



Report on the International Policy and Market Response to
Global Warming and the
Challenges & Opportunities that
Climate Change Issues Present
for the Caribbean Tourism Sector





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The Caribbean Regional Sustainable Tourism Development Programme



The Caribbean Tourism Organization



European Commission



Carl Bro Intelligent Solutions



The Caribbean Regional Sustainable Tourism Development Programme

This report is an output of the 8th European Development Fund (EDF) Caribbean Regional Sustainable Tourism Development Programme (CRSTDP), which is a five-year (2003-2008) programme funded by the European Union. The overall objective of the Programme is to contribute to economic growth and poverty alleviation in The 15 states that make up the Caribbean Forum of African, Caribbean and Pacific States (CARIFORUM) through increased competitiveness and sustainability of the Caribbean tourism sector. CARIFORUM comprises Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica, the Dominican Republic, Jamaica, Grenada, Guyana, Haiti, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, and Trinidad and Tobago.

The Caribbean Tourism Organization

The Caribbean Tourism Organization (CTO), with headquarters in Barbados and marketing operations in New York, London and Toronto, is the Caribbean's tourism development agency and comprises 32 member governments and a myriad of private sector organisations and companies. The CTO's mission is to provide, to and through its members, the services and information needed for the development of sustainable tourism for the economic and social benefit of the Caribbean people. The organisation provides specialised support and technical assistance to member countries in the areas of marketing, human resource development, research, information management and sustainable development.

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ACP	African, Caribbean and Pacific	EU15	Includes the following countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom.	Mw	Mega watts
APD	Air Passenger Duty			NextGen	Next Generation Air Transportation System
ATA	Air Transport Association	EU25	Includes EU15 plus: Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia	NGO	Non-governmental Organisation
CANARI	Caribbean Natural Resources Institute			NVERs	Non Verified Emission Reductions
CARICOM	Caribbean Community and Common Market	EUA	Emissions Unit Allowance	OAS	Organization of American States
CARIFORUM	Caribbean Forum of ACP States	EU ETS	European Union Emission Trading System	OPEC	Organization of Petroleum Exporting Countries
CARILEC	Caribbean Electric Utility Service Corporation	GDP	Gross Domestic Product	PATA	Pacific Asia Travel Association
CAST	Caribbean Alliance for Sustainable Tourism	GEF	Global Environment Facility	Pkm	Passenger kilometre
CDM	Clean Development Mechanism	GHG	Greenhouse Gases	Ppmv	Parts Per Million by Volume
CEHI	Caribbean Environmental Health Institute	GS	Gold Standard	RFI	Radiative Forcing Index
CERs	Certified Emission Reductions	GSCER	Gold Standard Certified Emission Reduction	SIKA,	Swedish Institute for Transport and Communications Analysis
CHA	Caribbean Hotel Association	GSEII	Global Sustainable Energy Islands Initiative	SLSDEU	St. Lucia Sustainable Development and Environment Unit
CIDA	Canadian International Development Agency	GS VERs	Gold Standard Verified Emission Reductions	SMME	Small-Medium and Micro Enterprise
CO ₂	Carbon-Dioxide	GTZ	German Development Agency	TICOS	Tourism Industry Carbon Offset Service
COP	Conference of the Parties	IATA	International Air Transport Association	UN	United Nations
CREDP	Caribbean Renewable Energy Development Programme	ICAO	International Civil Aviation Organization	UNDP	UN Development Programme
CRSTDP	Caribbean Regional Sustainable Tourism Development Programme	ICCL	International Council of Cruise Lines	UNEP	United Nations Environment Programme
CTO	Caribbean Tourism Organization	ICCT	International Council on Clean Transportation	UNESCO	United Nations Educational, Scientific and Cultural Organization
CTPU	CARIFORUM Tourism Programme Unit	IEA	International Energy Agency	UNFCCC	United Nations Framework Convention on Climate Change
DEFRA	Department of Environment, Food and Rural Affairs	IIED	International Institute for Environment and Development	UNWTO	World Tourism Organization
DFID	UK Development Agency	IPCC	Intergovernmental Panel on Climate Change	UWI	University of the West Indies
DOE	Designed Operational Entity	IUCN	International Union for Conservation of Nature	VAT	Value Added Tax
EDF	European Development Fund	JCDT	Jamaica Conservation Development Trust	VCS	Voluntary Carbon Standard
EC	European Commission	Kw	KiloWatt	VCU	Voluntary Carbon Unit
EMS	Environmental Management System	Kwh	Kilowatt-Hour	VERs	Verifiable Emission Reductions or Voluntary Emission Reductions
ESO	Energy Saving Options	Mb/d	Millions of barrels per day	WMO	World Meteorological Organization
ERU	Emission Reduction Unit	Mt	Mega tonnes	WTA	Willing to Accept
EU	European Union	MDG	United Nations Millennium Development Goals	WTP	Willingness to pay

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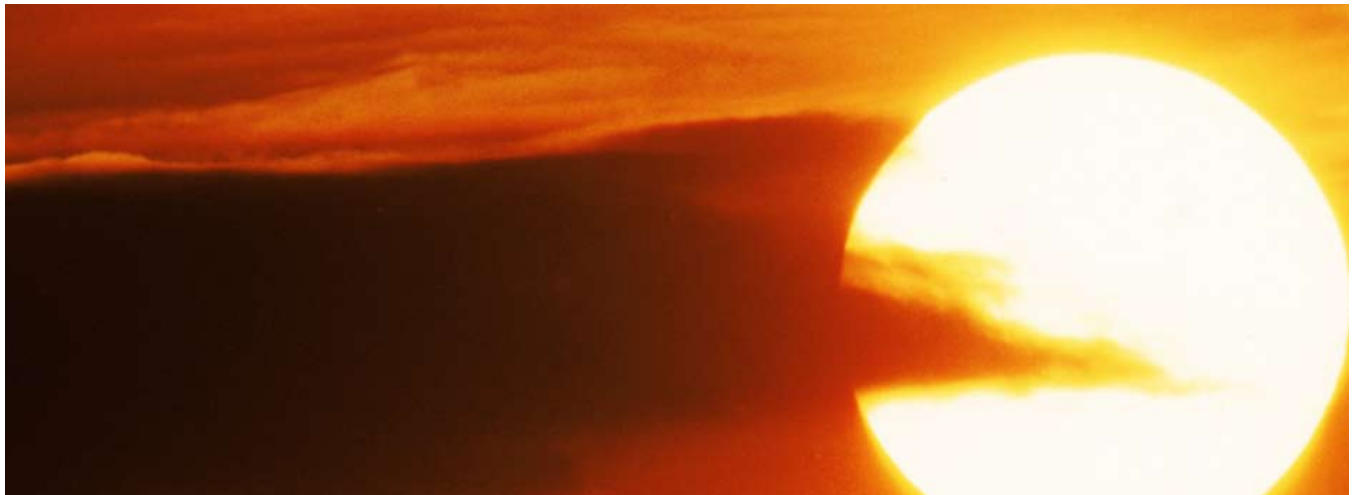
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Executive Summary



This report is in the main deliverable of a technical assistance project to research the international policy and market response to global warming – both present and likely future development – and the challenges and opportunities that climate change issues present for the Caribbean tourism sector. Focus is on the 15 CARIFORUM countries: Antigua & Barbuda, Bahamas, Barbados, Belize, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, St. Kitts & Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago. However, given the CTO's membership of 32 countries, including the full and associate members of CARICOM, it is expected that the report's results will also be relevant for CTO members in general.

The Caribbean has been called the most tourism-dependent region in the world (Tewarie 1997), and tourism in the Caribbean is estimated to be the single largest sector in terms of its contribution to GDP (14.8%) and employment (15.5%) (World Travel and Tourism Council 2004). CTO member countries make up only 1 percent of the world's population but attract 3 percent of global tourism arrivals and expenditure. According to the Caribbean Tourism Organization, the Caribbean received 22.5 million stay-over arrivals, 19.8 million cruise passenger visits and about US\$21.5 billion in expenditure in 2005 (CTO 2007). These figures highlight the importance of tourism for job generation, socio-economic development and opportunities for millions of people to relax, recover and explore what could be considered to comprise some of the most beautiful holiday locations in the world.

The Intergovernmental Panel on Climate Change (IPCC a, b, c) concluded that most of the observed increase in global temperatures since the mid-20th century is *very likely* (> 90% probability) due to the observed increase in anthropogenic greenhouse gas (GHG) concentrations, resulting mainly from land use change (principally deforestation) and fossil fuel consumption. The IPCC also projects that the pace of climate change is *very likely* to accelerate with continued GHG emissions at or above current rates, with the best estimate that globally averaged surface temperatures will increase by 1.8°C to 4.0°C by the end of the 21st century.

The environmental and economic risks of the magnitude of climate change projected for the 21st century are considerable. The Stern Review on the Economics of Climate Change (2006) stated that unmitigated climate change could risk major economic and social disruption later in this century (i.e., a reduction in consumption per capita of 20% later in the 21st century or early 22nd century) and that tackling climate change was a pro-economic growth strategy, with the benefits of strong, early action considerably outweighing the costs of inaction.

Executive Summary

In the Caribbean, climate change may have a wide range of consequences detrimental to the tourism industry, including:

- Greater hurricane intensity and possibly frequency, which would result in damage or loss of infrastructure, increased insurance costs or even lost insurability, business disruption and evacuation costs, as well as a negative image of the region as a safe destination
- Sea level rises, which would increase the vulnerability of tourism facilities in coastal areas (beaches, yachting marinas and cruise ship piers, a large percentage of accommodations, heritage attractions)
- Salt water intrusion into fresh water aquifers, with the Bahamas being identified as the world's most vulnerable nation to sea level rise by percentage of land area lost (Dasgupta et al. 2007)
- Temperature changes, resulting in warmer winters in northern markets and warmer summers in the region, affecting seasonal demand
- Changing precipitation patterns, leading to reduced water supply
- Increased sea surface temperatures causing coral reef bleaching and mortality (IUCN 2008)

In the light of these potential developments arising from a changing climate, it is clear that the Caribbean should support general climate policy aiming at a reduction of greenhouse gasses in industrialized countries. However, in addition to the direct impacts of climate change on the region, the global implementation of climate change policies will also impact on tourism, and in particular aviation, both of which have recently been identified as an important source of greenhouse gas emissions. Any climate policy focusing on air travel may have implications for tourist arrivals in the region.

So far, only the European Union (EU) has included aviation in an Emission Trading System (ETS), to be accomplished by 2012, but similar developments may follow in other regions such as North America. If climate policy as currently envisaged by the EU is implemented, prices for air travel would increase fairly substantially by 2012 (US\$42.2 per tonne (t) of carbon dioxide (CO₂) emitted) to reach a price level of US\$72.3 per t of CO₂ by 2020. This would translate into an estimated decline in demand by 0.6% to 1.8% in the year 2012 relative to overall holiday costs. Given continued high growth in demand as currently observed in most countries in the Caribbean, continued net growth in arrivals would nevertheless appear likely despite EU climate policy in subsequent years.

While EU climate policy and similar policy implementation across important source markets may not affect demand for Caribbean holidays substantially in the medium-term future (i.e. in the next 10-15 years) the vulnerability of the region to climate change, compounded by volatile oil prices, highlights the need for stakeholders in the region to focus on the potential implications for tourism at an early stage. In a carbon-constrained world, the focus of destination planning and management will need to be on tourist profitability, rather than growth in arrivals more generally. There are now numerous tools to achieve "carbon smart" tourism, such as eco-efficiency, which offers opportunities to combine both economic and environmental perspectives (Gössling et al. 2005). Carbon offsetting also has potential for reducing emissions from tourism, but the means by which it is implemented is vitally important, specifically in relation to the choice of credible partners. The best standard for offsets is the United Nations Framework Convention on Climate Change (UNFCCC) verified Gold Standard Certified Emission Reductions (GS CERs), combining emission reductions and sustainable development. Projects should ideally be implemented within the Caribbean, offering tourists the opportunity to visit "their" project. This, in turn, would benefit the region's image as taking global leadership in sustainable tourism development.

Overall, it is clear that a major challenge lies ahead for destinations such as the Caribbean region that rely heavily on intense tourism products. Moving towards low-carbon tourism is an essential strategy to mitigate the effects of climate change and avoid the potential impacts of rising world market prices for oil, in order to be in a strong position to compete within a developing 'carbon aware' marketplace. In this way, the expectations of the international community to address climate change will be met, as well as the demands from stakeholders for a sustained response to potential declines in the growth of tourist numbers.

Climate change is a challenge not only for tourism and the environment, but it is a multi-dimensional problem posing challenges also for the economy, investment, international development, trade, livelihoods and security.

Recommendations:

- Inter-ministerial cooperation and cross-ministerial collaboration is required to assist in the fulfilment and meeting of the following recommendations.
- Caribbean states should embark on a proactive strategy to support the Kyoto-integration of aviation plus support voluntary carbon offsetting.
- The countries should review the energy use of their source markets in comparison with their cost-effectiveness to restructure their tourism economies with the overall goal of reducing energy use and thus the vulnerability to oil price volatility, climate policy, environmental awareness of tourists, and the consequences of unlimited climate change. Considering economic bottom lines, there are now many tools to achieve this goal. The overall goal should be to reduce the dependency on highly energy intense markets, while developing new products to increase average length of stay and revenues per tourist (i.e. begin to restructure markets to focus on 'low emissions, high economic yield' segments).
- The Caribbean should seek to become the world's first 'carbon neutral' tourism region, which would generate huge media attention and create a positive, environmental image for the region. Tourists are generally willing to support pro-climate measures, and there is thus considerable potential to co-finance energy-efficiency, renewable energy and adaptation measures with payments and donations by tourists. Ideally, projects should have multiple sustainability dimensions, such as offset provider Atmosfair's proposition of saltwater greenhouses providing locals and hotels with organic vegetables, resulting in lower emissions (imports), reducing dependency, and providing local jobs.
- Voluntary or 'opt-out' carbon offsetting of flights should be incorporated in packages as soon as possible (by 2009), possibly based on an incentive approach (i.e. tour operators would match payments made by tourists on a 1:1 basis) or as part of a national hotel or departure tax.
- The money collected from tourists should be re-invested in the region. Projects should focus on energy-efficiency and renewable energy, as well as adaptation to climate change, and tourists should be able to visit these. This will stimulate positive feedback, and tourists may be willing to make additional donations. Offset projects in the Caribbean should include livelihood enhancements as well as environmental protection and enhancement.
- In order to guarantee a high level of transparency and credibility, the region should seek to cooperate with a high-quality voluntary carbon offset provider offering GS CERs, i.e. all projects should be registered through UNFCCC and provide sustainable development benefits. Some offset providers such as not-for-profit Atmosfair offer comprehensive solutions, i.e. they can provide the emissions calculator,

debiting software for tour operators, advice on suitable and innovative projects, and carry out the certification process through UNFCCC.

- Governments should combine voluntary with mandatory measures to ensure that the tourism industry in the Caribbean supports these goals. Dodds and Kelman (2008) include the following aspects:
 - 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.
- 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 the national, regional and destination level. Pragmatic strategies should be developed in harmony with other regional initiatives such as the Sustainable Tourism Zone for the Caribbean currently being established by the member states of the Association of Caribbean States.
- 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 and evaluating resilience and adaptive capacity; and evaluating current and future adaptation and mitigation activities.
- The needs of destinations, nations and the region should be addressed as a whole by using a sectoral approach i.e. addressing tourism through its integral sectors; energy, water, waste, agriculture, biodiversity and coastal planning. Funding should be sought and provided for further robust studies to clarify priorities and specifics for the different levels of the tourism supply chain and for sub-sectors / different activities conducted as part of tourism in the Caribbean.
- Carbon emissions should be measured with transparency through the tourism supply chain and the use of low carbon technologies and renewable energy should be encouraged by the use of incentives and regulation. Efficiencies should be sought through economies of scale and business investment in low carbon infrastructure should also be encouraged

Foreword

The people of the Caribbean are coming to recognize that climate change is the single largest threat to the long-term sustainable development of our region. While our region is in no way a major contributor to green house gas emissions, having recognized the threat, we must find ways to not only adapt to the resulting impact of increasing temperatures in the short term, but also assist in accelerating the adoption of global policies and practices in developed and developing countries that will mitigate against exacerbating the global warming problem.



We have already begun to see the impacts of increasing temperatures on such assets as our beaches, corals and other marine life as well as terrestrial plant and animal life. It has also been predicted that climate change will bring an increased intensity of hurricanes and other natural hazards that will continue to affect our tourism infrastructure and the livelihoods of many communities in our member countries. In addition, an increasing number of our prospective visitors are demanding evidence of responsible tourism practices before including destinations in their consideration set. All of this means that there is an increasing convergence of good reasons why the Caribbean must deliver on these responsible practices.

This report identifies a number of critical issues that will impact the way in which our tourism businesses develop in the future. While representing a good resource for members new to the issues of climate change, the report offers useful projections, market information and possible opportunities for the Caribbean.

It is our hope that the public and private sector, in addition to civic organizations, will work together in an integrated manner so that the Caribbean adapts. Working together we can take advantage of the opportunities climate change presents and creatively seek to protect and make better use of our resources. You may be assured of the commitment of the Caribbean Tourism Organization to be a strong part of this effort.

A handwritten signature in dark ink, appearing to read 'V. Vanderpool-Wallace'.

Vincent Vanderpool-Wallace
Secretary General and Chief Executive Officer
Caribbean Tourism Organization

1.0 Introduction

1.1 Background

Compelling evidence indicates that the global climate has changed in comparison to the pre-industrial era, and continued change is anticipated over the 21st century and beyond. The fourth assessment of the United Nations Inter-governmental Panel on Climate Change (IPCC 2007a) concluded that there is *very high confidence* that the net effect of human activities on the global climate system since 1750 has been one of warming and that most of the observed increase in global temperatures since the mid-20th century is *very likely* (> 90% probability) due to the observed increase in anthropogenic greenhouse gas (GHG) concentrations. These changes result mainly from land use change (principally deforestation) and fossil fuel consumption. Discernible human influences extend beyond an increase in average global temperatures to other aspects of climate and related environmental systems, including: sea temperature rise, sea level rise, changes in storm tracks, greater temperature extremes, and drought and heavy precipitation events.

The Intergovernmental Panel on Climate Change (IPCCa) has projected that the pace of climate change is '*very likely*' (> 90% probability) to accelerate with continued GHG emissions at or above current rates, with the best estimate that globally averaged surface temperatures will rise by 1.8°C to 4.0°C by the end of the 21st century. Even if atmospheric concentrations of GHGs were stabilized at current levels, the Earth would continue to warm as a result of past GHG emissions and the thermal inertia of the oceans. The biological response to this continued warming and sea level rise would continue for several centuries.

The environmental and economic risks of the magnitude of climate change projected for the 21st century are considerable and have featured prominently in recent international policy debates, including the 13th Conference of the Parties (COP) in Bali, Indonesia in December 2007. The IPCC reports conclude with very high confidence that climate change would impede the ability of many nations to achieve sustainable development by mid-century. The Stern Review on the Economics of Climate Change (2006) found that unmitigated climate change could risk major economic and social disruption later in this century (i.e., a reduction in consumption per capita of 20% later in the 21st century or early 22nd century) and that tackling climate change was a pro-economic growth strategy, with the benefits of strong, early action considerably outweighing the costs of inaction. Climate change is increasingly considered an international security risk that will steadily intensify, particularly under greater warming scenarios (German Advisory Council on Global Change 2007, Feakin 2005, Brown et al. 2007, Catarious et al. 2007, Campbell et al. 2007, Podesta and Ogden 2008).

Responding to the findings of the Fourth Assessment Report of the IPCC, the Bali Action Plan negotiated by 180 nations at COP-13, recognized that deep cuts in global GHG emissions are urgently required if the risks of more severe climate change impacts are to be avoided and that a delay in reducing emissions would significantly constrain opportunities to achieve the required lower stabilization levels.

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. The integrated effects of climate change will have far-reaching consequences for tourism businesses and destinations. Indeed, climate change is not a remote future event for tourism, as the varied impacts of a changing climate are becoming evident at destinations around the world and climate change is already influencing decision-making in the tourism sector (UNWTO - UNEP - WMO 2008).

At the same time, the tourism sector is a non-negligible contributor to climate change and is anticipated to grow rapidly over the next 30 years under 'business as usual' conditions. International and domestic tourism emissions from three main sub-sectors are estimated to represent between 4.0% and 6.0% of global emissions in 2005, with a best estimate of 5.0% (Table 1) (UNWTO – UNEP – WMO 2008). Transport generated the largest proportion of CO₂ emissions (75%) from global tourism, with approximately 40% of the total being caused by air transport alone. In case of the 'business as usual' scenario, which takes into account the UNWTO forecast of a 4% annual growth of international tourist arrivals, it was estimated that CO₂ emissions in the global tourism sector could grow by 152% by 2035.

Table 1: Emissions from Global Tourism in 2005

	CO ₂ (Mt)
Air transport	517
Other transport	468
Accommodation	274
Activities	45
TOTAL	1,307
Total World	26,400
Global Share (%)	5.0

Source: UNWTO - UNEP - WMO 2008

The *Davos Declaration* (2007) emerged from the UNWTO-led conference on tourism and climate change (Davos, Switzerland – October 2007) and concluded that tourism must seek to significantly reduce its GHG emissions in accordance with the international community, which at the Vienna Climate Change Talks 2007 recognized that global emissions of GHG need to peak in the next 10-15 years and then be reduced to very low levels, well below half the 2000 levels by mid-century. With respect to GHG emission reductions, the *Davos Declaration* recommended the following:

- Governments and International Organisations - Incorporate tourism in the implementation of existing commitments under the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol, and respond to the call by the United Nations Secretary-General for launching ... an effective and comprehensive climate change framework for the post-2012 period.
- Tourism Industry and Destinations - Take leadership in implementing concrete measures (such as incentives) in order to mitigate climate change throughout the tourism value chain and ... establish targets and indicators to monitor progress.
- Consumers - In their choices for travel and destination, tourists should be encouraged to consider the climate, economic, societal and environmental impacts of their options before making a decision and, where possible to reduce their carbon footprint, or offset emissions that cannot be reduced directly.

The Davos Declaration also recognizes the special place of tourism in the economies of many developing nations and that tourism cannot address the challenge of climate change in isolation, but must do so within the context of the broader international sustainable development agenda. The critical challenge before the global tourism sector

is to develop a coherent policy strategy that decouples the projected massive growth in tourism in the decades ahead from increased energy use and GHG emissions, so as to allow tourism growth to simultaneously contribute to poverty alleviation and play a major role in achieving the United Nations Millennium Development Goals (MDG). The recommendations of the *Davos Declaration* were strongly endorsed at Tourism Ministers Summit on Climate Change (London 2007) and 17th UNWTO General Assembly (Cartagena, Colombia 2007).

