Lakelands tourism region. Department of Geography Publication Series Occasional Paper 18, University of Waterloo, Waterloo, Ontario, Canada

Scott, D., Jones, B. & Abi Khaled, H. (2005) Climate change: a long term strategic issue for the National Capital Commission (Tourism and Recreation Business Lines) – Executive Summary. Report prepared for the National Capital Commission. Waterloo, Canada: University of Waterloo.

Sievanen, T., Tervo, K., Neuvonen, M., Pouta, E., Saarinen, J., Peltonen, A. (2005) Nature-based tourism, outdoor recreation and adaptation to climate change. FINADAPT Working Paper 11. Helsinki: Finnish Environment Institute.

Simmons, P. (2005). Swiss plan to wrap up their glaciers. The Times, March 30, p. 66.

Simpson M.C. (2007) The Impacts of Climate Change on Beach Destinations and Sustainable Coastal Tourism: Where do we go from here? Key Note Presentation Beaches World Tour Conference, Foundation for Environmental Education / Blue Flag Toronto, Canada. 9-11 October 2007

Simpson, M.C. (2008a) Community Benefit Tourism Initiatives: A Conceptual Oxymoron? Tourism Management, 29, 1, 1-18.

Simpson, M.C. (2008b in press) Global Climate Change and the Implications for Tourism Resilience in Small Island Developing States (SIDS) In Building Tourism Resilience in SIDS: Maximising Economic Benefits and Sustaining Tourism Development. SIDS Tourism Organization, The Bahamas

7

Simpson, M.C. and Hall, C.M. (2008) Tourism, Livelihoods, Biodiversity and the Climate Change Factor in Developing Countries: A Preliminary Investigation of Sub-Saharan Africa The Journal of Business and Globalisation submitted

Simpson, M.C. and Ladle, R. (2007) Report on 'Elaboration of a Project for Developing & Implementing the Sustainability Indicators for the Greater Caribbean'. Association of Caribbean States (ACS), Trinidad.

Simpson, M.C., Gössling, S. & Scott, D. (2008a in press) Report on the International Policy and Market Response to Global Warming and the Challenges and Opportunities that Climate Change Issues Present for the Caribbean Tourism Sector. Caribbean Regional Sustainable Tourism Development Programme: European Commission and the Caribbean Tourism Organization, Barbados.

Simpson, M.C., Ladle, R., Viner, D. and Nicholls, S. (2008b) Vulnerability and Resilience: The Impacts of Climate Change on Tourism in Caribbean Small Island States: The case of Tobago. Journal of Sustainable Tourism submitted

South West Climate Change Impacts Partnership (2007) Climate Change and Tourism in the South of England. http://www.oursouthwest.com/climate/archive/tourism-leaflet-2007.pdf

Stern, N., 2006: The Stern Review: The Economics of Climate Change. http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_report.cf

Sustainable Transport 2007. http://www.sustrans.org.uk

Tompkins, E. et al. (2005) Surviving Climate Change in Small Islands: A Guidebook. Tyndall Centre for Climate Change Research, university of East Anglia, UK.

Twinshare (2005). Tourism Accommodation and the Environment. http://twinshare.crctourism.com.au/aboutTwinshare.asp

Uemura, Y., Kai, T., Natori, R., Takahashi, T., Hatate, Y. & Yoshida, M. (2003). Potential of renewable energy sources and its applications in Yakushima Island. Renewable Energy, 29, 581-591.