National or international mitigation policies that seek to reduce GHG emissions are anticipated to have an impact on tourist flows. Mitigation policies are expected to result in 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:

- "What is the real price of cheap air travel?" *The Observer*, January 29 2006
- "'It's a sin to fly,' says church" *The Sunday Times*, 23 July 2006
- "Flugreisen als Klima-Killer" *Abendblatt*, 6 July 2004
- "Flight or fright?" *The Listener*, March 3-9 2007
- "Climate conscious may ditch air travel." *New Zealand TV One*, 9 April, 2007
- "100% Pure not enough for green future" *Stuff.co.nz*, 17 May 2007
- "The plane truth" *Guardian Unlimited*, 20 July 2007
- "Eco-friendly flyers buy carbon offsets" *The Calgary Herald*, 1 August 2007

Concerns about the impact of mitigation policies and 'anti-travel' sentiments in Europe and other mitigation policies have been expressed by several nations with a high proportion of long-haul tourism, including Australia, New Zealand, and a several Asian and Caribbean nations (e.g. Boyd 2007, Caribbean Hotel Association and Caribbean Tourism Organization 2007). The Caribbean Hotel Association and Caribbean Tourism Organization (2007), while supporting initiatives to achieve the necessary reductions in GHG emissions to reduce the negative impacts on the climate system, propose that '*every effort must be made to ensure that future consumer movements and government action in the EU to address climate change ... do not deter potential European travellers from taking vacations in the Caribbean,*' as this could jeopardize the sustainable livelihood of a large proportion of the region's population. The UNWTO supports this approach to emission reductions from air travel, indicating that aircraft emissions should be addressed on the basis of 'Contraction and Convergence', with preferential treatment for air services supporting the development of tourism in developing countries, but with a view on "responsible growth":

"Tourism is one of the main services exports with a strong comparative advantage in the world's poorest and emerging countries. These are markets that are growing at twice the rate of industrialized countries. At the same time our product is tied to climate and like other sectors we are greenhouse gas contributors. Responsible growth patterns must now address economic, social, environmental and climate sustainability." (UNWTO 2008: no page)

The regional manifestations of climate change and climate mitigation policies will generate both negative and positive impacts in the tourism sector and these impacts will vary substantially by market segment and geographic region. The recent report published by the United Nations World Tourism Organization (UNWTO), United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) identified the Caribbean as one of the world's destination vulnerability hotspots, due to the vital importance of tourism to the regional economy, the clustering of anticipated impacts in the region, and the relative adaptive capacity of nations in the

region (UNWTO-UNEP-WMO 2008). Tourism in the Caribbean is estimated to be the single largest sector in terms of its contribution to GDP (14.8%) and employment (15.5%) (World Travel and Tourism Council, 2004). In 2006, CTO statistics report the Caribbean had 22.2 million arrivals, 19.2 million cruise passenger visits and over US\$21 billion in tourist expenditures (CTO, 2007). Some of the key challenges climate change poses to this key economic sector include (UNWTO - UNEP - WMO 2008):

- Increases in hurricane intensity and possibly frequency – damage to or loss of infrastructure, increased insurance costs or loss of insurability, business disruption and evacuation costs, negative images of region as a safe destination;
- Sea level rise – vulnerability of tourism facilities in coastal areas (beaches, yachting marinas and cruise ship piers, a large percentage of accommodations, heritage attractions), salt water intrusion into fresh water aquifers (e.g. a World Bank study identified the Bahamas as the most vulnerable nation to sea level rise by percentage of land area lost – Dasgupta et al. 2007);
- Temperature changes – warmer winters in northern markets and warmer summers in the region may affect seasonal demand;
- Precipitation patterns – reduced water supply on some islands;
- Sea surface temperatures – coral reef bleaching and mortality (e.g. an in-depth analysis of the 2005 widespread bleaching in the Caribbean projected this magnitude of damage to become much more frequent by the 2030s and to occur annually by the end of the century under moderate to high warming scenarios – IUCN 2008);
- Mitigation policies – increases in travel costs and reduced mobility or tourist demand from key market regions (Europe, North America).

1.2 Objectives, Scope and Methodology

After careful consideration of this background, the Caribbean Regional Sustainable Tourism Development Programme (CRSTDP) and CTO launched a consultancy to review the consequences of climate change for tourism in the Caribbean, considering both the consequences of climate change for destinations, as well as tourism's contribution to climate change due to emissions of greenhouse gasses. Furthermore, the consultancy considered how the international market and policy response to climate change will affect tourist arrivals in the Caribbean, and which measures can be taken to re-structure the region towards 'carbon smart' tourism.

The Terms of Reference for the consultancy state that the geographic scope of the study is the 32 CTO member states in the Caribbean; however, due to the conditions attached to the application of the European Development Fund, only ACP countries in the region could be visited. Nonetheless the aim has been to create a reference document that is valid and of use to tourism stakeholders from across the region.

The Terms of Reference further state that the report should "address the status of the response to climate change in the Caribbean in terms of the actions implemented by the region's travel and tourism sector, as well as national and regional governments and intermediary organisations, to meet the need to address climate change issues". The consultants have taken a broad view of travel and tourism, and the Situational Analysis in Phase 1 (see below) therefore included a review of the climate change aspects of the full tourism value chain. However, it soon became clear that research and policy processes have been focused on certain key areas, whilst in other areas information is harder to obtain. Bearing in mind the short time span of this project, and the resources allocated for its execution, the consultants thus defined the scope of the project to cover those areas in which research and policy were

concentrated. Cruise tourism was thus excluded due to a significant lack of verified information on this topic, though the preliminary research located suggests that cruise tourism contributes more to global warming than aviation in terms of emissions per passenger per unit of distance, and therefore can not be seen as a more carbon neutral transport mode than aviation.

The duration of the assignment was three person months and the research was undertaken between December 2007 and March 2008. The methodology was comprised of the following:

a) Situational Analysis

This activity comprised a stocktaking of the existing, planned and likely direction of policy responses to global warming and climate change. The analysis focused on four different types of policy instrument: command and control instruments, economic instruments, voluntary instruments and relevant supporting instruments, and how they are being used to tackle global warming. The Situational Analysis also looked at the response from the international tourism sector in order to identify good practices, for example the steps taken by international airlines to absorb technologies that can reduce the environmental aspects of their activities. The outputs from the Situational Analysis are presented in section 2 of this report.

b) Stakeholder Analysis

A matrix of the main stakeholders of climate change issues, both internationally and in the region, was developed and used to plan a circular mission to the region, which was implemented in a two-week period in January 2008. Interviews were conducted with senior representatives of the Caribbean Community Climate Change Centre (CCCCC) in Belize, CARICOM in Guyana, Organisation of Eastern Caribbean States (OECS) in St. Lucia and Association of Caribbean States (ACS) in Trinidad and Tobago, as well as National Tourism Organisations and other stakeholders in those countries. The main aim of this activity was to gather empirical information on the challenges and opportunities that climate change presents for the Caribbean tourism sector and the findings are presented in section 3 of this report.

c) Inventory of Caribbean Initiatives to Reduce the Carbon Footprint of Tourism

Research was conducted on the initiatives that are taking place on the ground in the Caribbean to mitigate the carbon footprint of the tourism sector, and to identify likely areas that could benefit from regional offset schemes in the future. The initiatives identified are presented in section 4 of this report and include energy efficiency projects, linkage projects facilitating the uptake of nationally produced materials in the tourism sector, and the use of renewable energy sources by the tourism sector.

d) Analysis of Results

The findings from activities A – C were analysed and a series of recommendations developed for how the Caribbean member states and their tourism sectors can best seek to address the challenges and opportunities offered by the climate change response in an innovative manner. The overall conclusions and recommendations are presented in section 5 of this report.

e) Reporting and Dissemination of Results

The Government of the Bahamas, under the auspices of the Ministry of Tourism and Aviation, hosted a regional workshop to present the consultancy findings and results. This two day event took place on 18-19 March at the Wyndham Nassau Resort and was attended by approximately 60 delegates from Jamaica, Bahamas, Antigua and Barbuda, Cayman Islands, St. Vincent and the Grenadines, St. Kitts and Nevis, Dominica and Grenada, representing a wide range of public and private sector organisations. In addition, the Association of Caribbean States, the Organisation of Eastern Caribbean States and the Caribbean Community Centre for Climate Change participated. The presentations are available for download at www.onecaribbean.org. This report comprises the final component of the reporting and dissemination activity and has been translated and printed in English, French and Spanish versions.

2.0 Situational Analysis

2.1 Aviation, tourism and climate

Aviation has been identified as a significant and rapidly growing contributor of emissions of greenhouse gases (IPCC 1999, Sausen et al. 2005), and there is increasing concern of how emissions from this sector can be addressed in accordance with recognized needs for substantial global emission reductions (IPCC 2007a,b,c). Although aviation is often identified as being responsible for 2% of global CO₂ emissions or 3.5% of total radiative forcing, these estimates are based on the IPCC Special Report on Aviation and the Global Atmosphere (IPCC 1999), which was published in 1999 and based on 1992 data. Consequently, these estimates are 16 years old and so do not account for the rapid growth in the aviation sector since then, nor that emissions in some other sectors have stabilized or declined. One estimate puts the growth in CO₂ emission from international aviation between 1990 (the baseline year of the Kyoto Protocol) and 2005 at 83% (European Federation for Transport and Environment 2006). While global CO₂ emissions from aviation may appear negligible, the share of aviation emissions is considerably higher in industrialized countries, where the sector accounts for up to 11% of emissions of CO₂ in some nations (see Box 1 for the case of Sweden).

Aviation includes passenger- and freight transports, as well as military flights. The focus of this report is on passenger-, i.e. tourism transport, which accounts for the largest share of overall emissions from aviation. Excluding military flights (12.2%) and freight (19.5%), passenger transport is estimated to account for approximately 68% of all emissions associated with aviation (UNWTO - UNEP - WMO 2008). The share of passenger air travel corresponds to an estimated 2% of global CO₂ emissions and is considerably higher if aviation's contribution to global warming is measured as radiative forcing (i.e. includes the effect of non-carbon GHG as well - Sausen et al. 2005, UNWTO - UNEP - WMO 2008). Within Europe, GHG emissions from tourism-related aviation were estimated to account for 7% of all emissions in 2000 and are projected to increase to 15% by 2020 (Peeters et al. 2004).

Box 1: Emissions from Tourism: The Case of Sweden

Few studies have attempted to measure emissions from tourism on a national level, to include transport, accommodation and tourist activities. One recent study of tourism in Sweden (Gössling and Hall 2008) concluded that aviation is a major contributor to emissions, accounting for 33% of all CO₂ emissions from the sector. Emissions from aviation are higher than the global average, both in relative terms, i.e. as a share of national emissions, as well as in absolute terms, i.e. if calculated on a per capita basis. In 2005, fuel use by domestic and international aviation (the latter calculated as fuel bunkered in Sweden) was more than 2.5 Mega tonnes (Mt) CO₂, corresponding to about 4.8% of national emissions. Tourism-related emissions, i.e. excluding emissions from freight and military flights, were calculated at 1.9 Mt CO₂, corresponding to about 3.6% of national emissions of CO₂. Note that aviation's contribution to national emissions of greenhouse gases is far higher if calculated as radiative forcing or if travel-related emissions by Swedish citizens in other countries are included as well (cf. Åkerman and Höyer 2006). In the future, the share of aviation in national emissions can be expected to grow, as Sweden seeks to establish additional air connections in order to increase tourist flows into Sweden, while long-distance outbound travel has also seen substantial growth in recent years.

Source: Gössling and Hall 2008

The aviation sector is recognized as one of the most rapidly growing GHG emission sources and could be amongst the fastest growing in absolute terms by 2050. Aviation emissions have doubled since 1990 and are estimated by the International Civil Aviation Organization (ICAO 2007) to be increasing at 3.5 percent annually. Aviation GHG emissions in the EU have increased 87% from 1990 to 2004, and it is expected that they will double in the period 2005-2020 (Commission of the European Communities 2006). In Canada, aviation GHG emissions grew 35% between 1990 and 2005. Based on industry growth forecasts, the contribution of air travel to global emissions is expected to increase substantially in the next 25 years, despite projected increases in fuel efficiency. Depending on growth rates of air travel (3 to 5% annually), emissions from international air travel would represent between 22 and 67% of the CO₂ emissions from the UK in 2050, in a situation where all other sectors reduce greenhouse gas emissions (Lee et al. 2005).

Figure 1 illustrates how this potential growth in aviation emissions, even with fuel efficiency gains anticipated by the aviation sector, contrasts with long-range targets of economy-wide GHG emission reductions in the EU (80% reduction by 2050 to restrict global surface warming to 2°C compared to pre-industrial temperatures - European Commission 1996). If aircraft emissions continue to grow at rates currently observed, and then at more moderate rates, aviation alone may exceed the EU's 2050 carbon emissions target. If radiative forcing by other greenhouse gases is included this may occur even before 2050 (cf. Bows et al. 2006a, b). The upper line in Figure 1 shows the contracting carbon emissions total for the EU economy as a whole, for a 550 parts per million volume (ppmv) scenario; the middle line shows the contracting carbon emissions total for the EU as a whole, for a 450 ppmv scenario; the rising dashed line shows EU aircraft CO₂ emissions (not including radiative forcing of other greenhouse gasses), under a business as usual scenario that accounts for anticipated efficiencies and the moderation of air traffic growth rates from 2015 onwards.

Contraction and Convergence Comparison with Aviation Forecast for EU 25 Nations

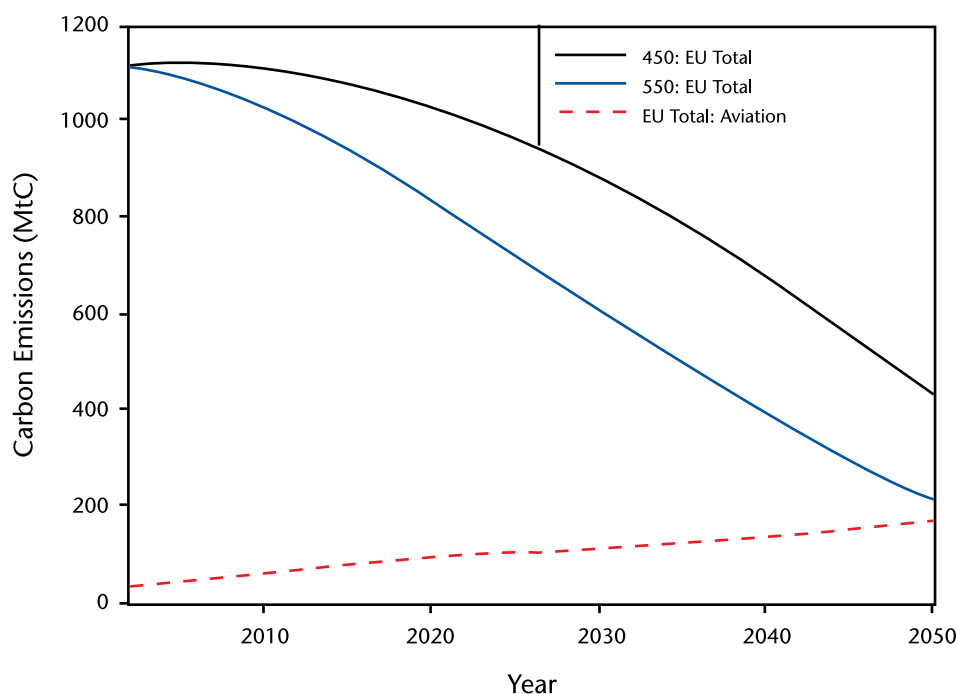


Figure 1: Reduction Needs in Emissions for EU25 Compared with Aviation

Source: Bows et al. 2006b

Situational Analysis

As a result of the apparent strong contrast between trends in aviation emissions and the desired emissions trajectory of the international community, several governments have moved to address emissions from aviation through targeted legislation. As yet, aviation is not included under international GHG targets or carbon trading schemes, as the Kyoto-Protocol does not consider emissions from aviation; this situation has not changed with regard to post-Kyoto negotiations in Bali in December 2007. However, some regions will include aviation in their emission trading schemes. For instance, the EU has on principle agreed to include aviation in the European Union Emission Trading Scheme by 2012. This will have a wide range of consequences for aviation, even though it is not as yet clear how air travellers in general, or the main travel segments (business and leisure tourism) will be affected.

Control and command policies are, however, not the only aspect that could affect air travel. Recent increases in oil prices have also caused operational costs of airlines to sharply increase. High energy -intensity translates directly into high energy costs, as has already been experienced in 2007, when airlines added fuel price additions to journey package prices and air fares. This situation can be expected to continue even in 2008, as for instance some tour operators have already announced that there will be price increases for travellers booking and paying trips after December 2007. Increasing ticket prices can affect demand, particularly in destinations seeking to address a moderate-price mass-market, even though it is likely that only considerable increases in prices will affect demand measurably. There are currently no signs that global energy costs will decline; in addition, the European Union discussions concerning the allocation of emission unit allowances will affect the price structures set by airlines. At this time, the structure and implications of these mechanisms are not clear and so it is difficult to say how demand will be affected. However, some preliminary conclusions are drawn in this report, based on a number of assumptions of how aviation is most likely to be affected.

While price-sensitive travellers may react to changing price structures, there is also a trend towards greater environmental awareness among air travellers. An increasing number of tourists are now willing to pay premiums to offset their emissions through voluntary carbon offsetting schemes, i.e. the reduction of an equal amount of emissions as released through the flight in alternative projects (e.g. renewable energy, energy efficiency). This is also reflected in the number of carbon offset providers, which has grown rapidly in recent years. Given that voluntary action can make a substantial contribution to reduce the environmental impact of aviation, this report also provides an overview and critical discussion of the voluntary offset market.

Overall, it is clear that a major challenge lies ahead for destinations that rely heavily on energy-intense tourism products. Moving towards low-carbon tourism is an essential strategy to avoid the potential impacts of rising world market prices for oil, to be correctly positioned to compete in an increasingly 'carbon aware' marketplace, and meet the expectations of the international community to address climate change.

2.2 Command and control measures

2.2.1 International and national policies affecting aviation

Command and control measures to regulate growth of GHG emissions in the aviation sector can be established internationally, for instance through the Kyoto-Protocol, and nationally, for instance through taxes on emissions. Internationally, the Kyoto-Protocol is the most relevant agreement regulating GHG emissions, even though aviation is not as yet included, nor was aviation the topic of post-Kyoto emission reduction negotiations in Bali, Indonesia, in December 2007. Emissions from international aviation are not currently accounted for by any nation, even though countries reporting to the UNFCCC are asked to provide estimates of aviation bunker fuels for international aviation. Emissions from national aviation, on the other hand, are included in national GHG inventories, even though these are usually small in comparison to those of international aviation, at least in the case of small countries (Gössling and Hall 2008).

As mentioned, international aviation emissions are currently excluded from Kyoto Protocol targets. Instead Article 2 of the Kyoto Protocol states that the responsibility for limiting and reducing GHG emissions from international aviation in Annex 1 nations is the responsibility of the International Civil Aviation Organization (ICAO). Member states have endorsed very different approaches to reducing emissions. The ICAO annual assembly in 2004 dismissed the idea of establishing a global ETS for aviation itself or establishing a separate organisation to do so, but endorsed the inclusion of aviation in existing national/regional ETS as more cost effective than fuel taxes or charges on aviation activity. However, in October 2007, the annual assembly of ICAO decided against requiring airlines to limit GHG emissions through participation in the European ETS, effectively rejecting their earlier decision. Instead, ICAO created a panel to develop a comprehensive climate change plan for the international aviation industry. The 42 countries in the European group of ICAO strongly disagreed with the decision by making a 'reservation' against the resolution, indicating that these member states may chose to ignore the resolution on legal grounds that it compromises the EU's capacity to achieve its international GHG emission obligations under the Kyoto Protocol.

The European Union is currently the only economic region in the world with a comprehensive regulatory system to address GHG emissions, even though similar mechanisms exist in the form of the Chicago Climate Exchange in North America, which is voluntary to join, but legally binding on the companies that do join. The regulatory framework in North America is evolving as many states and provinces had established GHG targets in recent years (Table 2) and are proposing new legislation to meet these targets.

Table 2: State and Provincial GHG Reduction Targets

State/Province	GHG Targets
Alberta	50% reduction in emissions <u>intensity</u> below 1990 by 2020 (equivalent to a 20-35% increase in absolute emissions relative to 1990 levels)
British Columbia	10% below 1990 by 2020 - Commitment to develop 2050 targets
New Brunswick	1990 levels by 2012 10% below 1990 by 2020

Situational Analysis

State/Province	GHG Targets
Ontario	• 6% below 1990 by 2014 • 15% below 1990 by 2020 • 80% below 1990 by 2050
Québec	• 6% below 1990 by 2012
Saskatchewan	• Stabilize absolute level of GHG emissions by 2010 • 32% below 2006 by 2020 • 80% below 2006 by 2050
Arizona	• 2000 levels by 2020 • 50% below 2000 by 2040
California	• 1990 levels 2020 • 80% below 1990 by 2050
Connecticut	• 75% reduction by 2050
New Jersey	• 3.5% below 1990 by 2005
New Mexico	• 2000 levels by 2012 • 10% below 2000 by 2020 • 75% below by 2050
New York	• 5% below 1990 by 2010 • 10% below 1990 by 2020
Oregon	• 10% below 1990 by 2020 • At least 75% below 1990 by 2050
Vermont	• 25% below 1990 by 2012 • 50% below 1990 by 2028 • 75% below 1990 2050

EU Emissions Trading Scheme

The EU Emissions Trading Scheme constitutes the largest multi-country, multi-sector carbon emission trading scheme in the world. The European Union is also the only economic region in the world where there are plans to include emissions from international aviation in emission reduction scenarios. The European Commission (EC) has for several years had plans to include emissions from all aircraft departing EU airports, i.e. including intra-EU as well as all other flights, in the EU Emissions Trading System. In November 2007, the EU parliament opted to include national and international aviation in the European Union into the EU ETS by 2011 (EU Parliament 2007). The current amendments of the European Parliament legislative resolution of 13 November 2007 on the proposal for a directive of the European Parliament and of the Council amending Directive 2003/87/EC so as to include aviation activities in the EU ETS, also provide evidence that there will be a cap on emissions from aviation in the order of 90% of average emissions over the period 2004-2006. The decision will be taken in 2008, with the EU Commission, Parliament and Council taking different positions, indicating that the cap for 2012 will be in the range of 90-100% of average annual emissions of the period 2004-2006, with 10-25% of allowances to be auctioned (João Vieira 2008, Transport & Environment, personal communication). As the current EC proposal for the ETS review calls all sectors to cut emissions by 21% compared to 2005 levels by 2020, it can be assumed that emissions from aviation will have to decline in a similar way. Given the observed strong growth in aviation emissions, the gap in between

the caps likely to be set for 2012 and 2020 and a business-as-usual growth scenario will be substantial. Aviation in the European Union has grown substantially since 1990, with projected growth by >100% in the period 2005-2020 (Commission of the European Communities 2006), which can be compared to the caps for 2012 and 2020 (Figure 2)

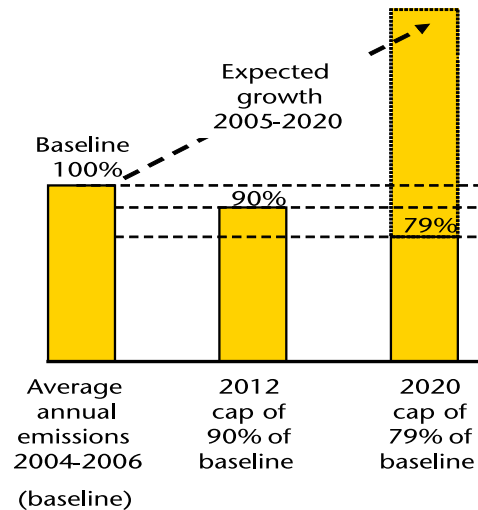


Figure 2: EU Aviation Growth Scenario and Emission Caps 2012 and 2020

Source: Gössling et al. 2008a

The situation is further complicated with regard to trading mechanisms. First of all, the EU Parliament (2007) suggests that emissions from aviation be treated differently than those from surface-bound traffic, due to the additional contribution of nitrogen oxides to global warming. Effectively, this is likely to imply that every ton of CO₂ emitted over and above allocated levels will be multiplied by a factor of 2. For net emissions exceeding allocated levels, the aviation sector will thus have to buy two times the amount of CO₂ emissions in permits, i.e. allowances from other sectors, or reductions achieved through Clean Development Mechanism or Joint Implementation.

More specifically, the European Union plans to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community, provide evidence of how aviation is going to be affected. Excerpts will be presented in the following to highlight the most important issues. First of all, the EU Parliament suggests in its Amendment 1 that international aviation will be included in an open emissions trading system:

While the Community is not a contracting Party to the 1944 Chicago Convention, all Member States are contracting Parties to that Convention and members of ICAO, and continue to support work on the development of market-based instruments working with other states at global level. At the sixth meeting of the ICAO Committee on Aviation Environmental Protection in 2004, it was agreed that an aviation-specific emissions trading system based on a new legal instrument under ICAO auspices seemed sufficiently unattractive that it should not be pursued further. Consequently, Resolution 35-5 of the ICAO Assembly does not propose a new legal instrument but instead endorses "the further development of an open emissions trading system for international aviation" and the possibility for States to incorporate emissions from international aviation into their emissions trading schemes.

(EU Parliament 2007, Amendment 1, Recital 5)

Consequently, the European Union suggests that this will take place in 2011 for all flights. In this context it is worth noting that the International Civil Aviation Organization (ICAO) has not been favourable of a separate emissions trading scheme for aviation, and has asked for incorporating international aviation emissions into national greenhouse gas inventories, with emissions trading being open with other economic sectors, which has now effectively been accepted by the EU. An open emission trading system is generally accepted by EU airlines and considered preferable to taxes or other levies, even though there has been substantial lobbying to avoid some of the following cornerstones of the planned integration of the aviation sector in the EU ETS.