UN-DESA (n.d.) Johannesburg Plan of Implementation of the World Summit on Sustainable Development http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/POIToc.htm

UNDP, (1998). Capacity assessment and development. In a Systems and Strategic
Management Context. Technical Advisory Paper No. 3.
http://www.pogar.org/publications/other/undp/governance/capsystech3-98e.pdf

UNDP (2004). Adaptation Policy Frameworks for Climate Change. Developing Strategies, Policies and Measures. Lim, B., Spanger-Siegfried, E. (eds.) Co-authors Burton, I., Malone, E., Huq, S.
http://www.undp.org/gef/undp-gef_publications/publications/apf%20front%20matter_contents _foreword.pdf

UNDP (2005) Human Development Report 2005: International Cooperation at a Crossroads: Aid, Trade and Security in an Unequal World, New York: UNDP

UNEP (n.d.) List of Acronyms and Glossary Terms. http://www.unep.org/DEC/OnLineManual/Resources/Glossary/tabid/69/Default.aspx?high=capacity+building#high

UNEP (1996) Sustainable Tourism Development in Small Island States. http://islands/unep.ch/d96-20a3.htm .

UNEP (1998) Handbook on Methods for Climate change Impact Assessment and Adaptation Strategies (version 2.0) Feenstra, J., Burton, I., Smith, J. and Tol, R. (eds) UNEP, Nairobi and Institute for Environmental Studies, Vrije University, Amsterdam.

UNEP (2003). Switched on: Renewable Energy Opportunities for the Tourism Industry. Paris: UNEP

UNEP (2005). Bali Strategic Plan for Technology Support and Capacity-building http://www.unep.org/GC/GC23/documents/GC23-6-add-1.pdf

UNEP (2006). International Marrakech Task Force on Sustainable Tourism Development: Tourism for sustainability. http://www.unep.fr/pc/sustain/resources/MTF/Brochure_STTF.pdf

UNFCCC (2005) Compendium of Decision Tools to Evaluate Strategies for Adaptation to Climate Change. http://unfccc.int/adaptation/methodologies_for/vulnerability_and_adaptation/items/2674.php

UNFCC (2007) Outcomes of the Nairobi work programme on impacts, vulnerability and adaptation to climate change. assess the adaptive capacity of communities in coastal zones. http://unfccc.int/files/adaptation/sbsta_agenda_item_adaptation/application/pdf/200801_cfa_09.pdf]

UNFCCC (2008) Nairobi work programme on impacts, vulnerability and adaptation to climate change. http://unfccc.int/adaptation/sbsta_agenda_item_adaptation/items/3633.php.

UNWTO (2004) Indicators of Sustainability for Tourism Destinations, UNWTO, Madrid.

UNWTO (2007a) Davos Declaration. http://www.world-tourism.org/pdf/pr071046.pdf

UNWTO (2007b) Ministers Summit on Tourism and Climate Change, London Conference Pack 2007 (=.

UNWTO (2007c) Tourism will contribute to solutions for global climate change and poverty challenges, Press release, UNWTO Press and Communications Department, March 8, Berlin/Madrid. http://www.unwto.org/media/news/en/press_det.php?id=1581&idioma=E

UNWTO (2008) Adaptation to climate change in the tourism sector in the Fiji Islands – summary report of the initial stakeholder workshop. Madrid: UNWTO.

7

UNWTO and UNEP and WMO (2008), Climate Change and Tourism: Responding to Global Challenges, (prepared by Scott, D., Amelung, B., Becken, S., Ceron, JP., Dubois, G., Gössling, S., Peeters, P. and Simpson, M.C.), UNWTO, Madrid, and UNEP, Paris.

US Energy Information Administration (2007). International emissions data - per capita emissions. http://www.eia.doe.gov/environment.html

USAID (2007). Adapting to Climate Variability and Change: A Guidance Manual for Development Planning. US Agency for International Development, Washington. http://www.usaid.gov/our_work/environment/climate/docs/reports/cc_vamanual.pdf

Van den Brink, R.M. & Van Wee, B. (2001). Why has car-fleet specific fuel consumption not shown any decrease since 1990? Quantitative analysis of Dutch passenger car-fleet specific fuel

Visit Copenhagen (2007). http://www.visitcopenhagen.com/composite-378.htm

Wilbanks, T.J., Romero Lankao, P., Bao, M., Berkhout, F., Cairncross, S., Ceron, J-P., Kapshe, M., Muir-Wood, R. and Zapata-Marti, R. (2007). Industry, settlement and society. In Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. and Hanson, C.E. (eds) Climate Change 2007: Impacts, Adaptation and Vulnerability. Cambridge. Cambridge University Press: 357-390.