From 2011, emissions from all flights arriving at and departing from Community airports should be included. If a third country adopts measures for reducing the climate impact of flights to a Community airport departing from that country which are at least equivalent to the requirements of this Directive, the scope of the Community scheme should be amended to exclude *the* flights from that country. Climate change is a global phenomenon which requires global solutions. The Community considers this Directive as an important first step. Non-EU parties are invited to contribute with their ideas to the debate so as to develop this policy instrument further. To make the voice of third parties heard, the Commission should be in permanent contact with them, both prior to and during the implementation of this Directive. If the European Union agrees with a third party on a common scheme which has at least the same positive effects for the environment as the Directive, the Commission may propose an amendment of the Directive. In any case the Commission may propose that incoming flights from third countries not be covered by the scheme if the third country has in place a system which has at least the same environmental benefit as this Directive. (EU Parliament 2007, Amendments 64, 71, 9; Recital 11).

However, it is important to note that emissions from aviation will be treated differently than those from surface-bound traffic, due to the additional contribution of in particular nitrogen oxides and water vapour to global warming. Effectively, that will imply that every tonne of CO₂ emitted will be multiplied by a factor 2, i.e. doubling CO₂ emissions from aviation as relevant under the Kyoto-Protocol:

Aviation has an impact on the global climate through releases of carbon dioxide, nitrogen oxides, water vapour and sulphate and soot particles. The Intergovernmental Panel on Climate Change has estimated that the total impact of aviation currently is two to four times higher than the effect of its past carbon dioxide emissions alone. Recent Community research indicates that the total impact of aviation could be around two times higher than the impact of carbon dioxide alone. However, none of these estimates takes into account the highly uncertain cirrus cloud effects. In accordance with Article 174(2) of the Treaty, Community environment policy must be based on the precautionary principle and therefore all impacts of aviation should be addressed to the extent possible. Air traffic management authorities should apply effective measures in order to avoid the formation of contrails and cirrus clouds through changes in flight patterns, namely by ensuring that flights will avoid passing through areas where due to specific atmospheric conditions the formation of such clouds is foreseen. In addition, they should strongly promote research on the formation of contrails and cirrus clouds including effective mitigation measures (e.g. fuel, engines, air traffic management) that do not adversely affect other environmental goals. Pending other legislation to be proposed by the Commission focusing specifically on the problem of nitrogen oxide emissions in aviation, a multiplier should be applied to every tonne of CO₂ emitted. (EU Parliament, Amendments 10 & 65, Recital 12).

Furthermore, the EU will set a cap at 70-80% of 1990 emissions by 2020. As the sector has grown substantially since 1990, this means that emissions reductions that have to be achieved by 2020 are considerably higher (a reduction of 20-30%) over current levels.

Despite the fact that it is difficult for aircraft operators to switch to alternative (renewable) energy sources, the aviation sector must still achieve a considerable emissions reduction that is in line with the overall EU reduction target of 20 to 30 % compared to 1990 levels. For each commitment period under the Community's scheme in which aviation is to be included, depending on the reference period used for aviation in that commitment period, the target for aviation should be set on the basis of the average efforts required of all the other fixed-source sectors in all the Member States

(EU Parliament 2007, Amendment 13, Recital 13A).

As for Emission Unit Allowances (EUAs), the aviation sector will be able to cover 90% of its emissions during previous years, which will probably be based on a period, i.e. 2004-2006, rather than one year only. For the remainder, the sector will have to buy emission reduction units through own reductions, or reductions achieved through the Clean Development Mechanism or Joint Implementation (see below). However, it is important to note that it is as yet unclear how emissions will be allocated. There are no less than 10 different options as currently discussed within the EU (Ruth, personal communication), as a national bunker fuel approach (considering fuel bunkered in a given country) is not accepted by countries currently serving as hubs. For instance, both in The Netherlands (Schiphol, Amsterdam) or in France (Charles-de-Gaulle, Paris) major airports serve as communication knots for long-distance flights, i.e. most fuel is bunkered here, even though passengers may largely be foreigners.

The total quantity of allowances to be allocated to aircraft operators shall be equivalent to 90% of the sum of the historical aviation emissions in relation to each year. [...] Depending on the choice for a post-2012 carbon dioxide reduction target of either 30% or 20% with 1990 as a base year, the Commission shall reduce the total quantity of allowances to be allocated to aircraft operators in the further periods under Article 11(2) in accordance with the regulatory procedure with scrutiny referred to in Article 23(2a). This downward review will provide a mechanism to ensure that the environmental effectiveness of the scheme is maintained. There shall be provision for subsequent downward reviews of the total quantity of allowances allocated.

(EU Parliament 2007, Amendments 61 & 24, ARTICLE 1, POINT 3Article 3b, paragraphs 1 to 3 (Directive 2003/87/EC)

In this context, it is of importance to note that a share of Emission Unit Allowances (25%) will be auctioned, i.e. that a share of EUAs will be given to the highest bidder rather than to be given away free of charge:

Starting in 2011, 25% of allowances shall be auctioned.

(EU Parliament, Amendment 74, ARTICLE 1, POINT 3Article 3c, paragraph 1 (Directive 2003/87/EC)

Regarding the Clean Development Mechanism/Joint Implementation, airlines are allowed to factually grow in emissions, if they have achieved energy efficiency gains, by buying emission reductions from other sectors/from projects carried out in non-Annex I countries. It is also planned that the allocation of emission permits will be negotiated before each new trading period.

To increase the cost-effectiveness of the scheme, aircraft operators should be able to use allowances issued to installations in other emission trading scheme sectors, CERs and ERUs from project activities to meet obligations to surrender allowances.

(EU Parliament 2007, Amendment 15, Recital 15).

[...] Member States shall allow each aircraft operator to use allowances issued under Chapter III, CERs and ERUs from project activities up to a percentage of the number of allowances it is required to surrender

pursuant to Article 12(2a); this percentage being the average of the percentages specified by Member States for the use of CERs and ERUs for the period in accordance with paragraph 1.

(EU Parliament 2007, Amendment 39, ARTICLE 1, POINT 6 Article 11a, paragraph 1a (Directive 2003/87/EC)).

On the basis of the experience acquired during the period 2010-2012, the Commission shall submit a proposal concerning the quota of emission permits the aviation sector is authorised to purchase on the secondary market for wider emission permit schemes.

(EU Parliament 2007, Amendment 35, ARTICLE 1, POINT 3 Article 3d, paragraph 5 c (new) (Directive 2003/87/EC)).

Referring to nitrogen oxides, the EU Parliament also suggests that each emission reduction unit is to be divided by 2, mirroring the decision that each ton of carbon dioxide be weighted by a factor 2.

As long as there are no Community measures which incentivise the reduction of releases of nitrogen oxides from aircraft carrying out an aviation activity listed in Annex I, and which ensure the same ambitious level regarding the protection of the environment as this Directive, for the purposes of paragraph 2a and by way of derogation from Article 3(a), the amount of carbon dioxide which an allowance, other than an aviation emissions allowance, or a CER or ERU permits an aircraft operator to emit shall be divided by an impact factor of 2.

(EU Parliament 2007, Amendment 41, ARTICLE 1, POINT 8, POINT (B A) (new) Article 12, paragraph 2 b (new) (Directive 2003/87/EC)).

Finally, and of importance with a view to individual national decisions, such as by the British government to introduce a UK Air Passenger Duty (APD), the EU Parliament notes that:

This Directive should not prevent any Member State from maintaining or establishing other complementary and parallel policies or measures that address the aviation sector's total impacts on climate change.

(EU Parliament, Amendment 18, Recital 19A).

It becomes clear from these suggestions for legislation presented by the EU Parliament that aviation will have to accept substantial changes in the future in comparison to its current status, which has largely been characterized by fuel tax exemptions and various forms of subsidies (Gössling and Peeters 2007). The question is thus how these legislative mechanisms will affect aviation, which will be addressed in the latter sections of this report.

The International Air Transport Association (IATA) opposes the inclusion of aviation in the EU ETS as well as some nations, such as the US. IATA has clearly stated its opposition to the inclusion of aviation in the EU ETS, suggesting the unilateral application to foreign airlines is a violation of the Convention on International Civil Aviation (the 'Chicago Convention') and the resulting legal battles and trade disputes will pose a barrier to progress on GHG emission reductions within the aviation sector for several years. The US government opposes the inclusion of non-EU carriers in the EU ETS, contending that the application of the ETS requires mutual agreement by third party nations and that the unilateral imposition of the ETS regulations on airlines from non-EU nations is a violation of international aviation law. The US government has indicated it will pursue legal action to contest the application of the EU ETS to its airlines (Charter 2007). Opposition has also been expressed by other nations and national aviation organisations.

Proposed Legislation in the United States and Canada

In the US, two recent legislative decisions have important implications for GHG emissions in the aviation industry. In 2007, the US Senate Committee on Environment and Public Works approved the 'Lieberman-Warner Climate Security Bill' and forwarded it to the full Senate for consideration. This proposed legislation includes a cap-and-trade GHG emissions trading scheme. Several States are already moving to implement emission trading schemes of their own. For example, the Regional GHG Initiative involves nine North Eastern states and will first cap GHG emissions from power plants as of 2009. In January of 2007, the CEOs of ten major US companies called on the US Congress to support legislation to install a cap-and-trade system.

If enacted, the Lieberman-Warner Bill would create a regulatory system similar to the ETS for the American aviation industry. Like the ETS, the US commercial aviation industry (Air Transport Association, Air Line Pilots Association, Cargo Airline Association, and the Regional Airline Association) expressed strong concerns about the proposed legislation, arguing it would add a further unnecessary tax burden on airlines, increasing their costs and compromise their ability to invest in new aircraft and fleet upgrades to reduce emissions. If an ETS system were implemented in the US, the Air Transport Association (ATA) contends that past achievements in fuel efficiency gains by the aviation sector must be recognized and that it should be passed in tandem with federal support for infrastructure improvements, such as the Next Generation Air Transportation System (see below), and incentives for fleet renewal.

The failure of the US Congress to reauthorize the Airport and Airways Trust Fund in 2007 has delayed the funding for the Next Generation Air Transportation System (NextGen), which the aviation industry contends is needed to enable airlines to fly more direct routes, reduce congestion and system-caused delays and would result in specific GHG emission reductions of 10-15% through improved system operations. The future of the NextGen system remains uncertain.

In Canada, provincial governments in British Columbia and Quebec have proposed implementation of a carbon tax. In early 2008, the National Round Table on the Environment and Economy provided a detailed report to the federal government, recommending the establishment of a carbon tax, a cap-and-trade system, or a combination of the two, as soon as possible. This advisory body is made up of business, government and non-government members that represent the interests of a wide range of stakeholders that would be potentially affected by a carbon tax and was specifically requested by the Government of Canada to provide advice on a GHG reduction strategy for the federal government. Thus, its recommendations are expected to have considerable weight with governments in Canada. The proposed carbon tax was to include all sectors of the Canadian economy, including domestic aviation and would increase operational costs for Canadian airlines. No price for carbon was recommended, so it is not possible to estimate the potential increase in costs for airlines or the implications for air fare increases to Caribbean destinations at this time.

2.3 Economic Instruments

2.3.1 Fuel and emission taxes

Aviation is currently exempted from most fuel taxes (European Federation for Transport and Environment 2006), but the European Parliament voted on 4 July 2006 to introduce a tax on aviation fuel for flights originating from the 25 member states of the EU. So far, this has been accepted in the Netherlands, where all flights within the EU and/or shorter than 2500 km will be charged with €1.25, and all other flights with €45 per ticket. Transfer passengers are exempted. In March 2007, the British Conservative Party proposed new 'green taxes' on passenger flights that would charge increasing levels of tax on people who take more than one short-haul flight per year. This increasing level of taxation for frequent flyers was aimed at changing travel behaviour (e.g. shifting mode of short-haul travel to trains), while not resulting in air travel being the preserve of the wealthy. Yet another mechanism proposed by the UK Government is a requirement for all those selling air tickets in the UK to include in the price of the ticket the cost of an offset, and to retail that offset along with tickets unless the customer requests otherwise. This mechanism is not likely to have any effect on the development of air travel, as it is a voluntary "opt out" instrument, i.e. customers can choose not to pay the cost of the offset, which also incurs only moderate additional costs (see section 2.4.8 below).

In North America, all aviation fuels (gasoline, kerosene/jet fuel) for use in domestic flights are subject to federal and provincial/state excise taxes. In Canada, the federal government taxes each of the aviation fuels differently (ranging from US\$0.10/litre on aviation gasoline to US\$0.04/litre on jet fuel) (Government of Canada 2008). All international flights are exempt from these federal taxes. Each of the Canadian provinces also taxes aviation fuel for domestic flights, but at considerably different rates, ranging from US\$0.01/litre to US\$0.15/litre (Air Transport Association of Canada 2008). Some provinces also provide tax refunds on aviation taxes to commercial airlines. In the US, the commercial aviation jet fuel tax rate is US\$0.043 per gallon for domestic flights, while non-commercial jet fuel is taxed at US\$0.218 per gallon and non-commercial aviation gasoline at US\$0.193 per gallon (Air Transport Association 2008). International flights are exempt from aviation fuel taxes.

As yet, fuel or emission taxes have a very limited impact on aviation, as they are implemented in only a few countries, and usually at modest levels (Gössling et al. 2008a). It is unclear whether more countries will introduce fuel taxes in the future. Most countries seem to have implemented moderate taxes for domestic aviation (for instance, there is a 6% VAT on domestic flights in Sweden), but international aviation is not covered in member states, nor any other country in the world. ICAO (2000) undertook a study of GHG taxes and charges and concluded that in order to achieve a 25% reduction in the projected growth of emissions, it would demand the implementation of charges totalling US\$47 billion annually world-wide. Achieving 5% absolute emission reductions over 1990 baseline levels was estimated to cost US\$245 billion annually, reflecting that demand for air travel is high and growing, and that changing travel behaviour through taxes and charges would demand these to be considerable.

Table 3 provides an overview of the types of legislative instruments that could affect prices for air travel (Peeters et al. 2007). A charge on tickets is the most straightforward and simplest option to internalize the environmental costs of aviation. Overall, however, demand is likely to continue to grow and a ticket charge would not provide an incentive for airlines to reduce their emissions. Another option, emission charges, is targeting the source of impact and could be charged according to the contribution of a particular flight to global warming.

Table 3: Options for Taxing and Charging Aviation within the EU

Type of levy	Operational issues	Financing (EU)	Effect on emissions	Legal aspects
Charge or VAT on ticket	Simple to introduce in the short term	A charge or VAT of 15-21% on airfares, equalling charges on luxury products in the EU, could raise about US\$43.5-97.3 billion annually.	Probably most direct effect on demand if increase is large enough); low incentive for airlines to become more efficient.	Legally feasible.
Fuel tax	Added on each litre of fuel sold, equal to tax on fuels for surface-bound traffic.	A tax of US\$.46 per litre of kerosene would raise US\$20 billion annually.	Incentive for increased fuel efficiency; reduction in demand uncertain.	Problematic, given the large number of bilateral agreements stating tax exemption for fuel.
Emission tax	Complicated, as many factors determine emissions and radiative forcing.	Emission charges per litre of kerosene of about US\$0.17 for CO ₂ , US\$0.17 for water vapour and US\$.87 for NO _x , would yield about US\$20 billion.	Best option to reduce emissions; incentive for technological and operational improvements of airlines.	Legally not in conflict with the Chicago Convention and the bilateral agreements.
Emission trading (see discussion above)	Aviation joins carbon trading schemes, e.g. the EU ETS	Current prices are between US\$14.5 and US\$43.5 per ton CO ₂ ; or about US\$0.7- US\$8.7 per ticket (Wit et al. 2005)	No impact on aviation at current carbon prices; but substantial emission reductions to be realised in other sectors.	Legally feasible and EU implementation envisaged in 2011 for small part of all aviation emissions.

Source: Peeters et al. 2007

In summary, various options for policy changes exist to reduce the contribution of aviation to GHG emissions. In particular two options may be relevant: first, current direct and indirect subsidies for air travel could be ended, including tax exemptions. Second, environmental costs of air travel could be internalised, for example through charges or levies. These could be designed in a way to reduce demand for the most emissions intense air transport, while simultaneously encouraging technological (fuel efficiency), and operational (more efficient routing and operational procedures) innovation in the aviation industry. Currently there does not appear to be the necessary political support for such policies to be implemented in Europe or North America.

2.3.2 Energy price developments

Airlines have made substantial profits in 2007, with IATA (2007) reporting a global industry profit of US\$ 5.6 billion in 2007, with higher oil prices (full-year average forecast is US\$73 per barrel) being compensated for by strong passenger number growth (+5.9% in 2007) and even higher revenue growth (+8.4%). It needs to be noted, however, that the profitability of the sector is low at a 1.1% margin. The market situation for airlines is likely to

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become more difficult in 2008, and, as can be speculated, in consecutive years, as it may be increasingly difficult for airlines to achieve further non-fuel cost reductions and higher labour productivity, as well as reduced sales and marketing costs, because airlines have focused on and already gained substantial cost reductions in these sectors in recent years. At the same time, fuel costs are projected to grow, with overall fuel costs being expected to grow by more than 10% in 2008, based on an average price assumption of US\$78 per barrel (IATA 2007). As growth in fuel costs includes higher consumption, the relative increase in the price per litre is, however, lower – an increase from US\$73 per barrel in 2007 to US\$78 per barrel in 2008 would correspond to a price increase by 6.8%. This, in turn, would increase the fuel cost share of operational costs from 28% to 30% in 2008 (IATA 2007). Even though revenue growth will still be substantial at 4.7%, profits in 2008 are expected to be lower than in 2007 (US\$5.0 billion; IATA 2007a), indicating further declining margins. Overall, positive developments in fuel prices are thus in contrast to the period 1998-2003, where substantially falling air fares were observed; for instance, Njegovan (2006) puts these for the UK at -20% to -43% (average -26%) for a range of important destinations.

Reduced profitability will be unevenly distributed according to IATA's (2007) forecast, with particularly negative forecasts for the two most important source markets for the Caribbean, North America and Europe. North American carriers will see the largest absolute reductions in profitability, as the continent operates a comparably old fleet of aircraft. According to IATA, 35% of aircraft are over 25 years old, and the impact of growing fuel prices will thus be felt specifically in North America. Nevertheless, North America will remain the leading region in terms of absolute profitability, even though it should be noted that IATA warns in its Financial Forecast (IATA 2007) that "the US economy is expected to move very close to outright recession". Likewise, European carriers are expected to see drops in profitability, even though absolute profitability will remain substantial. The two regions are expected to still account for almost 85% of global profits made by airlines.

Overall, it seems clear that global increases in fuel prices should be taken seriously, however, even though this needs to be seen in the light of the substantial efficiency gains that can be made by renewing fleets. Many North American and European airlines have considerable options to exchange aircraft that are now more than 2 decades old in favour of more efficient ones, even though it should be noted that for most aircraft classes, the technology used is already 10-15 years old. Exceptions are the A380 and B787 aircraft, which are relevant for long-haul markets. In summary, profitability in the two major markets for the Caribbean will continue to be good in 2008, even though margins are low and there is a risk of economic downturn in at least one market (the USA).

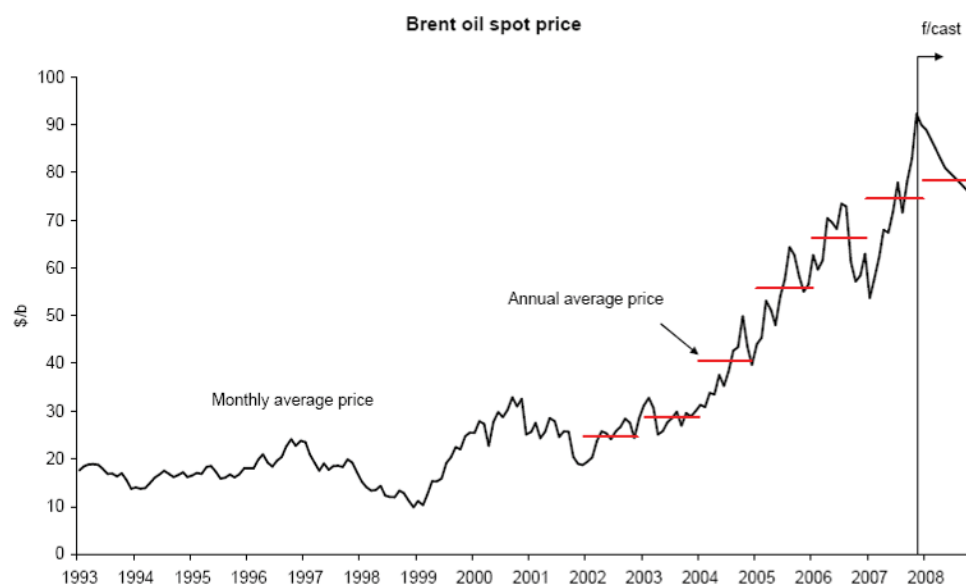


Figure 3: Oil Price Development

Source: IATA 2007

Higher fuel prices will affect the situation in that profit margins will further decrease, unless this is compensated for by further cost reductions in sales & marketing, non-fuel and labour, or unless increasing fuel costs are passed on to passengers. If costs were passed on, ticket prices may increase by 2% from 2007 to 2008. Current increases in fuel costs do not seem to have affected demand, which is expected to grow at 4.9% per year (passenger numbers) in the period 2007-2026 (Airbus 2008). Fuel costs are also only one third of operational costs, i.e. a 6% fuel cost increase translates into a 2% ticket price increase if the costs are passed on to air travellers. However, it is far more uncertain how prices will develop in the post-2008 period, even though IATA (2007) assumes a decline in oil prices. In contrast, the International Energy Agency (IEA 2007) has warned that global energy demand is still rising sharply, which will affect prices, even though the Agency also points out that the 2007 high of US\$100/barrel does not reflect oil availability. The IEA (2007: no page) nevertheless points out:

In the Reference Scenario, net oil imports in China and India combined jump from 5.4 mb/d in 2006 to 19.1 mb/d in 2030 – this is more than the combined imports of the United States and Japan today. World oil output is expected to become more concentrated in a few Middle Eastern countries – if necessary investment is forthcoming. Although production capacity at new fields is expected to increase over the next five years, it is very uncertain whether it will be sufficient to compensate for the decline in output at existing fields and meet the projected increase in demand. A supply-side crunch in the period to 2015, involving an abrupt escalation in oil prices, cannot be ruled out.

In order to show how growing energy prices may affect ticket prices, Figure 4 presents a 2%, 5% and 7% per annum oil price increase scenario up to 2020. As the scenario graph shows, oil prices may increase from the projected US\$78/barrel in 2008 to US\$100/barrel by 2020, if price increases are rather moderate at 2% per annum. If prices develop more rapidly, they may reach US\$140/barrel in the 5%/annum scenario and US\$175/barrel in the 7%/annum scenario.

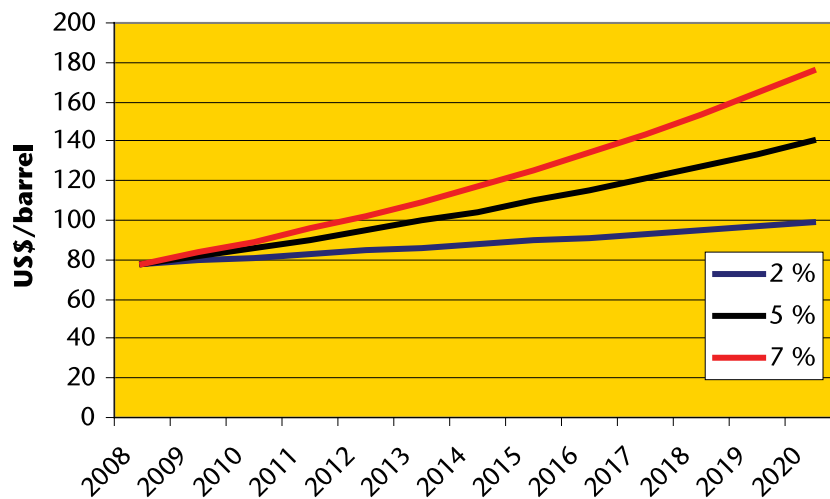


Figure 4: Scenarios for Future Oil Prices
Source: authors' calculation based on IATA (2007)

It should be noted that oil prices are largely the result of two aspects, i.e. the availability of oil on the world market, which in turn is a function of demand and production, as well as purchasing strategies at resource exchanges in the light of various uncertainty factors (hedging). As for the availability of oil, peak oil, i.e. the point of maximum production, is seen by many analysts to occur within the coming 20-30 years (for one summary see www.trendlines.ca; Greene et al. 2006). The Organization of Petroleum Exporting Countries reports that growth in oil production

has increased by 1.4% by December 2007 over the previous year, and is expected to grow at a similar pace in 2008. This reflects a situation where consumption of petroleum is still increasing, while the maximum capacity for production is moving closer. This, in turn, may affect availability and thus oil prices. As for uncertainty factors, it is difficult to say how these will affect prices over the coming years, but it should be remembered that oil prices reached highs of up to US\$100/barrel in late 2007.

Should annual fuel price growth be in the range of 2-7% over the next 12 years, this would translate into price increases of fuel to US\$99-176 per barrel by 2020 (starting from US\$78/barrel in 2008), i.e. be 27-126% higher than in 2008. However, aircraft are currently becoming more efficient by 1-1.5% per annum (UNWTO 2007; specific consumption per seat kilometre; however, each year efficiency gains are declining, cf. Peeters et al. 2007), and the effect on consumer end prices will thus be mitigated. However, as aircraft are currently becoming more efficient by 1-1.5% per annum (UNWTO 2007; specific consumption per seat kilometre), the effect would be mitigated if such efficiency gains are maintained or even accelerated. Taking into consideration a low and high efficiency scenario, Gössling et al. (2008a) estimate that fuel costs would increase by in between 12-88% by 2020, or ticket cost increases of in between 4-26% (assuming that fuel costs are about 1/3 of total ticket costs).

Note that there is an above average potential for airlines in the USA to become more energy-efficient by replacing old aircraft. Economic growth may also compensate part of the increase in ticket prices, as for instance the UK Aviation White Paper assumes a UK long-term real GDP growth of 2.25% per annum (Department of Transport 2003). On the other hand, economic growth in the EU15 was, considering inflation; close to zero in the period 2001-2005 (Eurostat 2008). Arguably, other factors such as the operational costs of aircraft, which are influenced by income levels of staff and management, will also be of importance. Overall, these findings would nevertheless indicate that the consequences of fuel price developments are difficult to predict. Even though increases in fuel prices may be substantial if measured over the period 2008-2020, they are, on a year-to-year basis, not likely to have a substantial impact on ticket price developments. Note that sudden jumps in oil prices due to uncertainties may have a different effect, though, as they could result in headlines over steep increases in prices or kerosene add-ons, making people more aware of the necessity of – still relatively small – additional payments.

2.3.3 Consequences of emission trading schemes for ticket prices

In the EU, the inclusion of aviation in the ETS will be a second factor influencing fuel prices. As outlined above, the EU foresees a reduction of emissions from aviation from 2011 onwards – this however means that ticket prices will not be affected for another 3 years by the EU ETS. Emission trading will subsequently affect aviation as emission reductions need to be “in line with the overall EU reduction target of 20-30% compared to 1990 levels” (EU Parliament 2007), but the details of the inclusion of aviation in the EU ETS as well as other emission trading schemes are not as yet clear. One of the main questions raised in this report is whether climate policy, and in particular the EU ETS will affect demand for travel to the Caribbean. The following section thus provides a scenario for 2012/2020 for aviation originating from the European Union. The scenario is based on the following assumptions (Gössling et al. 2008a):

- Emissions from aviation in the EU will, compared to 2005, grow by 40% by 2011 (the year aviation will be included in the EU ETS) and 100% by 2020
- There will be a cap of 90% of 2005 emission in 2012 and 79% of 2005 emissions in 2020
- 25% of allowances will be auctioned

(Note that the above assumptions represent the least favourable scenario for the aviation industry as currently discussed by the EU)

- Airlines will try to avoid the EU ETS by changing routes to maximize fuels bunkered outside the EU, with the consequence that 20% of fuels will not be affected by the EU ETS.
- Costs of auctioned EUAs are €30 in 2012 and €40 in 2020, while emission reduction units will be traded at €40 in 2012 and €50 in 2020.
- A factor 2 is applied to all traded emissions exceeding caps, accounting for non-carbon impacts at flight altitude.
- Costs apply to all flights that originate in or arrive at EU airports, whether for EU or other airlines; there will be no other trading schemes for aviation anywhere in the world before 2020.

Based on the above assumptions, the average cost per ton CO₂ will amount to US\$52.4 in 2012 and US\$96.3 in 2020 (currency converter www.oanda.com; 1 Euro = 1.54109 US Dollar). When calculating cost increases for particular journeys, it is however not the full amount of emissions released during a flight that is subject to emission trading. This is because the EU ETS will not affect all emissions, as only flights starting or ending in the EU will be affected, for instance when travellers use connecting flights from a hub outside the EU. It is assumed that in 2012, 80% of the overall kilometres covered by travellers from EU source markets are covered by the EU ETS. In 2020 this share will decrease to 75% due to rescheduling by airlines (choosing other hubs/itineraries). Consequently, additional cost of emissions for flights would be US\$42.2 in 2012 and US\$72.3 in 2020 per ton CO₂ (Gössling et al. 2008a).

In order to understand how the EU ETS will affect flights to the Caribbean, emissions caused by these flights have to be calculated. As shown in table 9, the emission calculators provided online by voluntary offset providers arrive at widely varying amounts of emissions for identical flights. This is partially because of the use of 'uplift factors', i.e. the integration of non-carbon emissions in calculations. As the EU ETS only considers emissions of CO₂, the focus is here entirely on this greenhouse gas. Based on Gössling et al. (2008a), we use an emission factor of 0.122 kg per passenger kilometre (pkm). Distances are derived from the emissions calculator provided by Atmosfair, which is a very exact tool for flight distance calculations (www.atmosfair.de; see technical annex of emissions calculator).

For a sample of flights to the Caribbean (cf. table 9), flights would include return distances of emissions would thus entail in between 4,730 pkm (Toronto, Canada – Havana, Cuba) and 14,110 pkm (London, UK – Havana, Cuba). This translates into emissions of in between 0,577 and 1,721 t CO₂. At prices of in between US\$731-1,401 (Toronto-Havana) and US\$1,330-2,045 (London-Havana), which seem to represent flight costs from main markets to the various destinations (cf. table 11), costs for travel to the region would increase by 2012, or US\$24.3 (Toronto-Havana) and US\$72.6 (London-Havana), all else being equal. This corresponds to air fare increases of in between 1.7-3.3% (Toronto-Havana) and 3.6-5.5% (London-Havana). These additional costs do however not reflect changes in the overall costs of holiday-making, as the flight may only account for one third of the costs of a holiday. As Njegovan (2006: 34) states for the UK, "the share of air fares in total expenditure on holidays abroad is, on average, somewhere in the range between 25% and 35%". Consequently, air fare price increases should be seen against the overall cost of the journey rather than the increase in air transport prices alone. For the price ranges presented above, the overall costs of holiday-making would thus increase by in between 0.6-1.8% in 2012. NOTE that this is a scenario where a global emission trading system similar to that in the European Union would be established. Currently, these increases in prices would only be relevant to the European source markets. The development in the period 2012-2020 is likely to be characterized by further price increases, with projected costs of US\$72.3 per t CO₂ in 2020. There are many uncertainties, however, how this will affect travel behaviour, given changes in income, fuel prices and other travel cost parameters.

2.3.4 Travellers' price perceptions

Regardless of the cause, higher prices for holidays are known to affect demand, even though there is some uncertainty how significant these effects will be for short- vs. long-haul travellers, business- vs. leisure travellers, and low-fare vs. "standard" fare travellers (e.g. Crouch 1994, Brons et al. 2002). A system modelling approach by Njegovan (2006) showed that ticket prices are not necessarily the main or only driver in air travel demand, but that strong cross elasticities may exist with domestic leisure prices and destination cost levels. This implies that the effectiveness of a carbon charge for air travel should be assessed in a wider context. For this study, it means that relative increases in air fares do not reflect the average cost increase for the journey, which also entails costs for accommodation and activities. It is more complicated to assess how an increase in air fares will be perceived in contrast to other costs. For instance, air travellers purchasing all inclusive packages, may hardly notice increases in air fares, which only represent perhaps one third of the overall holiday package cost, unless fuel price increases and emission costs are explicitly communicated as cost lines on purchase invoices. The latter may have a more substantial impact on price perceptions than the non-communicated cost increase included in package prices. At the other end of the spectrum, travellers purchasing the ticket separately from accommodation and activities may not make a distinction between the air fare price increase and the overall cost of the journey, i.e. if a traveller buys a package it is unclear which portion of the total price is air travel, in this case price perception will relate to total travel costs ('all inclusives' are an example of this situation), price perceptions may therefore either focus on the flight or the total price. Finally, it also needs to be noted that travellers in some destinations, i.e. particularly those with mass markets as opposed to more exclusive tourism products, may perceive increases in ticket prices as more central to their travel decisions (Gössling et al. 2008a). In further outlining complexities by pointing out the eventual lack of substitutability, Mayor and Tol (2007: 512) conclude for the UK market:

It is hardly conceivable that UK tourists would consider a domestic holiday as a substitute for a foreign holiday—with the possible exception of Ireland. As Great Britain is an island, the distinction between "domestic" and "abroad" is much sharper than, say, on the European continent. Low substitutability implies low price elasticity [...].

Given this situation, a short review of the literature on price sensitivities is provided in the following, which focuses entirely on air fares, i.e. not including part of the holiday consumption process (accommodation, activities). In the light of the uncertainties and complexities presented in the previous section, it can thus be assumed that several studies entirely focusing on air fares overestimate the consequences of increasing costs. Table 4 reviews some studies focusing on elasticity. Sensitivity to changes in prices is usually measured in terms of elasticity, with an elasticity of 1 expressing that at a 1% increase or decrease in price, this will be felt as a 1% increase or decrease in demand¹. Note that none of the studies considers differences between low-fare, charter and scheduled leisure air travel, which may be substantial (cf. Brons et al. 2002). Note as well Njegovan's (2006: 35-36) quotation of Dargay and Hanly's (2001) findings:

Dargay and Hanly (2001) used a pooled time-series cross-section data which covered the years 1989–1998. They estimated a long-run income elasticity for UK outbound traffic of about +1 and a fares elasticity of about -0.6. Interestingly, they found exchange rate (local currency per pound) and relative prices [...] to be more influential than air fares [...].

¹ An elasticity measures the direction and strength of the market response to a change in a given demand driver such as price, income or the quality of services. It is defined as the ratio of the percentage change in quantity demanded to the percentage change in the variable that brought the demand change about, holding all other independent variables constant (Njegovan 2006: 35).

Table 4: Air Travel Price Elasticities

Business Domestic	Business International	Leisure Domestic	Leisure International	Country	Source
-0.2	-0.1	-1	-0.7	Sweden	SIKA 2006
-1 (average over all sectors)				UK	Department for Transport 2003
			-1.7 to -0.56, median -1*	Various	*Gillen et al. 2003
			-0.45	UK	Mayor and Tol 2007

*This summary of studies distinguishes long-haul international business vs. -leisure, long-haul domestic business vs. -leisure, as well as short-haul business vs. -leisure, which is a sensible approach, given vast distances in Canada, as well as other countries. Of relevance in the context of this article is long-haul international leisure. Most of the studies considered in Gillen et al. (2003) were published prior to 2001, many as far back as in the 1980s.

For the purpose of a preliminary assessment of how increasing prices may affect travel behaviour, we here suggest that at price elasticity ranges of -0.45 to -1.0, demand for Caribbean holidays should fall by in between 0.3% to 5.5% in 2012, reflecting the lowest and highest combination of price increases and price sensitivities (total holiday cost increases by 0.6% and an elasticity of -0.45; air fare increases by 5.5% and an elasticity of -1.0). Note that the actual change in tourist arrivals will very much depend on growth rates in arrivals. For instance, in a destination with growing arrival numbers, climate policy and emission trading would not lead to a decline in arrivals, rather than to slow down growth. Consequently, it is likely that both the inclusion of aviation in the EU ETS and increasing fuel prices will have a negligible impact on demand for holidays in the Caribbean in the near future. Note as well that the future situation will also be influenced by airlines' strategies to replace their current fleet of aircraft with newer ones. Note as well that policy measures such as the EU ETS will only affect travel from the EU, but not travel from the US to the Caribbean. As outlined in the sections above, there are no plans to address emissions from aviation on an international level. Consequently, only fuel prices will be relevant for these market segments.

2.4 Voluntary Instruments: carbon offsetting schemes

Carbon offset providers offer to “neutralize” emissions caused by consumption in one sector, such as a flight, through emission reductions to take place elsewhere in another sector, for instance by investing in renewable energy, energy efficiency, or forestry projects. Voluntary offsetting schemes have grown rapidly in the past 10 years and there are now an estimated 90 organisations offering carbon offsets with a focus on aviation (Gössling et al. 2007, Ecosystem Marketplace 2007). At this early stage in the development of the offsets market, it is unclear whether voluntary carbon offsets could make a significant contribution to making tourism more sustainable. An estimated 10 million t of CO₂ were offset voluntarily in all economic sectors by voluntary offset providers in 2005, including tourism and aviation (Schiermeier 2006), which would represent less than 3% of regulatory market in the same year (cf. Capoor and Ambrosi 2006). Regarding aviation-focused voluntary offset schemes, Gössling et al. (2007) suggested that considerably lower amounts were offset, probably as little as 200,000 t CO₂ in 2005. Voluntary carbon offsetting is thus far from firmly rooted in the tourism industry and among travellers, though there are some positive trends. Nevertheless, voluntary emissions reductions need to increase substantially to account for even a fraction of the CO₂ currently entering the atmosphere. For this to be achieved, a sizeable proportion of the travelling public, airlines, tour operators and typical long-haul destinations would have to become part of voluntary compensation schemes rather soon.

Unlike emissions trading, which is regulated by a strict formal and legal framework, carbon offsets by individuals or companies that are arranged by commercial or not-for-profit carbon-offset providers lack formal standards and certifications. A number of concerns have been raised about the as yet unregulated voluntary carbon offset market, including whether offset projects meet the criteria ‘additionality’, the possibility of double-counting and multiple sales of the same carbon credits, the lack of standard for verification, the time scales and location of projects, and the possibility of a ‘rebound affect’ in traveller behaviour (Gössling et al. 2007, Clean Air-Cool Planet 2006, Tufts Climate Initiative 2006). Each of these criteria for evaluating the quality of carbon offsets are elaborated on below, followed by a comparison of offset providers for flights from major markets to the Caribbean and traveller response to offset products (willingness to pay versus current offset costs).

2.4.1 Emission reduction units – an overview

In the highly unregulated marketplace of carbon offset, various forms of offsets that can be purchased, including Emission Unit Allowances (EUAs), Certified Emission Reductions (CERs), Voluntary Emission Reductions (VERs), Gold Standard Certified Emission Reductions (GS CERs), Gold Standard Verified Emission Reductions (GS VERs), and Non-Verified Emission Reductions (NVERs). On principle, there is also an option to buy Emission Reduction Units (ERUs), but it appears that these are not currently offered by any of the offsetting agencies. All of these emission reduction units are different, and their purchase has thus various implications.

Emission Unit Allowances (EUAs) are units exchanged in the regulatory carbon market in the European Union Emission Trading Scheme (EU ETS). These are allocated to companies, and can be bought or sold if companies exceed or fall below their emission allowance. This type of offset means that there is an interference with the compulsory market, as retired EUAs increase the pressure on companies to reduce emissions. A consequence that companies seek to increase their purchases of CERs, i.e. emission reductions generated through the Clean Development Mechanism (CDM), which are comparably cheap. CERs are generated through projects in countries not forced to reduce national emissions under the Kyoto-protocol, and subject to validation through UNFCCC, i.e. they have to be certified and registered through Designated Operational Entities (DOEs), the UNFCCC’s official

validators. The systemic problem with this kind of offset is that since there is no global cap on emissions, new offsetting projects can theoretically be carried out infinitely. This, in turn, would adversely affect innovation towards low-carbon economies. For example, in the trading period 2005-2007, Sweden was allowed to import only 10% of CERs from outside the EU, while it had to meet the major part of its obligation to reduce emissions through efficiency- or renewable energy projects within the country. In the coming trading period 2008-2012, the share of CERs that can be imported in the EU ETS will increase substantially (source). In such a situation, there is no real need for companies to achieve efficient operations, as it may be cheaper to buy emission reductions from outside the EU, i.e. notably in countries with no cap on emissions.

There is also evidence that CERs are often generated through projects with few to no sustainable development benefits (cf. Michaelowa and Michaelowa 2007; Holm Olsen 2007). Only Gold Standard CERs (GS CERs) can be expected to deliver benefits to local people, and they would thus be a better option for emission reduction units to be sold by voluntary offsetting agencies. One problem is, however, that CERs and GS CERs interfere with the EU ETS, as they are registered nationally. The Gold Standard (2006; www.cdmgoldstandard.org) an organisation founded by various NGOs and approved by the UNFCCC, created Verified Emission Reductions (GS VERs), which combine offsets and sustainable development, but do not interfere with the regulatory market, as they are not nationally registered as reductions. GS VERs are, however, not undergoing the same strict validation and certification process as GS CERs and CERs. Verified Emission Reductions (VERs) are emission reductions validated and verified by third independent parties, but standards, when present, vary substantially. They are currently the most common type of offset sold in the voluntary market, even though VERs have the lowest level of credibility in terms of meeting acclaimed emission reductions, and adhering to the principle of additionality (cf. UNFCCC 2007; Gold Standard 2006). Finally, NVERs are emission reduction units without any kind of certification. Emission reduction units (ERUs) are generated through Joint Implementation, i.e. in between countries obliged to reduce emissions under the Kyoto Agreement. ERUs could potentially be interesting offsets, as they lead to emission reductions in the countries causing most emissions, which may lead to a higher degree of technical innovation. However, as nationally registered offsets, they help countries to reduce their emissions, which may affect a country's ambitions to further reduce emissions. ERUs are not currently available in the market, however, as they are more costly to generate.

A comparison of offset types indicates that GS CERs or Gold Standard VERs may be the most suitable categories of voluntary offsets. They offer a globally acceptable emission reduction standard approved and controlled by the UNFCCC, while also making a contribution to sustainable development. In a situation where aviation is included in a compulsory emission reduction scheme, such as the EU ETS, voluntary carbon offsets based on GS CERs or GS VERs can thus be a suitable complement, leading to additional emission reductions as well as sustainable development benefits.

2.4.2 Principles of credibility and efficiency

Voluntary offset projects must show that the emission reductions from the project are additional to what would have happened in the absence of the project. Additionality should be assessed in a conservative manner so as to avoid crediting business-as-usual activities, and it should be demonstrated that:

- The project would not have occurred without the project being a voluntary offset project; due to financial, political or other barriers;
- The project goes beyond a 'business as usual' scenario, i.e. reductions that may have been achieved in the usual energy efficiency- or technological renewal cycle;

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- Greenhouse gas emissions are lower with the project than they would have been without the project (i.e. the baseline situation);
- Overseas Development Aid is not involved.

(Source: Gold Standard 2006)

Another important aspect is the use of radiative forcing indices (RFI), as previously discussed. The European Union foresees to double each ton of CO₂ within the EU ETS framework, to account for the additional global warming caused by nitrogen oxides and water vapour. This has now also been suggested by DEFRA (2008). As shown in Table 5, out of 35 organisations with online calculators, exactly half currently use no precautionary principle factor (RFI). Note that 3 companies did not give any information on the precautionary principle factor used, which was interpreted as an RFI equalling 1. One quarter uses a factor 2.0, and 5 companies use factors of 2.7 or 3.0. Four other companies have customized the factor, i.e. they allow the customer to decide to include a higher/lower factor. The use of different RFI standards heavily influences the calculation of the amount of CO₂-e generated by a given flight, even though it does not necessarily explain differences in emissions calculated for a given flight. For instance, emissions calculated for a flight from Amsterdam to Barcelona can vary between 0.3 t CO₂-e (Climate Care, UK) and 0.74 t CO₂-e (My Climate, Switzerland), even though both companies claim to use an identical RFI of 2.0 in this particular case.

Table 5: Number of Voluntary Carbon Offsetting Organisations Applying Specific RFI

RFI 1.0	RFI 2.0*	RFI 2.7	RFI 3.0	RFI customized	Total
17	9	3	2	4	35

*Including two organisations using RFIs of 1.9 and 2.16, respectively

Source: Gössling et al. 2007

The use of RFI also seems unrelated to the total costs of compensation for a specific flight, with costs for offsetting 1 tonne(t) of CO₂-e varying between US\$3.45 (American Forests, US) and US\$54.89 (Moor Trees, UK), representing a factor 15 price difference. The price difference becomes even greater when calculated per flight. For instance, offsetting a short distance flight from Amsterdam to Barcelona (2,600 pkm return distance) is offered at prices ranging between US\$2.79 (Carbon Fund Foundation, US) and US\$29.52 (Carbonozero, Portugal) and may be influenced by minimum charges applied by the provider. In effect, compensation by an “expensive” organisation using an RFI of 1.0 might thus be offered at the same price as compensation by a “cheap” organisation using an RFI of 3.0. The prices of compensation might thus rather depend on the time horizons over which projects are calculated, the validity and reliability of projects, administrative costs, or profit margins taken out by for profit entities (out of 41 organisations, 16 are for profit), than on the choice of an RFI. The share of payments invested in offsetting projects can vary between 40% (Bonneville Environmental Foundation, US) and a claimed 100% (Friends of Conservation, UK). Note that most companies do not provide information on the share of investments in relation to payments made; however, for newly started and small companies, administrative costs will heavily influence results. Note as well that out of 41 organisations surveyed, only 16 had accessible annual reports, even though this might be due to the fact that 17 organisations were founded in 2005 or 2006. For those provided, the details and assurances vary considerably particularly if offsetting is not the primary activity of the organisation.

2.4.3 Project types

Compensation schemes support mainly two project categories, including i) biological “sinks” where carbon is sequestered in biomass through afforestation or reforestation (here summarized as forestry) or ii) emissions savings, where energy-efficiency gains or replacement of fossil fuels by renewable energy sources reduces GHG emissions from a business-as-usual baseline. Companies also engage in buying offsets from the Chicago Climate Exchange (www.chicagoclimatex.com), and practice a wide range of other measures, such as methane capture, forest and biodiversity conservation, or projects focusing on climate change adaptation. However, as Table 6 shows, most of the voluntary carbon offsetting organisations identified focus entirely or partially on forestry projects. Less than 25% focus entirely on renewable energy and energy efficiency projects.