Wolfsegger, C., Gossling, S., & Scott, D. (2008–in press). Climate change risk appraisal in the Austrian ski industry. Tourism Review International.

World Commission on Environment and Development (WCED) (1987). Our Common Future. Oxford: Oxford University Press.

World Bank (1996). The World Bank Participation Sourcebook. http://www.worldbank.org/wbi/sourcebook/sbhome.htm

About the UNEP Division of Technology, Industry and Economics

The UNEP Division of Technology, Industry and Economics (DTIE) helps governments, local authorities and decision-makers in business and industry to develop and implement policies and practices focusing on sustainable development.

The Division works to promote:

> sustainable consumption and production
> the efficient use of renewable energy
> adequate management of chemicals
> the integration of environmental costs in development policies.

The Office of the Director, located in Paris, coordinates activities through:

- **The International Environmental Technology Centre** - IETC (Osaka, Shiga), which implements integrated waste, water and disaster management programmes, focusing in particular on Asia.
- **Production and Consumption** (Paris**)**, which promotes sustainable consumption and production patterns as a contribution to human development through global markets.
- **Chemicals** (Geneva), which catalyzes global actions to bring about the sound management of chemicals and the improvement of chemical safety worldwide.
- **Energy** (Paris**)**, which fosters energy and transport policies for sustainable development and encourages investment in renewable energy and energy efficiency.
- **OzonAction** (Paris), which supports the phase-out of ozone depleting substances in developing countries and countries with economies in transition to ensure implementation of the Montreal Protocol.
- **Economics and Trade** (Geneva), which helps countries to integrate environmental considerations into economic and trade policies, and works with the finance sector to incorporate sustainable development policies.

UNEP DTIE activities focus on raising awareness, improving the transfer of knowledge and information, fostering technological cooperation and partnerships, and implementing international conventions and agreements.

For more information, see www.unep.fr

With its close connections to the environment and climate itself, tourism is considered to be a vulnerable and highly climate-sensitive economic sector, similar to agriculture, insurance, energy, and transportation. At the same time, tourism is a contributor to Greenhouse Gas (GHG) emissions, including emissions from transport, accommodation and activities. In 2005, tourism's contribution to GHG emissions was estimated to be approximately 5%.

According to the Davos Declaration on climate Change and Tourism the sector has to ***"rapidly respond to climate change, within the evolving UN framework and progressively reduce its Greenhouse Gas (GHG) emissions, if it is to grow in a sustainable way"***.

In response to this challenge this publication is designed to provide a pragmatic platform to strengthen the capacity of professionals to understand and respond effectively to the global challenges of climate change in tourism destinations. It is the result of the ongoing cooperation between UNEP, UNWTO and WMO in the context of the wider UN response to climate change.

The publication presents an overview of the current science and policy of climate change, followed by self-guidance material on mitigation and adaptation, exploring tools, methods and techniques associated with the management of climate change in tourism. It also identifies examples of good practice from which stakeholders might learn in order to develop their own capacities for implementing climate change strategies.

www.unep.fr/scp

United Nations Environment Programme
P.O. Box 30552 Nairobi, Kenya
Tel: (254 2) 621234
Fax: (254 2) 623927
E-mail: cpiinfo@unep.org
E-mail: uneppub@unep.org

UNEP

For more information, contact:
UNEP DTIE
Sustainable Consumption and Production Branch
15 rue de Milan
75441 Paris Cedex 09, France
Tel: +33 1 44 37 14 50
Fax: +33 1 44 37 14 74
Email: unep.tie@unep.fr
www.unep.fr/pc

ISBN - 978-92-807-2921-5
DTI/1047/PA

Cover Photo: Antônio Moreira Torres
Paraty, Brazil