Table 6: Focus on Project Categories among Voluntary Carbon Offsetting Organisations

Forestry	Forestry, Renewables, Energy efficiency	Renewables, Energy efficiency	Total
20*	11**	10	41

*Including Conservation International (entirely conservation projects, i.e. “avoided deforestation”)

**Including three companies buying credits from the Chicago Climate Exchange. As these can comprise forestry projects, the companies are included in the mixed category

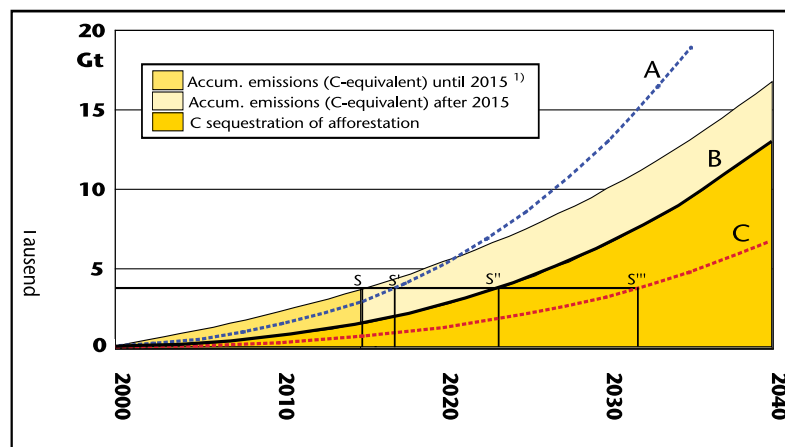
Source: Gössling et al. 2007

To include forestry in regulatory offsetting schemes is possible because of article 3.3 of the Kyoto Protocol, which states that countries have to account for emissions and the sequestration of afforestation (newly planted areas), reforestation (previously planted, cut down and replanted areas) and deforestation. More specifically, the Marrakesh Accords allow the inclusion of afforestation and reforestation activities as sink projects within the CDM (Marrakesh Accords 2001). Tree planting appears popular among customers. One reason for this could be that forests are important places for recreation in industrialized countries. Tropical forests, on the other hand, refer to Western concepts of natural, unsullied environments, and the diversity of life. Trees are thus generally seen as something positive, appealing to common aesthetics. While forestry projects can have a number of advantages, such as their potential to contribute to local development processes, biodiversity management, and to raise awareness of climate change, there are also a number of problems. For instance, Gössling (2000) calculated that offsetting global aviation’s GHG emissions for the year 2000 (leisure tourism only) would require an area of about 28,800 km². An area of similar size (growing by about 3% per year) would have to be afforested each year, indicating the scale at which forestry projects would have to be operated (see also Boon 2006). Furthermore, unless carbon stored in trees is not used for the production of biofuels to substitute for fossil fuels (Read and Lermitt 2005), the area used for afforestation would also have to be set aside infinitely. This might be even more problematic given the fact that forests will increasingly be at risk (fire, drought etc.) because of climate change (Ceron and Dubois 2007). Moreover, monocultures for fuel production would only support low levels of biodiversity, and the effectiveness of afforestation must be assessed, particularly in developing countries, against political stability, social and other environmental aspects (Bäckstrand and Lovbrand, 2006; Benitez et al., in press; Brown and Corbera, 2003; Jackson et al., 2005; Reich et al., 2006). Finally, forestry and biomass production can entail significant energy inputs and related GHG emissions that should be deducted from the carbon stored, to only consider net gains. Caribbean states could focus on forestry schemes in the context of Kyoto, but this may prevent ‘leapfrog’ technology becoming established and in addition some forests are already protected.

In comparison, eco-efficiency measures have the goal of achieving the same output in terms of production or service at a lower input of energy or materials (for a case study of tourism see Gössling et al. 2005). Investments in eco-efficiency measures would thus seek to reduce the amount of emissions caused by a particular mobility pattern or journey through reductions in energy use and associated emissions in other sectors. Likewise, exchanging existent energy structures based on the use of fossil fuels in favour of those based on renewable ones might have a range of development advantages.

2.4.4 Temporal aspects of compensation

Another aspect of fundamental importance in the calculation process is the period over which compensation companies calculate their offsets. All carbon released at present will lead to additional build-up of CO₂ in the atmosphere, while compensation measures, such as forestry, will lead to sequestration over time. As Table 7 shows, some companies seek to “neutralize” emissions through forestry projects during the same year they occur, while others calculate sequestration over 100 years (i.e. the assumed lifetime of a tree). Clearly, such differences in the time horizon chosen not only have consequences for CO₂ concentrations in the atmosphere, but also influence prices for offsetting. Furthermore, carbon sequestration will depend on the tree species planted, soil conditions and climate, thus varying between geographical regions. It thus seems clear that the integration of proper timeframes for various compensation projects (particularly forestry, but also for renewable energy and energy efficiency) is paramount. A simple model in the context of forestry projects illustrates this (Figure 5).



1) Emissions of CO₂, NO_x and H₂O converted into CO₂-equivalent and calculated as C mass fraction; growth rate 1991/92-2040: 3.9% yr (Schmitt and Brunner 1997).

Fig. 1: Emissions of tourism-related air travel and sequestration potential of afforestation programmes, 2000-2040

Source: Gössling 2000

Figure 5: Carbon Accumulation through Afforestation Over Time

One of the major questions in the context of afforestation schemes is the question of the size of the area that needs to be afforested in order to offset one ton of carbon. Since emissions are released over hours, but sequestered over the life-time of a tree, the interval between emission and storage determines the build-up of additional atmospheric carbon. Gössling (2000) used three carbon storage scenarios (10, 20 and 40 years), based on the assumption that fuel demand of leisure air travel was in the order of 80.5 Mt in 2000, increasing by 3.9%.

Note that current growth in fuel use worldwide is somewhat lower in the order of 3% per annum; however, European growth in fuel use in 1990-2003 was 4.3% per annum (Commission of the European Communities 2005). The RFI used in Gössling's (2000) model was 2.7. In scenario A, emissions accumulated between 2000-2015 (S), are offset until 2017/18 (S'), in scenario B until 2023/24 (S'') and in scenario C until 2032/33 (S'''). As shown in Figure 5, the rate of carbon sequestration in trees in scenario A (fast sequestration) soon passes the rate of atmospheric accumulation, while in scenario C (slow sequestration), sequestration of carbon follows emissions slowly, leading to an increasing build-up of carbon in the atmosphere. It was concluded that emissions should be sequestered within a period of 20 years, as the carbon increment would follow emissions slowly over time. While the model is simplified, using RFI as a constant parameter (Sausen et al. 2005; Peeters et al. 2006), it nevertheless shows that the consideration of time horizons is significant for future build up of CO₂ concentrations. The model also shows that using forestry sequestration horizons of 100 years is unfeasible, which is recognized in the Marrakesh Accords (2001) and addressed through complex guidelines regarding forestry CDM, but disregarded by organisations in the voluntary carbon market.

In the light of the most recent publications by the IPCC (2007d), demanding that net global emissions of carbon dioxide decline from 2015 onwards, it is also clear that there should be no gap between the release of emissions and compensation. Consequently, the best approach may be to calculate emissions from forestry projects by the end of each year over a period of up to 20 years. Trees may sequester carbon long after this, but this exceeds the maximum timeframes for projects as defined in the Marrakech Accords.

2.4.5 Validation and certification

Companies sell Certified Emission Reductions (CERs), Voluntary or Verified Emission Reductions (VERs) or Non Verified Emission Reductions (NVERs), which are generated through their own or third party projects. The most common standard is the VER, generated through own projects. A wide variety of auditors are involved in accreditation, making it difficult to understand the standards used for VERs. While some companies state that they do not go through auditing to save money, there are also a number of companies providing very general information that verification is based on an "external auditing". For individual customers it is currently next to impossible to judge the real value of the credits they buy. Formal certification does indeed increase transaction costs. While carbon credits certified under the Gold Standard may cost around US\$29.04 per t of CO₂-e, NVERs through forestry may cost one tenth of this amount. Clearly, the credibility of current audit practices is variable and price in an increasingly competitive compensation market may be a driving force behind this. Efforts to regulate the generation and trade of VERs are proposed from a number of sources. The Gold Standard and UK Government recommendations have previously been mentioned, whilst the NGO The Climate Group is developing its own Voluntary Carbon Standard (VCS) with the International Emissions Trading Association and World Economic Forum. The VCS is less prescriptive of project type and sustainability criteria than others, the central intention being to provide comparable auditing standards and a central registry of Voluntary Carbon Units (VCUs) to prevent double selling (The Climate Group 2006). It is not clear how the various proposals will interact in the marketplace and what, if any, legislation may develop.

Box 2: Characteristics of the Perfect Offset Project

- **Additionality** – It would be easy to see the connection between demand created by carbon offset markets and the emissions reductions being sold as offsets.
- **Baseline Determination:** Once additionality is confirmed, a credible approach would have been used to create an emissions baseline for the project.
- **Benefit Quantification:** The quantification of the GHG emissions reductions resulting from an offset project (relative to baseline emissions) would reflect key potential uncertainties, as well as the potential for leakage.
- **Ownership:** Ownership of the reductions would be clear, making it less likely that the same offsets might be claimed and sold multiple times.
- **Monitor and Verifications:** The offset project would be monitored and its offsets verified independently over time.
- **Registration:** The offsets would be registered to provide a paper trail and to reduce the possibility that the same offsets might be sold multiple times.

Source: Clean Air – Cool Planet 2006

Overall, it should be noted that carbon offsetting schemes may be best seen as a strategy to buy time until emission reduction strategies can be developed and implemented. Gössling et al. (2007: 241) noted that:

It should also be clear that offsets are environmentally risky options that do nothing to directly reduce aviation emissions. If not presented as a temporary or complementary strategy, offsets carry the political risk of encouraging people to believe that they need not change their behaviour, thus creating irreversibility in current consumption and production patterns. Moreover, if emissions from aviation are allowed to grow on the basis of concomitant offsets in other sectors, this will reduce the number of options available for future reductions in these sectors at comparably low costs. Given the need for more drastic emissions reductions in the post-Kyoto period, such an approach could increase the future costs of offsets while reducing the margins of reductions that can be achieved through technology.

Likewise, there may be a 'rebound affect' in traveller behaviour: as a result of offsets, air travellers may not perceive it as necessary to change travel patterns. However, there is no research confirming that there is indeed such a perspective by travellers. Rather, it seems that offsets are currently purchased by travellers who are aware of their impact on the environment, and who may already have minimized their air travel.

2.4.6 A comparison of voluntary carbon offset providers

Figure 6 illustrates how the number of organisations (which cannot be distinguished by region as they operate internationally) in the voluntary carbon offsetting market for aviation has grown in between 1991-2006 (data for 40 organisations available; Gössling et al. 2007). With so many new providers of carbon offsets entering the retail market, it has become quite difficult for potential purchasers to understand what they are buying. As the following statement from a participant in a public forum on carbon offsetting for air travel in the UK (London 2007) indicates,

some consumers are becoming sufficiently concerned by the lack of transparency and credibility of offset providers that have stopped offsetting their flights:

“I’m ambivalent about offsetting and I’ve stopped. As a consumer ... I’ve stopped because I am deeply confused and not sure whether it is the right thing to do or not. And then I’m not clear on how much I should pay and how much good it does.”

Three independent evaluations of offset providers have been conducted and the results of each are summarized below

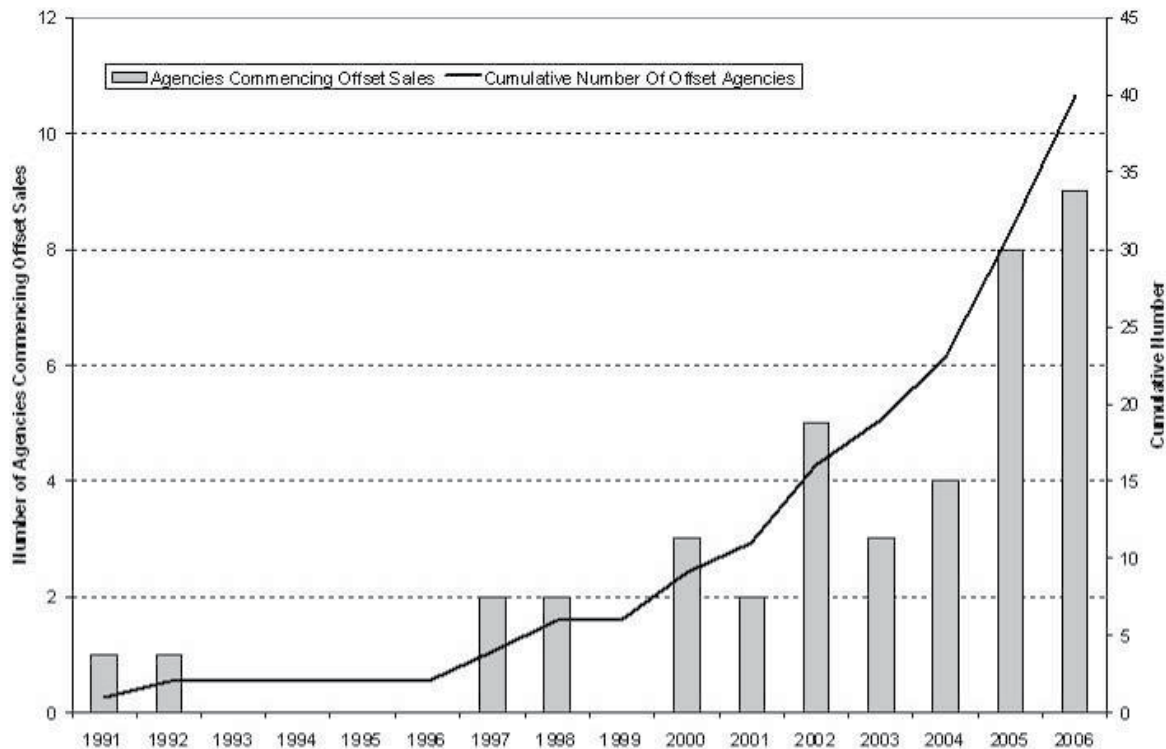


Figure 6: Number of Organisations Commencing Carbon Offset Sales from 1991-2006

Source: Gössling et al. 2007

In one review of carbon offset providers, Gössling et al. (2007) investigated the efficiency and credibility of 41 offset providers focusing on air travel. An overview of offset providers is presented in Table 7 including geographical location, offset sales commence, offset project types (forestry, renewable energy, energy efficiency, other), forestry horizon, an emission/ offset price example, the percentage of income invested in projects, general offset type sole (CER/VER), availability of annual report and charity/for profit status. Note that some offset providers were not willing or not in the position to provide data with respect to some criteria.

As few as six offset providers existed up to 2000, but numbers increased subsequently, with the most rapid growth in recent years (Figure 6). Out of 40 voluntary offset providers, 17 commenced sales in 2005-2006. Several offset providers were previously working with forests, and have only recently started to offer this as a carbon offset

– obviously with a view to an additional income source. Overall, most offset providers are not entirely focusing on aviation, rather than to offer the “neutralization” of emissions in general, including all kinds of transport, but even household- or food-related emissions. Even though no detailed data is available on all offset providers in this rapidly growing market, a recent estimate puts their number at 88 (Ecosystem Marketplace 2007).

As shown in Table 7, there are regional clusters of carbon offset providers. Notably, there is not a single offset provider in a developing country, and most are located in North America, Australia/New Zealand and Europe. The United Kingdom alone counts 14 offset providers, and appears to be the country with the largest single number of such Organisations. Offsetting projects are widely distributed. One general distinction is whether emission reductions are generated domestically or abroad. Furthermore, it is relevant whether those generated abroad are located in Annex I or non-Annex I countries, as this has implications for national greenhouse gas inventories (voluntary offsets can, if located in Annex I countries, contribute to achieve national reduction goals, even though they are meant to be additional). Of those offset providers providing information on their projects, 23 sell emissions reductions generated through domestic projects, while 10 focus in their projects on developing countries, and 8 on a combination of domestic- and projects in developing countries. Gössling et al. (2007) estimate that projects are carried out in about 30-40 different countries. Only a single company, Climate Care, seems to have carried out a project in the Caribbean (St Lucia), focusing on a replacement of conventional light bulbs with low-energy light bulbs. Note that such projects fail to meet the preconditions for projects as outlined by UNFCCC, or more specifically, they cannot be considered additional, as it is fully economic for anyone to replace conventional light bulbs.

With regard to the selection of projects, each offset provider appears to have its own system. For instance, for newly established offset providers, it may for financial reasons be difficult to engage in projects of their own, and they may seek to buy emission reduction units from other offset providers in the market or commercial carbon brokers such as Natsource (US). The more established offset providers such as Atmosfair invest considerable time in selecting projects that meet criteria of the Gold Standard (see previous discussion), but also fulfil criteria for sustainable development. Atmosfair puts particular weight on the establishment of innovative, cutting-edge technology, seeking to invest in highly innovative projects. Other, newly established offset providers such as TICOS in the UK have focused on project submissions, i.e. asking for proposals that are reviewed with regard to both sustainable development criteria and carbon savings. TICOS accepts rather high costs per ton of CO₂ saved (up to £30 per ton) if projects are unique or provide sustainable development benefits that justify such high costs. Most offset providers in the market offer clients to identify projects of their own that can be established in co-operation with the provider. This is potentially of importance should countries in the Caribbean agree on the introduction of voluntary carbon offsetting schemes, as projects within the Caribbean are likely to have a greater appeal to visitors.

Table 7: Characteristics of Carbon Offsetting Organisations

Organisation	Base	Offset Sales Commence	Offset Project Types					Forestry Horizon	% Invested	CER	VER	Report 2005	For Profit
			F	R	EE	CCX	O						
American Forests	USA	2000	x					15	-	N	N	Y	N
Atmosfair	DEU	2005		x	x		x	N/A	>80	Y	N	Y	N
Bonneville Environmental Foundation	USA	1998		x				N/A	40	N	Y	N	N
C-Change Trust	UK	2006	x					40	75	N	N	N/A	N
Carbon Balanced [World Land Trust]	UK	2000	x					20	85	N	N	Y	N
Carbon Clear	UK	2005	x					10	70	N	N	N	Y
Carbon Footprint	UK	2005	x			X		100		N	Y	N	Y
Carbon Fund Foundation	USA	2004	x	x		X		Lifetime	93	N	Y	N	N
Carbon Neutral	AUS	2002	x					30	52	N	N	Y	N
Carbon Neutral Newcastle	UK	2002	x	x	x			99	75	N	Y	N	N
Carbon Planet	AUS	2005	x					100	57	N	Y	N	Y
Carbon Zero	CAN	2006	x	x	x			80	75	N	Y	N/A	Y
Carbonozero	PRT	2005	x					30	61	N	Y	N	Y
Cero CO ₂	ESP	2005	x	x	x		x	20	-	N	Y	N	N
Climat Mundi	FRA	2006		x	x			N/A	70	N	Y	N/A	Y
Climate Care	UK	1998	x	x	x			100	60	N	Y	Y	Y
Climate Friendly	AUS	2004		x				N/A	65	N	Y	Y	Y
Carbon Counter [Climate Trust]	USA	2003	x	x	x			50 or 99	60	N	Y	N	N
CO ₂ balance	UK	2003	x	x				50	90	N	Y	N	Y
CO ₂ Solidaire [GERES]	FRA	2006		x				N/A		N	Y	N/A	N
Conservation International	USA	2006					x	Lifetime	85	N	N	Y	N
Easy Trees	UK	2003	x					40	N/A	N	N	N	Y
Friends of Conservation	UK	2004	x		x			20	100	N	N	N	N

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Organisation	Base	Offset Sales Commence	Offset Project Types					Forestry Horizon	% Invested	CER	VER	Report 2005	For Profit
			F	R	EE	CCX	O						
Green Fleet	AUS	1997	x					Lifetime	>70	N	N	Y	N
Green My Flight	CAN	2006		x				N/A	75	N	Y	N/A	Y
Green Seat	NLD	2005	x					100	N/A	Y	Y	Y	N
Grow A Forest	UK	2005	x					-	-	N	N	N	N
Ebex21 [Landcare Research]	NZ	2002	x					3	77	N	Y	Y	Y
Moor Trees	UK	2006	x					100	90	N	N	Y***	N
My Climate	CHE	2002		x	x			N/A	80	Y	Y	Y	N
Native Energy	USA	2001		x			x	N/A	-	N	Y	N	Y
Offsetters	CAN	-		x	x			N/A	-	-	-	-	N
PrimaKlima Weltweit	DEU	1991	x					30 or 50	90	N	Y	N	N
Terrapass	USA	2004		x		X	x	N/A	-	N	Y	Y	Y
The Carbon Neutral Company	UK	1997	x	x	x			typically 100	60	N	Y	Y	Y
The Conservation Fund	USA	2000	x					Lifetime	-	N	Y	Y	N
Tree Canada	CAN	1992	x					80, 20, 10 or 1	80	N	N	Y	N
Tree Flights	UK	2006	x					Lifetime	65	N	N	N/A	Y
Trees for Life	UK	2002	x					Lifetime	80	N	N	N	N
Trees for Travel	NLD	2001	x					100	≈ 75	Y	Y	Y	N
Vancouver Renewable Energy Cooperative	CAN	2006		x				N/A	90	N	N	N/A	N

Source: Gössling et al. 2007

- Information not available or not disclosed

N/A Not applicable

Key:

F: forestry; R: renewables; EE: energy efficiency; CCX: retired credits from Chicago Climate Exchange; O: Other.

Overall, Gössling et al. (2007) list a number of preconditions for credible and efficient compensation schemes. For instance, emissions should be compensated fully, based on the correct calculation of emissions. This in turn demands adequate aviation data, and the consideration of warming effects by non-CO₂ greenhouse gases. The latter is difficult, though, as the amount of greenhouse gas emissions released during a flight, as well as their contribution to global warming, will necessarily be estimated rather than measured. At the most basic level, this is due to the infeasibility of measuring the emissions of individual vehicles, be they surface vehicles or aircraft. Emissions estimates for the purposes of offsets thus assume average operating conditions and typical engine sizes, allowing emission factors to be applied as multipliers to the distance travelled. At the most detailed level, a more accurate calculation would have to consider the type of aircraft used by the traveller, its fuel use, occupancy rate, route, cruising altitude, the time of the day flown, and even particular weather conditions, such as the presence of supersaturated zones. All of these factors will ultimately affect the individual traveller's contribution to climate change (IPCC, 1999).

The US non-governmental organisation Clean Air-Cool Planet (2006) evaluated 30 retail offset providers using the following seven criteria: prioritization of offset quality, buyer's ability to transparently evaluate offset quality, transparency in provider operations and offset selection, provider's understanding of technical aspects of offset quality, priority assigned by the provider to educating consumers about climate change and climate change policy, ancillary sustainable development benefits of the offset portfolio, use of third-party project protocols and certification. Based on these criteria, the top 25% of providers were recommended to consumers and included: AgCert/Driving Green (Ireland), Atmosfair (Germany), Carbon Neutral co (UK), Climate Care (UK), Climate Trust (US), co2balance (UK), Native Energy (US), Sustainable Travel/My Climate (US). Note, however, that there are substantial differences in between these offset providers, some of which (e.g. Climate Care) have received massive negative media campaigns due to the character of their projects. For instance, one recent article in The Sunday Times (23 September 2007, "The 'carbon offset' child labourers") questioned whether child labour could be part of offsetting schemes, and The Times asked on 28 August 2007: *"To cancel out the CO₂ of a return flight to India, it will take one poor villager three years of pumping water by foot. So is carbon offsetting the best way to ease your conscience?"* Both articles referred to Climate Care.

The Tufts Climate Initiative (2006) based at Tufts University in the US similarly evaluated 13 offset companies using a different set of criteria that included: quality of offsets, standards and verification, quality of air travel calculator parameters and accuracy with available science, price per ton of carbon offset, transparency, company profile (whether or not the company is a non-profit and when established), and overhead percentage used to cover operating costs. The four offset companies that were recommended without reservation were:

- Atmosfair
- Climate Friendly
- MyClimate
- Native Energy

For additional analysis and price comparison of these providers see table 8. In an analysis of customer perspectives on offsetting, Gössling et al. (2008b) concluded that a simple rule for customers is that offset providers offering Gold Standard Certified Emission Reductions (GS CER) are generally acceptable. The combination of Gold Standard, a quality label developed by several non-governmental organisations that is recognized by UNFCCC, and the CER standard guarantee that emissions offsets have been independently verified and registered by UNFCCC, also fulfilling high sustainability standards. GS CER offsets are provided by Atmosfair and My Climate, both of which also cancel credits in the UN registry after these have been sold to customers, to avoid interference of voluntary emission reductions with regulatory markets (registered credits would otherwise "help" the regulatory markets to achieve

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the Kyoto-goals). Another important difference between offset providers is that some include non-carbon effects from aviation, while others focus entirely on CO₂ (cf. table 7 & 8). It is clear that a focus on CO₂ underestimates the effect of greenhouse gas emissions on the climate, and it is thus recommended to choose an offset provider considering the radiative forcing of non-carbon greenhouse gasses (see following section).

Table 8: High Quality Offset Providers and Key Criteria

Offset provider	Reduction units sold	"Uplift" factor for aviation	Cost per t CO ₂	SD*	CERs/ ERUs/ GS CERs cancelled in UN registry?	Recommendation
Atmosfair www.atmosfair.de Germany	GS CERs	2.7	€23	++	Yes	Fully recommended
Climate Friendly www.climatefriendly.com Australia	VERs GS VERs	2.7	€20	+	Not applicable	Not recommended
MyClimate www.myclimate.org Switzerland	CERs, GS VERs GS CERs	2.0	€24-72 (discount possible if >1000 t)	+ / ++	Yes	Recommended, if Gold Standard emission reductions are bought.
Native Energy www.nativeenergy.com USA	VERs	Unclear	€22 (estimate)	+	Not applicable	Not recommended

* SD: Sustainable Development benefits, also considering the innovativeness of projects in terms of establishing new technologies.

2.4.7 Comparing carbon offsets to the Caribbean

Very few offset providers make available their calculation procedures, and the differences in between emissions calculated and prices charged for the same flight can be considerable. Table 8 illustrates this for flights from three major Caribbean tourism markets (New York, Toronto, London). Large differences in the calculation of emissions can be observed in flights from these three markets to the Caribbean region, with the highest estimate being two to three times higher than the lowest estimate. The differential use of radiative forcing indexes (RFI) in calculations of the climate impacts of aviation explains most of the variation in the calculation of emissions in between offset providers (calculations in Table 9 do thus partially only include CO₂, partially CO₂ and non-carbon greenhouse gas emissions). RFIs are used to capture the non-carbon contribution of aviation to global warming, particularly contrail-induced cirrus clouds and nitrogen oxides related ozone generation (cf. Sausen et al. 2005). The contribution of various greenhouse gases to global warming is then compared to CO₂ and expressed as CO₂-equivalent (CO₂-

e). However, the calculation of RFIs is scientifically problematic, as this is a comparison of short- and long-lived, i.e. historically accumulated greenhouse gases, which can only be calculated for a given year (for discussion see UNWTO 2007). The use of RFIs is thus difficult from a scientific point of view, while it would be unacceptable to only focus on the radiative forcing contribution of CO₂. The European Union has suggested to use a factor 2 in its climate policy until the level of scientific understanding has improved, to account for the effects of nitrogen oxides. It is also worth noting that only few carbon offset providers can provide rather exact measures of emissions caused during a flight, and many providers use travel distance and a standard emissions factor for calculations. Others offer basic estimates for travellers relating to short, medium or long haul flights rather than calculating emissions for a specific journey.

The price charged to offset a tonne of carbon was also found to vary substantially, with prices ranging from US\$15/tonne to just over US\$30/tonne. The different rates largely relate to the quality of the offset projects each provider invests in, as discussed in section 2.4.6. For instance, Atmosfair charges the highest prices for offsetting, indicating that high-quality offsetting comes at a higher price.

Table 9: Comparison of Offset Providers from Major Markets to the Caribbean

Offset Company	Tonnes	Cost to offset (USD)	Cost/Tonne
New York (JFK) - Santa Domingo, DR (SDQ) - Round trip			
Atmosfair	1,42	43,98	30,97
The Carbon Neutral Company	0,60	9.18-17.13	15.3-28.55
Climate Care	0,55	8,69	15,80
My Climate	1,16	17,75	15,30
Zerofootprint			
Climate Trust (via Carbon Counter)	1,84	22,08	12,00
Toronto (YYZ) - Santa Domingo, DR (SDQ) - Round trip			
Atmosfair	1,58	48,26	30,54
The Carbon Neutral Company	0,80	12.24-22.84	15.3-28.55
Climate Care	0,65	10,22	15,72
My Climate	1,35	20,62	15,27
Zerofootprint			
Climate Trust (via Carbon Counter)	2,18	26,16	12,00
London-Heathrow (LHR)- Santa Domingo, DR (SDQ) - Round trip			
Atmosfair	4,74	140,39	29,62
The Carbon Neutral Company	1,50	22.94-42.83	15.29-28.55
Climate Care	1,96	30,97	15,80
My Climate	3,18	48,49	15,25
Zerofootprint			
Climate Trust (via Carbon Counter)	5,14	61,68	12,00

Situational Analysis

Offset Company	Tonnes	Cost to offset (USD)	Cost/Tonne
Toronto (YYZ) - Havana Cuba (HAV) – Round trip			
Atmosfair	1,24	38,01	30,65
The Carbon Neutral Company	0,60	9.18-17.13	15.3-28.55
Climate Care	0,51	8,03	15,75
My Climate	1,09	16,63	15,26
Zerofootprint	0,50	7,83	15,66
Climate Trust (via Carbon Counter)	1,71	20,52	12,00
London-Heathrow (LHR) - Havana Cuba (HAV) - Round trip			
Atmosfair	5,48	162,34	29,62
The Carbon Neutral Company	1,60	24.47-45.69	15.29-28.55
Climate Care	2,11	33,39	15,82
My Climate	3,42	52,10	15,23
Zerofootprint	1,60	25,07	15,67
Climate Trust (via Carbon Counter)	5,51	66,12	12,00
New York (JFK) - Bridgetown, Barbados (BGI) - Round trip			
Atmosfair	1,92	58,36	30,40
The Carbon Neutral Company	0,70	10.70-19.99	15.28-28.56
Climate Care	0,74	11,70	15,81
My Climate	1,53	23,31	15,24
Zerofootprint	0,70	10,97	15,67
Climate Trust (via Carbon Counter)	2,48	29,76	12,00
Toronto (YYZ) - Bridgetown, Barbados (BGI) - Round trip			
Atmosfair	2,08	62,86	30,22
The Carbon Neutral Company	0,90	13.76-25.70	15.30-28.56
Climate Care	1,08	17,08	15,81
My Climate	1,76	26,86	15,26
Zerofootprint	0,90	14,10	15,67
Climate Trust (via Carbon Counter)	2,88	34,56	12,00
London-Heathrow (LHR) - Bridgetown, Barbados (BGI) - Round trip			
Atmosfair	4,38	130,13	29,71
The Carbon Neutral Company	1,50	22.94-42.83	15.29-28.55
Climate Care	1,89	29,85	15,79
My Climate	3,06	46,68	15,25
Zerofootprint	1,40	21,94	15,67
Climate Trust (via Carbon Counter)	4,97	59,64	12,00

Source: compiled by authors from offset providers websites on 15 December 2007.

2.4.8 Traveller perspectives on voluntary carbon offsetting

A critical dimension of voluntary carbon offsetting for travel is consumer perceptions of the need to act to reduce travel related GHG emissions. A number of market surveys have been conducted over the past five years in order to examine three main themes:

- 1) Perception of environmental impact of air travel.
- 2) Support for policies to reduce the environmental impact of air travel.
- 3) Willingness to take personal action to reduce the environmental impact of air travel (reduce flying, willingness to pay for offsets, etc.).

The results of 11 surveys from Britain, USA, Canada, Australia, and one multi-national survey are summarized in Table 10 for each of the above themes.² Results are organized by nation to facilitate comparison of public opinion in major markets for the Caribbean.

In the European market, there appears to be increased public awareness of the impact of aviation on the environment, specifically its contribution to climate change, since 2000. This may be attributed to the growing discourse on the environmental impacts of aviation in the media. The level of public knowledge remains uncertain however, with evidence that some travellers are unaware or underestimate GHG emissions from air travel, while others substantially overestimate emissions as a proportion of total emissions.

There is evidence for public support of government policies to regulate GHG emissions from aviation in Europe. No similar evidence was found, either from public opinion surveys or scientific literature, for the North American market. Generally, survey information suggests the European market has greater concern about the contribution of air travel on climate change and higher stated willingness to act to reduce or offset emissions from personal travel. For example, support for a carbon tax on air travel was highest among European travellers (80%), followed by North American (75%) and Asian travellers (59%). Support for passenger taxes on air travel was highest when the revenues would go toward improving the environment. There is also some evidence that a small portion (less than 20%) of travellers in Europe and Australia are considering flying less for their holidays in order to reduce their personal GHG footprint. Much broader surveying is needed to confirm this trend in major market regions and to assess in more detail which market segments and destinations might be more affected. Market surveys have also revealed a large gap in stated willingness to pay for carbon offsets and the proportion of travellers that actually pay for offsets. Surveys indicate a broad willingness to pay some amount for carbon offsets in several nations (UK 61-75%, Canada 70%, US 69%), however the proportion that state they have paid to offset at least some of their flights is generally less than 5%. The Institute for Environmental Studies (2007) multi-national survey and Becken (2007) found that some travellers were unwilling to participate in offsetting voluntarily when so many other passengers were not. Because of this 'free flyer' problem it was argued that little could be expected from tourists in terms of voluntary initiatives to reduce emissions and that consideration should be given to making carbon offset or tax payments compulsory rather than voluntary, a system recently introduced with very positive results by UK-based tour operator Explore! (Gössling et al. 2008b). Some surveys (e.g. Dawson) have also revealed doubts amongst consumers that carbon offsets will make any difference to the environment, however, the level of understanding about how offsets work and the reason(s) for doubts about their effectiveness were not examined.

² Other market surveys are known to exist, but the results are not publicly available (i.e. carbon offset companies have undertaken their own market surveys, but consider this information proprietary).

Situational Analysis

Many NGOs, both in Europe and North America, are known to be actively engaged in raising public and corporate awareness about GHG emissions from air travel and tourism more broadly. Consequently, public awareness should be anticipated to increase over the next five years, with a greater influence on travel decision-making in these major markets for the Caribbean. Monitoring of trends in public opinion on air travel and the environment and willingness to pay for carbon offsets, either through evaluation of publicly available surveys or by conducting surveys with travellers to the Caribbean region, should be incorporated into a future climate change adaptation strategy for the Caribbean tourism sector.

Table 10: Summary of Traveller Surveys on Air Travel and the Environment

A - Perception of environmental impact of air travel
<u>Britain</u> (DEFRA 2001) 65% agree transport in general is a contributor to climate change (National Statistics Omnibus Surveys - 2002, 2006) 2002 - 62% believed air travel harmed the environment 2006 - 70% believe air travel harmed the environment - Those who flew more frequently were more likely to consider air travel harmful to the environment than those who had not flown at all in the last year or had flown once - Those in managerial/professional occupations and with higher income levels were particularly likely to strongly agree air travel harms the environment 64% agreed that "the current level of air travel has a serious effect on climate change" (Nunwood 2007) - UK consumers in general overestimated carbon dioxide emissions from aviation (as % of UK emissions) <u>Canada</u> (Dawson et al. 2007) 69% believed that "air travel is a contributor to climate change"
B - Support for policies to reduce the environmental impact of air travel
<u>Britain</u> (World Environmental Review 2007) 46% think the government should impose a carbon tax on all domestic and international flights (National Statistics Omnibus Survey – 2003, 2005) 2003 - 78% agreed people should be able to travel by plane as much as they want to - Agreement fell to 17% if "air travel harms the environment", then 59% were against unrestricted air travel - More frequent travellers are more likely to support unrestricted travel even when potential environmental consequences are considered 2005 - agreement that "people should be able to travel by plane as much as they like" fell to 70% (from 78% in 2003) (Ipsos MORI 2006) - Between 37% and 58% support policies aimed at slowing down growth in air travel - Support was higher for airlines paying higher taxes (55% to 65%) to reflect the environmental damage done by aircraft than higher passenger duties (47% to 57%) - Support for passenger taxes on air travel was highest when the revenues would go toward improving the environment (71% to 74%).

C - Willingness to take personal action to reduce the environmental impact of air travel

Britain

(World Environmental Review 2007)

- 18% claim to have cut back on air travel in the last year
- 13% say they would be willing to cut back on air travel in the future

(Taylor Nelson Sofres 2007)

- Majority of holidaymakers would be unwilling to change their travel plans to a more environmentally-friendly alternative
- 7% of tourists said they would be "quite likely" to choose a green destination; 2% are "very likely" to do so
- 14% said they would opt for a tour or holiday tour operator which is involved in a carbon offsetting scheme
- Only 4% reported to make a payment to offset their travel over the last year

(Travel Insurance Web 2007)

- 61% of tourists would pay a "green tax" (of an unspecified amount) to help balance the impact air travel has on the environment

(National Statistics Omnibus Survey – 2006)

- Respondents who believed air travel harms the environment (70%) were asked whether they agreed in principle with the price of a plane ticket reflecting environmental damage caused by air travel and how much extra they would be prepared to pay:
 - o 63% agreed the price should reflect even if this makes air travel a bit more expensive
 - o 47% agreed the price should reflect even if it makes air travel much more expensive
 - o Older people were more likely to support additional payments
 - o Managerial/professional and intermediate occupations were more likely to support an increase in the price of a ticket
 - o Those who had flown were less likely to support price increases than those who had not
- Respondents who agreed air travel harms the environment were asked if they would be willing to pay extra on the price of their ticket or nothing extra at all:
 - o 2006 - 24% would not be willing to personally pay any more for a plane ticket to reflect environmental damage caused by flying; 55% willing to pay 15% more, 35% willing to pay 20% more
 - Female travellers willing to pay more than males (56% would pay more, 40% pay an additional 20%) and the male figures were (43% and 31% respectively)
 - o 2002 - 82% believed that a 5% increase would be acceptable, 56% believed a 10% increase would be acceptable, 29% agreed with a 15% increase

USA

(Travel Horizons Survey 2007)

- More than 50% said they were more likely to select an airline, rental car or hotel that uses more environmentally friendly products
- 50% said they would be more likely to use an airline if they knew it took the initiative to offset carbon emissions
- 13% said they would be willing to pay higher rates for demonstrated environmental responsibility (56% said they might)
- 76% said they would pay less than 10% extra per usage (flight, night)

Canada

(Conference Board of Canada/ Canadian Tourism Research Institute 2007)

- 70% said they would pay US\$10 or more for every US\$1,000 (~1%) of a flight cost, if the funds were collected to develop sustainable resources of energy and reduce GHG emissions

(Innovative Research Group, 2007)

- 44% of Canadians say carbon-offset programs will make minor differences towards improving the environment; 39% feel such programs will make no difference at all
 - o Albertans (61%) are most likely to feel offsets have no effect on the environment;
 - o Quebecers (12%) most likely to think they will make a difference
- 23% said they are likely to pay an extra US\$10 for carbon offsets when buying an airline ticket; drops to 14% for US\$20 extra and 8% for US\$50 extra
- People who are not convinced offsets work will not buy at any price

(Dawson et al. 2007)

- 12% willing to pay a carbon offset/carbon tax in addition to the price of an airline ticket
- Reasons why not willing to participate in air travel carbon offset schemes included a lack of understanding of what a carbon tax is (20%) and what the money would be used for (33%), not knowing what company to trust (19%), and a perception that it would be too expensive (6%)
- Of those willing to pay more to offset their carbon emissions from air travel, the majority would pay 5-10% of the price of their airline ticket on top of the ticket price

C - Willingness to take personal action to reduce the environmental impact of air travel

Australia

(Totaltravel.com 2007)

- 18% said they would give up air travel as it caused irreparable harm to the environment
- 32% said they would not stop flying on planes because it was quick and convenient for travel
- 16% said they did not care about climate change and it would not affect their travel choices
- 35% are looking at voluntary carbon-offsets for future flights taken

Multi-national

(Poverty Reduction and Environmental Management Program 2007)

- 75% were willing to pay a carbon tax on air travel (80% of Europeans, 75% of North Americans and 59% of Asians)
 - o Only 14% protested against paying, mainly due to the disbelief that a carbon tax will have any real positive benefit for the environment.
- For those willing to pay, the average amount ranged from 20 eurocents per 100km (Asian travellers) to 1 euro per 100km (European travellers)

2.4.9 Comparing offset costs with willingness to pay

While the stated willingness to pay for carbon offsets for air travel outlined in Table 10-C must be considered with some degree of caution, Table 11 provides a comparison of the range of current offset costs from six carbon offset suppliers for flights from major markets (London, England; New York, USA; Toronto, Canada) to the Caribbean region with the stated willingness to pay (WTP) for offsets from travellers in the nations where the survey was conducted. Importantly, all of the available studies examined willingness to pay for carbon offsets and not the cost travellers were willing to accept (WTA), through charges for the environmental damage of air travel, in order to still be able to travel to their destination of choice. The scientific literature has shown WTA to be a higher amount than WTP in many areas of environmental stewardship.

Offset costs from London to Caribbean destinations ranged from 1% to 13% of total flight costs depending on the season of the flight and offset provider selected. Surveys in the UK indicate that 82% of this market would be WTP the lowest offset cost and that just over half would also be WTP for the highest offset cost (Table 10). Mandatory offset costs would therefore only become an impediment for travellers from this market if the highest range were imposed.

The range of offset costs from New York to the Caribbean was very similar to that from London, ranging from 1% to 13%. The majority of respondents to a market survey in the US indicated WTP less than 10% extra, suggesting that many may not be WTP for the high range of offsets, but WTP for the mid to low range offset costs. As with the UK market, the minimum offset range would not appear to pose a substantial barrier to the majority of travellers from the US.

Offset costs from Toronto to the Caribbean were found to represent a lower percentage of flight costs (1% to 6% range), largely due to high average flight costs. Two surveys in this marketplace suggest very different WTP for the minimum range of offset costs, with one survey indicating 70% are WTP the minimum range of 1%, but another suggesting only 23% would be willing to pay US\$10 extra that generally represents the minimum offset cost. If the first survey is accurate, then like the US and UK markets, the minimum offset does not represent a barrier to Caribbean travel for the majority of the Canadian market.

Table 11: Comparison of Offset Costs to the Caribbean and Stated WTP for Offset

Source Market and Destination	Flight Cost in US\$ (a)	Range of Offset Costs in US\$ (b)	Offset Cost as Percentage of Flight Cost	Stated Willingness to Pay (WTP)
London				
Santa Domingo	Max US\$1995 Min US\$1395	Max US\$140 Min US\$23	Max 10% Min 1%	(2006 survey) 55% WTP 15% extra
Havana	Max US\$2045 Min US\$1230	Max US\$162 Min US\$24	Max 13% Min 1%	
Bridgetown	Max US\$1752 Min US\$1216	Max US\$130 Min US\$22	Max 11% Min 1%	
New York				
Santa Domingo	Max US\$835 Min US\$345	Max US\$44 Min US\$9	Max 13% Min 1%	76% WTP <10% extra
Havana	Max N/A Min N/A	Max N/A Min N/A	Max N/A Min N/A	
Bridgetown	Max US\$1004 Min US\$588	Max US\$58 Min US\$11	Max 10% Min 1%	
Toronto				
Santa Domingo	Max US\$1025 Min US\$799	Max US\$48 Min US\$10	Max 6% Min 1%	70% WTP 1% extra
Havana	Max US\$1401 Min US\$731	Max US\$38 Min US\$8	Max 6% Min 1%	23% WTP US\$10 extra 14% WTP US\$20 extra
Bridgetown	Max US\$1079 Min US\$761	Max US\$62 Min US\$14	Max 8% Min 1%	8% WTP US\$50 extra

- (a) Maximum and minimum flight costs reflect the range of fares over four seasons: mid-Feb, mid-May, Mid-August, and Mid-Nov. Flight costs obtained from the web sites of British Airways, American Airlines and Air Canada on 15 December 2007.
- (b) The range of offset costs represent the lowest and highest offset quote obtained from the web sites of Atmosfair, The Carbon Neutral Company, Climate Care, My Climate, Zerofootprint, Climate Trust (via Carbon Counter) on 15 December 2007.

A recent study on voluntary carbon offsetting perceptions (Gössling et al. 2008b) has shown that willingness to participate in these schemes can be improved. The study (n=300) found that one major problem with current offsetting schemes is that most air travellers seem not yet aware of opportunities to address the environmental impact of their travel: only about a quarter of the respondents were aware of options to participate in voluntary carbon offsetting. Furthermore, even though most air travellers believed that climate change is real and a problem to which aviation contributes, only about one third of the sample saw emissions caused by flying as their responsibility. Airlines are thus required to more actively engage in emission reductions, while they should omit to discursively question the contribution of aviation to climate change, which is confusing for customers. The study concluded that only if the airlines' own environmental action is credible, the precondition for participation in offsetting is given. This, however, also demands better information, dialogue, transparency and access, as well as communication

of the outcome of offsetting projects in between airlines and air travellers. Similar results were also presented by Dawson et al. (2007), indicating that the cost of the offset may in fact be a secondary factor in decisions to buy/not buy offsets.

2.4.10 Summary of voluntary instruments

Carbon offsetting is a promising tool to compensate for emissions from aviation, even though it should, from a climate change perspective, be combined with a mandatory system for emission reductions, such as the EU ETS. There are now a large number of voluntary offset providers, even though only few offer Gold Standard Certified Emission Reductions (GS CERs), the best standard for emission compensation, while also addressing non-carbon greenhouse gas emissions. As the review of several offset providers has shown, additional costs of offsetting may be in the order of 1-10% of air fares, even though credible offsets (GS CERs) will rather tend towards the higher end of the price range.

There are now many studies showing that air travellers are increasingly concerned about their contribution to climate change. These travellers seem often willing to compensate their emissions, even though uptake of voluntary carbon offsetting schemes is still low, including only 2-5% of air travellers. This share can probably be increased if a number of measures are taken:

- Opportunities to offset emissions have to be communicated more widely, as only a minor share of travellers seems sufficiently informed about voluntary carbon offsetting.
- Airlines and aviation organisations have to stop spreading contradicting information on the environmental harmfulness of aviation, such as that aviation is only responsible for a negligible share of global emissions, and that there are continuous specific emission reductions. Only if airlines are honest about their significant and growing contribution to climate change will travellers feel obliged to contribute to voluntary compensation schemes.
- This cannot be seen as a PR exercise or it may have real consequences for tourism in the form of consumer backlash. Airlines thus need to cooperate with credible voluntary offset providers offering Gold Standard Emission Reduction Units and multiplying the amount of CO₂ released with at least a factor 2, as foreseen for the EU ETS by the European Union and recommended in the UK by the Department of Environment, Food and Rural Affairs (DEFRA 2008).
- Airlines have to engage in emission reductions by seeking to operate new aircraft with the newest technology, and they should thus communicate their efforts to reduce absolute emission reductions.
- Tour operators should introduce mandatory offsetting, possibly in combination with an incentive system. For instance, British tour operator Explore! introduced mandatory offsetting in 2007, with only very few customers not supporting the system. An example for an incentive approach is provided by Fritidsresor, a Swedish tour operator, which matches each payment made by a traveller with the same amount.
- Re-investing the money collected from travellers in offset projects with sustainable development benefits in the respective destinations can improve willingness to pay, particularly if there are options for travellers to visit the projects they have paid for. These projects can include mitigation and adaptation, to help particularly poor people in developing countries to live with the consequences of climate change.

2.5 Sector Response

Four major types of greenhouse gas reduction strategies occur in the tourism sector: reducing energy use (i.e. energy conservation), improving energy efficiency (i.e. carrying out the same operation with a lower energy input), increasing the use of renewable or carbon neutral energy (i.e. substituting fossil fuels with energy sources that cause lower emissions), and sequestering CO₂ through carbon sinks (e.g. through afforestation or in aquifers or oceans, and in geological sinks) (Becken and Hay 2007). The wide ranging mitigation initiatives that are being undertaken in the tourism sector world-wide is summarized by UNWTO–UNEP-WMO (2008). While relatively few tourism operators have established voluntary or legally binding GHG emission targets (however see UNWTO–UNEP-WMO (2008) for industry leaders that have targets), the Pacific Asia Travel Association (PATA) issued CEO Challenge for Confronting Climate Change may change this significantly as tourism industry leaders from many sectors are meeting in April 2008 to discuss a collective response by the tourism sector (PATA 2008).

The aviation sector has adopted a number of initiatives to reduce greenhouse gas emissions. For reasons of economics and corporate social responsibility, airlines try to be as fuel efficient as possible. Fuel is now a major cost for airlines at about 20-30% of direct operational costs (Hanlon 2007, IATA 2008) and airlines continue to introduce fuel saving technologies, renew fleets to remove older and less efficient aircraft (e.g. Air France-KLM have committed US\$3 billion a year to 2020 to help achieve cut fuel consumption and GHG emissions – Associated Press 2008), reduce engine-on time when on the ground (e.g. single-engine taxiing, plug into electric gate power to avoid running auxiliary power units, use tugs to position aircraft), reduce operating weight, choose more efficient flight paths (direct routing and climb-cruise-descend at optimal airspeed), and push for improvements in air traffic management systems.

Fuel efficiency has improved in the airline industry over the past four decades, but not the often cited 70% improvement that simply compares the worst fuel using jet in the 1960s with the most efficient new jet and does not account for fleet average efficiencies or that slower piston-engine commercial passenger planes 40 years ago were as fuel efficient as current jets (Gössling and Peeters 2007). Boeing's 787 Dreamliner (rolled out in July 2007) is however 20% more fuel efficient at the same air speeds compared with today's commercial jets. The IPCC expects future emission reduction potentials from combined improved engine and airframe technology in the order of 20% between 1997 and 2015 and 30-50% between 1997 and 2050 (Penner et al. 1999). Peeters and Middel (2006) estimate that fuel efficiency between 2000 and 2050 will be less than 40%.

The use of alternative fuels is also being researched by the aviation sector. Aviation fuels must stay liquid at low temperatures found at cruising altitudes, and also have a high energy content by volume. Currently available biofuels do not match these requirements well and are not suitable for use in aviation, except in a very low mix ratio with jet fuel. However, a commercially viable bio-jet fuel could possibly be available in the near future as tests of Brazilian and US researchers have performed sufficiently for the US Air Force specifications (Cascio 2006) and Virgin Atlantic and Air New Zealand begin biofuel demonstration flights using Boeing 747s in early 2008 (Squatriglia 2007).

While biofuels hold promise for reducing GHG emissions from aviation, the exact feedstock will be an important determinant for the future of this technology, as several recent government studies have demonstrated that the aggregate environmental impact of some biofuels, including US corn, Brazilian soy and Malaysian palm oil, are worse than the fossil fuels they replace (Zah *et al.* 2007, Scharlemann and Laurance 2008). The airline industry clearly has a vested interest in maintaining and increasing air travel, however, at their last Annual General Meeting in 2007, IATA (2007) outlined a number of challenges on their pathway to what they coined as a "zero emissions future". Whilst these perhaps should be considered in light of a vested industry response they are listed here:

Situational Analysis

1. Air Traffic Management: IATA calls for a Single Sky for Europe, an efficient Pearl River Delta in China and a next generation air traffic system in the US (which the IATA estimates would reduce GHG from aviation in the US by 10-15%), to be implemented by governments so as to facilitate more direct routing as an emission reduction strategy.
2. Technology: IATA calls on the aerospace industry to build a zero emissions aircraft in the next 50 years. Basic research on a zero-emissions aircraft should be coordinated.
3. A Global Approach: IATA asks the International Civil Aviation Organization (ICAO) and its 190 member States to deliver a global emissions trading scheme that is fair, effective and available for all governments to use on a voluntary basis.
4. Green businesses: IATA is developing IATA Project Green to help airlines implement global best practice Environmental Management Systems.

3.0 STAKEHOLDERS

This chapter presents the summary data gathered through a process of stakeholder consultation and secondary data collation conducted through the life of the project. These activities also informed other chapters of the report in particular chapter 4, 'Inventory of Caribbean Initiatives to Reduce the Carbon Footprint of Tourism'. In this initial project over thirty stakeholders from more than 15 regional organisations in the Caribbean were consulted. Semi-structured interviews were conducted with selected stakeholders using a pre-defined qualitative questionnaire. The objective of these semi-structured interviews, coupled with a number of unstructured interviews, was to gather information on the challenges and opportunities that climate change presents for the Caribbean tourism sector in the context of the issues that this project addresses. The questions and topics used for discussion are given in Box 3; examples of the stakeholders consulted are given in Box 4, and contact details, additional information sources and other relevant organisations are given in Chapter 6 of this report. The rest of this chapter is divided into two sections presenting the summary data from individual stakeholder interviews, the first section presents the Challenges and Opportunities that Climate Change and Rising Travel Costs present for the Caribbean Tourism Sector, as perceived by the stakeholders; and the second, Information and Assistance Requirements.

Box 3: Questions and discussion topics in semi-structured interviews of regional stakeholders

- 1) In the context/face of climate change what challenges and opportunities do you see for the Caribbean in the short term (next 1-3 years)?
- 2) In the context/face of climate change what challenges and opportunities do you see for the Caribbean in the medium term (next 3-5 years)?
- 3) In the context/face of climate change what challenges and opportunities do you see for the Caribbean in the long term (next 5-10 years)?
- 4) How do you see these challenges and opportunities in relation to other long haul destinations such as Africa, Australia, New Zealand and small islands in the Pacific or Indian oceans? (e.g. is the Caribbean better off or worse off than other destinations?)
- 5) What do you believe are the key information requirements for the Caribbean region in the face of climate change? (e.g. what are the knowledge gaps?)
- 6) What kind of assistance do you think the Caribbean region needs to be able to adapt and mitigate climate change?
- 7) What origin region do you see as most vulnerable to the impacts of government and voluntary initiatives reacting to climate change and will most affect the Caribbean in a negative way? And why?
- 8) Do you know of any initiatives in the Caribbean that exist to reduce the carbon footprint of tourism?
- 9) How do you think tourism to the Caribbean will develop / evolve under the 'rising costs of air travel' scenarios?
- 10) If through a combination of schemes such as 'offsetting', inclusion in ETS and programmes to reduce the carbon footprint of tourism in destinations the Caribbean became a 'carbon neutral' tourism region how do you think this would affect consumer demand for the region? And in the light of the 'increased cost of air travel' scenarios, please comment.

Any other comments and discussion on the issues surrounding the topics of this report?

Box 4: Examples of Stakeholders consulted in the Caribbean Region

NAME	POSITION	ORGANISATION / INSTITUTION
Ms. Mareba Scott	Sustainable Tourism Product Specialist	Caribbean Tourism Organization (CTO)
Ms. Alison Brathwaite	Programme Director	CARIFORUM Tourism Programme Unit
Dr Kenrick Leslie	Director	Caribbean Community Climate Change Centre (CCCCC)
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Ms. Sharon Miller	Multi-Sector Specialist	Inter-American Development Bank (IADB)
Ms. Anja Thomas,	Senior Project Officer Sustainable Development	Caribbean Community Secretariat (CARICOM)
Dr. Gem Fletcher	Programme Manager Sectoral Programmes	CARICOM
Ms. Donna Mc Rae-Smith	Project Officer Sustainable Development	CARICOM
Ms. Beverley Reynolds	Programme Manager Human and Social Development	CARICOM
Mr. Leighton Waterman	Project Associate Caribbean Renewable Energy Development (CREDP)	CARICOM
Ms. Daphne de Vidal-Beauville	Programme Officer Tourism and Sustainable Development Unit	Organisation of Eastern Caribbean States (OECS)
Mr. Peter A. Murray	Programme Officer Environmental and Sustainable Development Unit	Organisation of Eastern Caribbean States (OECS)
Mr. Rodinald Soomer	Head, Macroeconomic and Sectoral Policy Unit	Organisation of Eastern Caribbean States (OECS)
Dr. Christopher Cox	Senior Programme Officer	Caribbean Environmental Health Institute (CEHI)
Ms. Mercedes Silva	Sustainable Tourism Adviser	Association of Caribbean States
Mr. Nigel Hosein	Executive Director	Caribbean Association of Electric Utilities (CARILEC)
Mr. Andre Escalante	Director	Energy Dynamics
Mr. Dennis Pantin	- Head of Economics Department & - Coordinator of Sustainable Economic Development Unit for Small Island Developing States	University of West Indies (UWI)
Dr. Marlene Attzs	Senior Technical Officer Sustainable Economic Development Unit for Small Island Developing States	University of West Indies (UWI)
Dr. Matt Wilson	Research Scientist Department of Geography	University of West Indies (UWI)
Mr. McHale Andrew	Research and Development Consultant	Caribbean Regional Sustainable Tourism Development Programme (CRSTDP)
Ms. Judith Crane-St. Hill	Deputy Permanent Secretary	Government of Saint Lucia, Ministry of Tourism
Mr. Crispin D' Auvergne	Chief Officer and UNFCCC Focal Point	Government of St Lucia, Sustainable Development and Environment Unit of Ministry of Economic Affairs (SLSDEU)
Ms. Alma Jean	Project Coordinator for the Second National Communication to UNFCCC	SLSDEU
Ms. Dawn Pierre-Nathaniel	Project Coordinator Special Programme for Adaptation to Climate Change	SLSDEU
Ms. Laverne Walker	Coastal Zone Coordinator	SLSDEU
Dr. James Hepple	Tourism Consultant	St. Lucia Tourist Board
Mr. Keats Compton	President	Marine Industries of St. Lucia (MIASL)
Ms. Yvonne Agard	Project Officer	St. Lucia Hotel and Tourism Association

NOTE: Within the resources available for this project, allowing particularly for budgetary and time constraints, extensive and valuable data was gathered from key organisations and individuals in the region. It is, however, a recommendation of this report that further projects should be developed to extend the stakeholder consultations relating to the issues addressed in this report.

3.1 Challenges and Opportunities that Climate Change and Rising Travel Costs present for the Caribbean Tourism Sector

Perhaps unsurprisingly, many stakeholders initially cited the physical direct and indirect impacts of climate change on destinations as some of the biggest challenges facing the Caribbean tourism industry. Issues mentioned included coastal erosion, coral bleaching, threats and changes to biodiversity, changes in levels and seasonality of precipitation, and increased incidence of extreme events such as floods and storm surge. Following further discussion concerning the topics relating to this study, concerns more pertinent to this particular report were expressed:

3.1.1 'Caribbean not alone'

It was noted by many that increased travel costs, be they the result of any combination of government taxes, fuel price increases, inclusion of aviation in emission trading schemes and/ or voluntary offsetting, will affect all medium and long haul destinations. There was serious concern over rising costs (see for example section 3.1.4 below) but there was general agreement amongst the stakeholders interviewed that the Caribbean would not be alone in being affected and therefore this would result in a 'level playfield' for all destinations and regions competing in similar markets.

3.1.2 'Source Markets'

Every stakeholder interviewed was of the opinion that travellers from the European Union (EU) would be the most likely to alter their travel patterns with regard to the Caribbean, i.e. reduce their demand for the region. The stakeholders believed this to be due to a variety of reasons, for example: the high level of awareness of climate change issues in the EU; the desire of governments to act on the mitigation of climate change through increasing taxes; and the increasing levels of 'enviro-guilt' present in the European travelling public driven by the media and voluntary offset companies. A small number of stakeholders considered that Canadians would also be subject to the pressures but that conflicting guilt about damaging the Caribbean economy and the livelihoods of the people would result in no change to demand for the region. All the stakeholders believed that travellers from the United States (US) would be the less likely to reduce their demand for the region although most believed this would happen eventually as awareness gradually raised in the US origin market.

3.1.3 'Higher Yield Tourists'

Most stakeholders were concerned that there would be less tourists travelling to the Caribbean region in the medium-term (3-5 years) and long-term (5-10 years) but believed that there would be an increase in 'higher value' tourists i.e. those with a higher than average expenditure in the region. Many of the stakeholders made the point that some destinations are actively targeting this higher yield market already for other less altruistic reasons.

3.1.4 'Decreasing Demand'

The majority of stakeholders believed that an overall (combined) 10% increase in travel cost would lead to a 1-5% decrease in consumer demand for the region and that a 25% increase in overall travel costs to the Caribbean would result in a much larger decrease in demand (15%+).

3.1.5 'Carbon Neutral Tourism Region'

All the stakeholders believed that if the Caribbean region became a carbon neutral tourist destination, that this would generate media attention and create a positive, environmental image for the region, encouraging more tourists to travel to the Caribbean. They all believed that this would compensate, in varying degrees, for the potential reduction in consumer demand expected due to increased travel costs. In summary, there was strong support for the development and implementation of policies and strategies aimed at establishing the Caribbean as a carbon neutral tourist destination/region (see Simpson et al 2008 for more detail on this concept).

3.1.6 'Push-Pull Factors'

The link between physical impacts and destination choice was raised repeatedly by the stakeholders in terms of shifting 'push-pull' factors (unfavourable climate condition in country/place of origin of tourists and favourable conditions at destinations). If physical conditions at a given Caribbean destination deteriorate as a result of climate change, i.e. water shortages, increase in vector borne diseases such as dengue fever, loss of attractiveness due to coastal and shoreline erosion, biodiversity loss e.g. coral bleaching, this coupled with increased prices will alter the usual 'push-pull' factors to the detriment of that destination. At the same time, environmental actions conducted at destination level by tourism stakeholders may address the physical impacts of climate change and raise the desirability of the destination to travellers who are more sensitive to environmental issues and choose to book accordingly. According to many stakeholders these actions together with an increase in standards of service and levels of hospitality may go some way to compensate for increased costs by encouraging more people to the destination. However, this was tempered by the opinion of other stakeholders that 'price rules'.

3.1.7 'Livelihoods and SMMEs'

Significant concern was raised by every stakeholder over the social, economic and livelihood impacts of rising travel costs and climate change. It was noted that small-medium and micro enterprises (SMMEs), which are prolific in the Caribbean, are particularly vulnerable. Food security, housing, and other poverty issues were raised consistently by the stakeholders.

3.1.8 'Additional Industry Sectors'

Most of the stakeholders also raised important anxieties over other related sectors and secondary industries and how a potential reduction in demand for tourism in the region would affect sectors such as agriculture, water, arts and crafts, food and beverage (restaurants), land use, finance, and construction. Energy use, security and efficiency was the related sector most commonly raised, this is addressed in more detail in Chapter 4 of the report.

3.1.9 'Opportunities for Stakeholders and the Region'

Many of the stakeholders identified a series of opportunities these mainly focused on the potential for increasing links across different organisations or groups (stakeholders in the climate change and tourism nexus). For example, opportunities were identified for sectors to work in closer coordination or perhaps to be forced into working closer together due to the threats associated with climate change. The water, energy, health, waste management, land use and agricultural sectors were seen as key areas that would benefit from the requirement to work more closely across the issue of tourism and climate change. Benefits for the region were expected from other stakeholders working more closely together such as international development agencies and United Nations (UN) agencies e.g. Canadian International Development Agency (CIDA), the German Development Agency (GTZ), the UK Development Agency (DFID), the UN Environment Programme (UNEP), the UN World Tourism Organization (UNWTO), UN Development Programme (UNDP), the World Meteorological Organization (WMO). Should development banks including the World Bank and the Inter-American Development Bank work closer together as a result of climate change this was also expected to potentially benefit the region.

3.1.10 'Other Opportunities Identified'

A number of stakeholders believed that the climate change agenda would result in a more sustainable and diverse 'energy mix' in the region i.e. an increase in the use of renewable energy technologies. Another opportunity or benefit was expected to be the chance to re-examine policies relating to the environment and climate change, both the obvious and the not so obvious, and the opportunity to initiate a more thorough environmental assessment of the Caribbean region.

3.1.11 'Political Problems'

A lack of cross-departmental and inter-ministerial collaboration was identified as a serious problem by stakeholders the vast majority of stakeholders interviewed also made reference to the fact that due to the political system in every country being based on a 4 – 5 year term in office there was a tendency towards short-term goals rather than taking a more long-term view of the issues surrounding climate change.

3.2 Information and Assistance Requirements for the Caribbean

Table 12 below gives the summary data gathered from the stakeholders interviewed regarding the knowledge gaps currently present in the Caribbean region and areas where these key stakeholders believe assistance is required. The information and assistance requirements have been divided in the table into themes to enable easier access.

Table 12: Information and Assistance Requirements for the Caribbean

Theme 1: Awareness Raising and Understanding
The private sector is not as engaged in awareness raising and understanding to a great enough extent, government information to them is not sufficient. Involvement needs focus.
Priorities are not clear; there should be a better understanding of specific impacts, and the difference between the short-, medium- and long-term issues.
General awareness is not the only or the main issue; there needs to be clarity concerning different tourism activities, geophysical issues and different sectors related to tourism e.g. how will climate change affect yachting, diving, fishing and other water sports individually; how will climate change affect agriculture, water, coastal zone management, biodiversity, energy and other sectors in specific nations and destinations.
Too often some knowledge is present but this is not transferred and developed into policy and implemented.
Theme 2: Cooperation and Collaboration
Inter-sectoral and inter-ministerial planning processes do not exist at anywhere near an appropriate or effective level. There are problems of understanding and awareness in individual ministries as well as across ministries. Cohesive and effective policies are required.
Cross-region and multi-national agreements and understandings need to be initiated with a clear set of actions to be implemented.
Developed nations need to do more in the mitigation of climate change.
Greater leadership is required for the Caribbean region and for the collaboration of nations, increased diplomatic and negotiating skills in the international arena are essential, currently there is fragmentation.
The private sector and the public sector should have stronger links and cooperative agreements.
Theme 3: Data, Studies, Projects and Funding
Sufficient and effective tools and instruments are not available to assess the situation on a destinational, national or regional level. Rhetoric is not enough a strong scientific basis is required for studies in the region
More and easier accessibility to funding is required to conduct the necessary research and develop practical tools and implement effective strategies. Funding should also be sourced for monitoring programmes.

- More in-depth and thorough studies are required at all levels; in particular data is required at all levels and in all relevant sectors. This needs addressing in terms of data collection, collation and availability.
- Large-scale projects are specifically required addressing the needs of destinations, nations and also the region as a whole – using a sectoral approach i.e. addressing tourism through its integral sectors e.g. energy, water, waste, agriculture, biodiversity, coastal planning.
- Environmental audits must be embedded into the culture of Caribbean nations.
- A meaningful, responsive and continuous set of indicators are required for the differing sectors and different aspects of climate change. Following the collection of baseline data through the use of these indicators, a regular monitoring programme must be conducted. ‘Snapshots’ of the situation are not sufficient.
- Incentives from the state are required for the private sector to encourage emissions reduction and to facilitate decision-making i.e. tax waivers on energy saving devices.

The themes and individual subject areas focusing on ‘requirements’ and ‘knowledge gaps’ overlap and coincide in many areas, some of the most acute and most frequently mentioned are the areas of data, monitoring, policy development and implementation. Figure 7 below illustrates these key areas that appear to be in critical need of development in order to strengthen the position of the Caribbean region in the face of a changing climate and global warming.

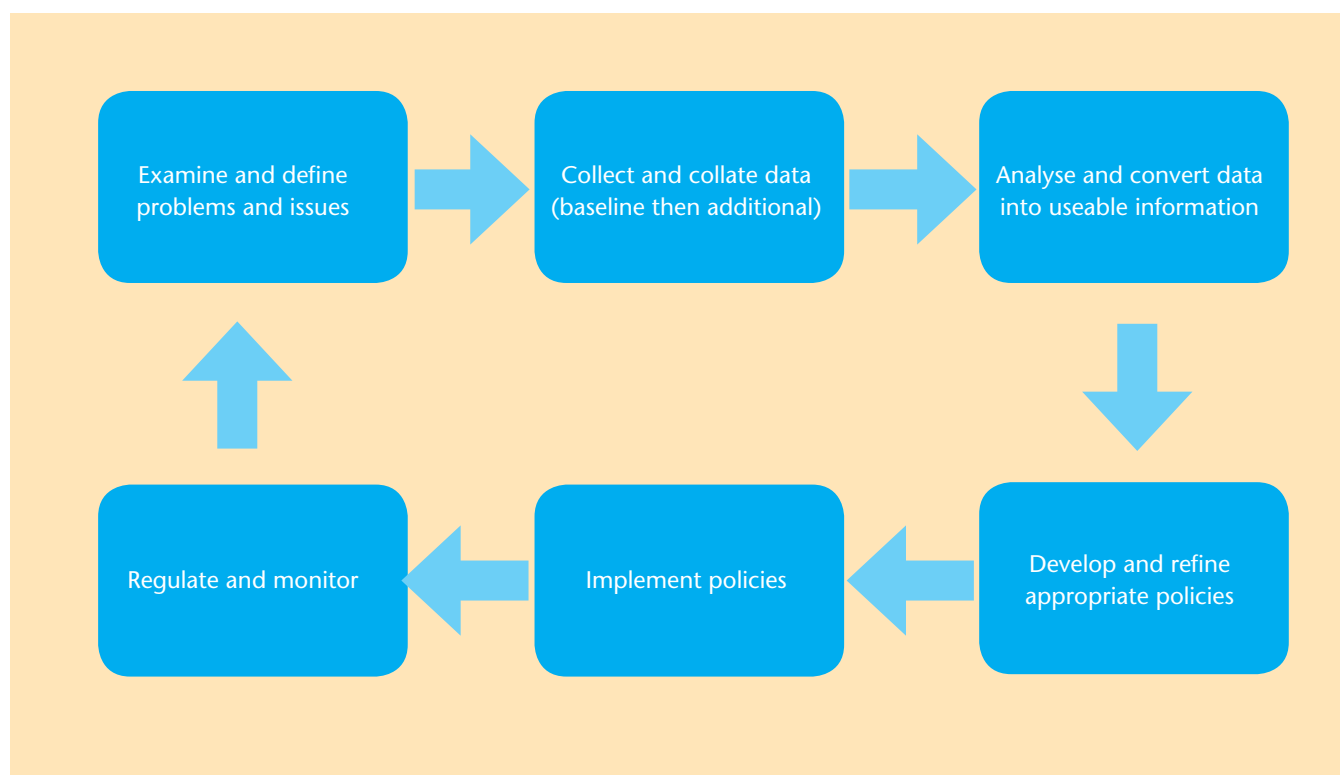


Figure 7: The Caribbean Climate Change Information and Implementation Nexus

4.0 Case Studies of Initiatives to Reduce the Carbon Footprint of Tourism

This chapter presents a selection of initiatives in the Caribbean that either aim to, or appear to reduce the carbon footprint of tourism. The chapter also gives the summary data from the stakeholder interviews that relate to renewable energy options for the Caribbean region. The following case studies are not presented to be a comprehensive listing of such projects; they are designed to be a representative sample of initiatives in the region. An inherent problem quickly became apparent in this phase of the project relating to the collection and collation of these initiatives. Many of the initiatives that appeared to aim to reduce carbon emissions in fact seemed to have been implemented in order to reduce energy costs and/or reliance on an erratic grid electricity supply. The stakeholders interviewed as part of this project supported this view; it was the opinion of many stakeholders that at the current time there are few projects that are specifically designed to reduce the carbon footprint of tourism. However, this does not detract from the fact that the following selected case studies contribute to the reduction of Caribbean tourism's carbon emissions in a variety of ways.

The case studies in the chapter include: a selection of energy efficiency projects in the tourism sector (e.g. lighting and air-conditioning); and a selection of linkage projects facilitating the uptake of nationally produced materials e.g. agricultural produce and processed food and beverages (these projects while assisting the local and national economy also reduce the need for imports and their associated transport requirements, thereby reducing emissions). The case studies below also include: examples of the use of renewable energy sources by the tourism sector such as solar power; design practices in the construction of accommodation e.g. natural ventilation; and carbon offset funds operating in the region.

Case Study 1

Reduction of Aviation Emissions, Costa Rica

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

Climate Change Mitigation 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 organisation 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.

Organisation(s) Implementing Tools, Techniques, Policies or Measures:

www.natureair.com

Case Study 2

Cruise ships reducing their emissions and waste, Caribbean

Tourism Destination and Situation: Caribbean

Climate Change Mitigation 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 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 cruiseships, 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 greywater 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.

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

Case Study 3

3 Rivers Eco Lodge, Dominica

Tourism Destination and Situation: 3 Rivers Eco Lodge, Dominica

Climate Change Mitigation Impact: Reducing the dependence on fossil fuels and the associated emissions through developing an effective renewable energy system.

Reducing water consumption and the need for chemicals or fertilizers by composting kitchen waste and recycling grey-water for irrigation purposes.

Mitigation Tools, Techniques, Policies or Measures: The 3 Rivers Eco Lodge has developed a renewable energy system that meets all the energy requirements for the resort. All kitchen and garden waste is turned into compost to grow organic food on the property. All grey water is treated and then re-used to water the garden.

Solar energy powers the entire 3 Rivers Eco Lodge resort. The water supply is pumped from the river using a solar-powered pump, which works in silence to avoid disturbance.

The resort has also modified a pick-up truck to run on used vegetable oil as well as diesel fuel. The truck has reduced emissions by 93% and is recycling oil which previously had sometimes been discarded by local restaurants in rivers and ravines.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: 3 Rivers Eco Lodge.

Case Study 4

Spice Island Beach Resort, Grenada

Tourism Destination and Situation: Spice Island Beach Resort, Grenada

Climate Change Mitigation Impact: Reducing the impact of tourism on the environment and the reduction in emissions through energy conservation measures

Mitigation Tools, Techniques, Policies or Measures: The resort has implemented a number of different environmental practices all of which help to reduce the negative impact of the resort on the local environment. A number of practices also help to reduce waste, the need to transport food and waste and energy saving technology to reduce energy needs. The resort has a home grown herb garden and natural composting to reduce the need for food from outside and the removal of kitchen and food waste. The resort uses solar heating for the hot water system, has a desalination plant and uses energy saving light bulbs and other consumption reducing devices. The resort has installed timers on outdoor lights to ensure they are not left on permanently. Most of the laundry is line-dried to reduce the need for electronic dryers.

The resort has also enlisted the help of the guests as they are offered the option of just having their linen changed every other day in a bid to reduce the water and electricity used in washing. Environmentally friendly cleaning products and chemicals are also used.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: Spice Island Beach Resort.

Case Study 5

Bucuti Beach Resort, Aruba

Tourism Destination and Situation: Medium-sized accommodation: Bucuti Beach Resort, Aruba

Climate Change Mitigation 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:

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

A full list of pro-environmental measures can be downloaded at:

http://www.bucuti.com/_pdfs/about_us_en/bucuti-env-updates.pdf

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

Case Study 6

Curtain Bluff Resort, Antigua and Barbuda

Tourism Destination and Situation: Curtain Bluff Resort, **Antigua and Barbuda**

Climate Change Mitigation Impact: Reducing the emissions through effective alternative technologies.

Reducing the emissions from importing food and other products.

Mitigation Tools, Techniques, Policies or Measures: The resort has obtained Green Globe 21 accreditation.

Curtain Bluff uses a membrane bioreactor wastewater treatment system which filters water more efficiently than traditional water systems.

The resort is fortunate in that due to its location on the bluff, cooling sea breezes mean air conditioning is not necessary. However, it is available if required. The air-conditioning units that are in place use an earth-friendly refrigerant.

Landscaping plants for the resort are cultivated in the on-site nursery and local ingredients and products are used in the restaurant.

In addition, all cleaning products used are non-toxic reducing the negative impact on the water system.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: Curtain Bluff resort, Antigua. Caribbean Alliance for Sustainable Tourism.

Case Study 7

Lastminute.com

Tourism Destination and Situation: Various destinations including Bahamas

Climate Change Mitigation Impact: Carbon offsetting of flight emissions.

Reduction in the need for petrol and diesel through the use of biofuels created from other waste products.

Mitigation Tools, Techniques, Policies or Measures: lastminute.com has established a carbon-offset scheme on their website called carbonwise. When booking a flight on the website, customers are also able to see the carbon dioxide emissions created and the cost associated with offsetting is displayed with the final ticket price. The customer can then choose to offset their flight.

One of the projects to benefit from the scheme is in the Bahamas where waste cooking oil from cruise ships and tourist restaurants is being converted to biofuel. The biofuel can then be used by local taxis, tour-boat operators and dive boats to power their vehicles. This is reducing the need for petrol or diesel.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: lastminute.com, Carbon Trust, Climate Care

Case Study 8

Beautiful Oceans, Grenada

Tourism Destination and Situation: Dive Operator Beautiful Oceans, Grenada

Climate Change Mitigation Impact: Reducing the impact of carbon emissions through an offsetting programme.

Mitigation Tools, Techniques, Policies or Measures: Beautiful Oceans is an eco-dive tour operator and coral reef education organisation that offsets the carbon emissions of all the flights and dives associated with their eco-dive vacations.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: Beautiful Oceans, Sustainable Travel International (STI), Aqua Dreams Travel, www.beautifuloceans.com

Case Study 9

Pilot project on the use Renewable Energy Technologies, Trinidad and Tobago

Tourism Destination and Situation: Trinidad and Tobago

Climate Change Mitigation Impact: Reducing the emissions associated with water heating systems

Mitigation Tools, Techniques, Policies or Measures: The use of solar water heating systems in the tourism sector to supplement existing hydrocarbon-based sources of energy. It is hoped the pilot project will be able to inform a national renewable energy policy and programme. Funding has facilitated the substitution of electric water heaters in member host-home facilities with solar water heater systems.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: Ministry of Energy and Energy Industries (MEEI), Government of the Republic of Trinidad and Tobago; Tourism Development Company Ltd (TDC), United Nations Development Programme, Global Environment Facility – Small Grants Programme (GEF/SGP), Tobago Bed and Breakfast Association (TBBA), Trinidad Host Home Association (THHA), bpTT

Case Study 10

Stonefield Estate Villa Resort, St. Lucia

Tourism Destination and Situation: Stonefield Estate Villa Resort, St Lucia Hotel, St. Lucia

Climate Change Mitigation Impact: Reducing transport emissions by using local products.

Reducing the emissions associated with importing furniture and the waste associated with disposing of old infrastructure.

Reducing water consumption through careful planting with in the grounds.

Mitigation Tools, Techniques, Policies or Measures: The resort actively supports local products by buying goods from local farmers, shopping at the local market and having local suppliers deliver organic fruit and vegetables to the resort. The resort also has their own fruit trees and vegetable garden.

The resort makes much of its own furniture from wood rather than importing plastic furniture that has to be replaced every 8 months. The production of wooden furniture not only reduces the need for resource intensive oil-based plastic but creates work for local people and prevents plastic going to landfill.

The resort has also been constructed to make the most of their natural position on the coast by ensuring the natural Caribbean breezes can flow through the resort.

Solar heaters generate much of the energy requirements and other energy-saving methods such as timers on lights and solar cells have been installed. The water tanks have also been installed at a level that does not require electric pumps as gravity ensures the water is available.

Plants at the resort have been carefully selected to ensure they do not require watering and can survive naturally in the environment.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: Stonefield Estate Villa Resort

Case Study 11

Paradise Bay, Grenada

Tourism Destination and Situation: Paradise Bay Resort, Grenada

Climate Change Mitigation Impact: Reducing the impact of the resort on climate change through reducing emissions

Mitigation Tools, Techniques, Policies or Measures: Paradise Bay has installed an 80KW windmill with an expected yearly yield of 180,000kWh. The resort has an estimated yearly power use of 120,00kWh so will be better than carbon zero. The surplus energy will be sold to the local electricity company.

Paradise Bay is also encouraging other resorts to adopt wind energy and actively assists them with feasibility studies, provides practical advice and will even offer installation support if required.

The resort has also installed air conditioners with heat recovery units. This means that any heat loss is converted into hot water. Solar water heaters are also in operation.

The resort also offers a carbon offset program where all flights by guests will be offset by carbon credits purchased by the resort automatically.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: Paradise Bay Resort

Case Study 12

Casuarina Beach Club, Barbados

Tourism Destination and Situation: Casuarina Beach Club, Barbados

Climate Change Mitigation Impact: Reducing the emissions produced as a result of the products purchased and transported for the resort.

Mitigation Tools, Techniques, Policies or Measures: The Casuarina Beach Club operates a responsible purchasing policy. When screening potentially new products, several questions are asked such as can the product be reused or recycled? Does the product contain recycled materials? Is the packaging minimal? Is it non-toxic and/or biodegradable?

Cooking oil is strained and sent to a recycling centre. Most other products such as glass, plastic and paper are either reused and/or recycled.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: Casurina Beach Club

Case Study 13

Eastern Caribbean Geothermal Development Project (Geo-Caraibes)

Tourism Destination and Situation: Eastern Caribbean (Dominica, St. Lucia and St. Kitts and Nevis)

Climate Change Mitigation Impact: Using renewable energy sources to reduce the dependency on fossil fuels.

Mitigation Tools, Techniques, Policies or Measures: Dominica, St. Lucia and St. Kitts and Nevis possess geothermal resources that may be exploitable for commercial power generation. However, before GEF funding efforts had been unsuccessful. The aim of the project is to maximise geothermal development by aggregating demand including inter-island transmission and to create market conditions for development.

The project also aims to influence policy to ensure that there is a balance between protection of national resources and attracting investors and the establishment of geothermal-specific laws.

It is expected that a large quantity of geothermal energy capacity (60 – 120 MW) will be developed and that the resulting power will offer the countries a low-cost power solution.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: GEF, Organization of American States (OAS), Dominica, St. Lucia, St. Kitts and Nevis, UNEP.

Case Study 14

Caribbean Renewable Energy Development Programme (CREDP – GTZ)

Tourism Destination and Situation: Caribbean Hospitality Sector

Climate Change Mitigation Impact: Reduction of the Caribbean region's dependency on fossil fuels and a reduction in greenhouse gas emissions.

Mitigation Tools, Techniques, Policies or Measures: The programme is aiming to create a framework of conditions for renewable energy investments in selected Caribbean countries. The objectives include providing policy advice to Caribbean governments, capacity building of stakeholders, identification and support of renewable energy investment projects and raising awareness amongst the public.

In Caribbean hotels, up to 60 per cent of the total energy use can be from air conditioning and refrigeration with hot water accounting for 15 per cent. Energy Dynamics Limited has calculated that highly efficient air conditioning units with appropriate controls can save up to 35 per cent of the total, solar thermal heating can save 15 per cent and automatic timers can save 3 per cent.

There are a number of renewable energy sources that the hospitality sector can introduce including solar heating for hot water systems, photovoltaic electricity generation, hydropower and biofuels.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: Global Environment Facility (GEF)

Case Study 15

Caribbean Solar Financing Project

Tourism Destination and Situation: Dominica, Grenada and St. Lucia

Climate Change Mitigation Impact: Reducing the dependency on non-renewable energy sources.

Mitigation Tools, Techniques, Policies or Measures: The availability of sufficient and reliable financing has limited the uptake of solar hot water systems within Dominica, Grenada and St. Lucia. The Caribbean Solar Finance Programme (CSFP) aims to reduce the constraints on, and increase the capacity for, financing solar hot water systems on the three islands. The programme is also hoping to raise awareness of the benefits of converting to solar-powered water systems.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: Caribbean Solar Financing Project.

Case Study 16

Global Sustainable Energy Islands Initiative (GSEII)

Tourism Destination and Situation: Small Island States especially Grenada, Dominica, St. Lucia, St. Kitts and Nevis.

Climate Change Mitigation Impact: Mitigate barriers and transform energy systems from fossil-fuel based to sustainable energy systems. Reducing dependence on fossil fuels and greenhouse gas emissions.

Mitigation Tools, Techniques, Policies or Measures: Accelerate the transition toward cleaner, more sustainable energy use through, amongst other things, encouraging private investment and trade.

Each nation is involved in the development and implementation of sustainable energy plans that identify actions to increase the uptake and use of sustainable energy options. The appropriate policy is also implemented along with incentive measures. There is also some assistance in securing financing and investment sources.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: GSEII is a consortium of international NGOs working with Alliance of Small Island States (AOSIS). Other partners include Energy and Security Group, United Nations Industrial Development Organization (UNIDO), Organisation of American States Unit for Sustainable Development and Environment, Climate Institute and International Network for Sustainable Energy.

Case Study 17

Ministry of Energy and Public Utilities, Barbados

Tourism Destination and Situation: Barbados

Climate Change Mitigation Impact: Reduce the use of fossil fuels.

Mitigation Tools, Techniques, Policies or Measures: Barbados has developed a variety of tax incentives to promote solar energy and energy conservation. A study was conducted in the 1970s and found that tax incentives for solar energy could save the island US\$50 million of energy in less than two decades, with a cost to the Government of US\$6.6 million in tax revenues.

In 1974, the Fiscal Incentives Act was enacted. It included exemptions on the raw materials for solar water heaters from the 20 per cent import duty, and simultaneously a 30 per cent consumption tax was placed on conventional electric water heaters.

The simple thermosyphon solar water heater consists of a solar collector or solar panel, a tank and the interconnecting plumbing.

Over 50 hotels now use the renewable energy method. The large-scale integrated designs cover the hotel roof with solar collectors and have large tanks which each hold up to 25,000 litres. The heat from the central air conditioning unit can also be used to preheat the water.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: Ministry of Finance, Solar Dynamics, SunPower and AquaSol.

Case Study 18

Sewerage and Solid Waste Project Unit of the Ministry of Health, Barbados

Tourism Destination and Situation: Barbados

Climate Change Mitigation Impact: Reducing the need to make new glass and plastic bottles and reducing emissions associated with production.

Mitigation Tools, Techniques, Policies or Measures: Barbados introduced the Returnable Containers Act in 1985 to encourage dealers of beverages to use returnable containers. The Act provides for the sale of drinks in containers, the payment of a deposit on containers, a refund for the return of containers and the final disposal of unused or unusable containers.

The Act covers beverage containers for carbonated drinks, non-carbonated soft drinks, mineral water, soda water and beer. It covers for the return of glass, metal, aluminium, steel or plastic bottles, cans or jars

Organisation(s) Implementing Tools, Techniques, Policies or Measures: Ministry of Health, Barbados.

Case Study 19

Architectural Innovations

Tourism Destination and Situation: Design and construction of tourist accommodation

Climate Change Mitigation Impact: Use of design and technology to achieve reduction in energy costs and carbon emissions.

Mitigation Tools, Techniques, Policies or Measures: OBM International are advocates and designers of 'green' buildings by using renewable energy such as solar e.g. photovoltaic cells made in windows themselves rather than placing panels on rooftops also making for better design. Using regional woods for building materials e.g. Santa Maria which is found in the Antilles from Cuba to Jamaica; this can not only diminish costs but also reduce carbon emissions caused by transporting woods from other more distant locations. Designs also incorporate natural ventilation and natural stone such as terrazzo, marble and porcelain to reduce the need for air-conditioning, thereby reducing carbon emissions.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: OBM International www.obmi.com

Case Study 20

Caribbean Community Climate Change Centre (CCCCC), Belize

Tourism Destination and Situation: Based in Belize (all sectors throughout the Caribbean (not tourism specific))

Climate Change Mitigation Impact: Reducing the overall impact of climate change on the region through a number of specific climate change projects.

Mitigation Tools, Techniques, Policies or Measures: The Caribbean Community (CARICOM) Heads of Government have established a centre that provides a range of services and products relating to research, impact assessment, response strategies and systematic observation of climate change in the region.

The Caribbean Environment Network (CEN) Project was implemented to improve environmental quality and coastal and marine natural resource protection, by promoting the use of environmentally sound practices in the tourism industry. Training workshops and manuals have been developed on a variety of issues including Sand Dune Management and Public Awareness.

The CCCCC coordinates the Caribbean region's response to climate change. The Centre is the key node for information on climate change issues and on the region's response to managing and adapting to climate change in the Caribbean. It is the official repository and clearing house for regional climate change data, providing climate change-related policy advice and guidelines to the Caribbean Community (CARICOM) Member States through the CARICOM Secretariat. In this role, the Centre is recognised by the United Nations Framework Convention on Climate Change (UNFCCC), the UNEP, and other international agencies as the focal point for climate change issues in the Caribbean. It has also been recognised by the United Nations Institute for Training and Research (UNITAR) as a Centre of Excellence. The CCCCC has strong links with international funding bodies and has managed projects with the Global Environment Facility (GEF), CIDA, DFID, the Ford Foundation and other funding bodies. The staff of CCCCC have managed a number of significant projects in the region including Caribbean Planning for Adaptation to Climate Change (CPACC) and Mainstreaming Adaptation to Climate Change (MACC).

In Antigua and Barbuda and Barbados, desalination plants have been constructed. In some CARICOM states, such as St Vincent and the Grenadines, building codes require cisterns to be constructed for water capture and storage.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: CCCCC, Caribbean Governments, CARICOM, GEF (and other funding bodies), University of West Indies.

Case Study 21

Papillote Wilderness Retreat, Dominica

Tourism Destination and Situation: Dominica

Climate Change Mitigation Impact: Reducing the import of food and the reliance on external markets. Reducing the amount of fuel used and the emissions generated in providing food for the restaurants.

Mitigation Tools, Techniques, Policies or Measures: Offering holiday makers the chance to stay in sustainable, environmentally-friendly accommodation without damaging the surroundings.

At the Papillote Wilderness Retreat, the restaurant serves freshly-caught seafood, cooked Creole-style using locally grown fruit and vegetables.

The Papillote also offers tourists the chance to visit the Carib Indian Territory to learn about the indigenous people of Dominica thus raising awareness.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: Papillote Wilderness Retreat

Case Study 22

Mocking Bird Hill Hotel, Jamaica

Tourism Destination and Situation: Port Antonio, Jamaica.

Climate Change Mitigation Impact: Contributing to biodiversity improvements through carbon offsetting.

Mitigation Tools, Techniques, Policies or Measures: For those guests staying on the Heavenly Honeymoon package, the hotel offsets their calculated carbon footprint by contributing to the Jamaican Conservation Development Trust. The Trust uses satellite images to increase biodiversity through planting fast-growing trees in the National Park.

The hotel offsets their own carbon emissions and enables their guests to offset the emissions produced by their flights.

The hotel also contributes directly to the Jamaica Conservation Development Trust (JCDT) which aims to preserve the environment. The NGO has a reforestation programme using native Jamaican forest trees.

In cooperation with JCDT, the hotel offers guests two different carbon offsetting projects. Honeymooning couples are given a package, which includes a gift certificate and the planting of two trees by JCDT. In the second option guests can indicate when they make their reservation, or at check-in or check-out, whether they would like to add a contribution to offsetting the carbon emissions that they generated during their travel. For example, the contribution for long-haul flights is 3 trees at a cost of US\$ 30. This contribution goes towards JCDT's tree planting programme.

To prevent wastage of natural resources through leaks and other faults, regular preventative maintenance checks are conducted on equipment.

The hotel is investigating the installation of an alternative energy system but in the mean time there are other energy reduction methods in operation. These include turning off the automatic doors on storerooms so they are not left open when staff enter, using lower wattage bulbs in areas where bright light is not required and using energy saving fluorescent bulbs in the kitchens.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: The hotel has teamed up with Sustainable Travel International (STI) who have an accredited carbon offsetting programme.

Case Study 23

Tiamo Resorts, Bahamas

Tourism Destination and Situation: Bahamas, Tiamo resort

Climate Change Mitigation Impact: Reducing the impact of the resort on the surrounding environment and reducing the need for electricity generation on site.

Mitigation Tools, Techniques, Policies or Measures:

The site clearing for the resort was done by hand using machetes and chainsaws to preserve the existing vegetation. All transport materials to the Tiamo site was done by hand, using small shallow draft boats to reduce the likelihood of the dredging that a larger vessel might do.

Buildings were carefully designed so that each is elevated to reduce the impact on the site and for cooling purposes. The buildings themselves have been used with wraparound porches which keep direct sunlight from the main living areas, reflective roofs, and an open design to maximise airflow.

There are no recycling facilities in the Bahamas so the resort has had to be creative in how solid waste is dealt with. All food waste is composted and paper products, if not reused, are burnt. The compost and ashes are used to fertilize the gardens.

Tiamo has a large solar field which can generate over 130,000 watts each day. 100% of the electrical needs are met by renewable energy sources.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: Tiamo Resort

Case Study 24

Caribbean Alliance for Sustainable Tourism (CAST)

Tourism Destination and Situation: Caribbean islands.

Climate Change Mitigation Impact: Reducing the impact of tourism businesses on the environment through changing practices and introducing more efficient approaches to business.

Mitigation Tools, Techniques, Policies or Measures: CAST was established by members of the Caribbean Hotel Association (CHA) to remote responsible environmental and social management within the hotel and tourism sector. Amongst other things, CAST provides guidance and expertise in environmental management systems.

CAST is also assisting hotels by conducting energy audits, and is a leading advocate of incentives for the promotion of energy efficient technology, the development of standards and building codes and the provision of attractive interest rates for the purchase of energy efficient technology. As part of this, CAST also documents specific case studies including performance measurements to determine cost benefits of energy conservation.

Part of CAST's strategic focus is to promote standards of environmental performance and leadership in the travel and tourism sector through certification. In May 2006, CAST inaugurated a new Green Globe Caribbean Benchmarking award with the first winners being all hotels in Aruba.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: Caribbean Alliance for Sustainable Tourism.

Case Study 25

Star Island, Bahamas

Tourism Destination and Situation: Star Island, Bahamas

Climate Change Mitigation Impact: Reducing the impact of the construction of a resort.

Mitigation Tools, Techniques, Policies or Measures: Star Island, due to open in 2009, is expected to be a showcase for the latest and most innovative sustainable technologies, materials and practices.

The construction has been carefully planned and sourced to ensure all the materials used are fully sustainable. The structures are to be built with eco-friendly systems like cold-formed steel which is primarily made from recycled materials.

The whole resort will also be entirely powered by alternative energy sources including solar, wind and microhydro. The buildings will also have geothermal temperature-control devices.

The beds will have renewable-bamboo sheets.

Organisation(s) Implementing Tools, Techniques, Policies or Measures: The Stella Group, Ltd.
www.starislandbarbados.com

4.1 Renewable Energy Options for the Caribbean

When considering power generation on a macro/national scale, according to the Caribbean Association of Electric Utilities (CARILEC) there are still no viable alternatives that could compete on price with oil for power generation (or coal or natural gas in the countries where their use is a feasible option). Most Caribbean islands are too small for present nuclear power technology, and commercial power generation based on hydrogen technology is not expected to become available until the distant future. CARILEC's recent Position Paper on Energy Policy released in January 2008 (CARILEC 2008) noted that in the past five years an increased need has arisen in many Caribbean States for establishing an Energy Policy. The paper states that the major factors that have driven Caribbean Governments towards energy policy initiatives are: increased oil prices; the dependency on oil; security of supply; environmental concerns; no economies of scale, particularly on the smaller islands of the Caribbean.

The situation has encouraged national governments and utility companies to explore more closely the best possible and economically most feasible options in the field of renewables. As described in the CARILEC report in the Caribbean the obvious options are: wind power, biomass, geothermal, ocean thermal, hydropower and bio-options like ethanol, landfill gas, palm oil/jatropha plant oil. Indirectly, solar power could also reduce the power demand when solar water heating is used instead of electric water heating. As part of this exploration of renewables CARILEC produced an annex to the CARICOM Draft Energy Policy released in January 2007, a section of this annex refers specifically to renewable energy sources with the aim to reduce dependence on fossil fuels (see Table 13).

The CARICOM secretariat is also promoting the use of renewable energy and the transformation of renewable energy markets in the Caribbean region through its execution of the Caribbean Renewable Energy Development Programme (CREDP) and through a forthcoming proposal to the European Development Fund for assistance in the sustainable management of energy resources. However, it is clear from the CARILEC Draft Energy Policy that that recommendations are likely to state that renewable energy applications must be technically and economically feasible and/or in line with governmental targets (subsidized in case of non economic feasibility), and are energy efficient.

Table 13: CARICOM- Actions on Renewable Energy Sources

WAY FORWARD , ANNEX to the CARICOM Draft Energy Policy dated January 2007. The following action items relating to Renewable Energy Sources are recommended for consideration. In order to reduce the dependence on fossil fuels, Member States will:	
a)	Develop comprehensive national energy policies that seek to increase the use of commercially viable renewable energy sources to 10% of primary energy by the year 2010;
b)	Draft and implement legislation and regulations to promote the use and development of renewable energy sources;
c)	Draft and implement regulatory and legislative enactments to require utilities to use or increase the utilization of renewable energy sources in the electricity sector;

WAY FORWARD, ANNEX to the CARICOM Draft Energy Policy dated January 2007. The following action items relating to Renewable Energy Sources are recommended for consideration.

In order to reduce the dependence on fossil fuels, Member States will:

- d) Ensure that the synergies between agricultural production and the renewable energy sector are optimized (e.g. for bio- energy sources such as bio-ethanol, biodiesel and biomass);
- e) Identify available renewable energy sources and technologies that are practical, commercially viable and suited to particular Member States;
- f) Encourage the substitution of renewable energy technologies that may be damaging to human health (e.g. charcoal and wood stoves) with more benign commercially viable renewable energy technologies;
- g) Encourage short and long term programs for active research, development and training in renewable energy technologies and designs;
- h) Establish South-South cooperation programs as a means to harness existing expertise from outside the region;
- i) Encourage the use of carbon trading opportunities as a means of enhancing the financial returns of renewable energy projects;
- j) Strengthen the Energy Desk of the CARICOM Secretariat, inter alia, to: (i) Research, advise on, recommend, co-ordinate and conduct educational programmes on renewable energy; (ii) Promote commercially viable renewable technologies; (iii) Develop model laws and fiscal policies to support renewable energy; (iv) Update CARICOM renewable energy targets, identify sources of grant financing and establish links between regional renewable initiatives (e.g. the Caribbean Renewable Energy Development Programme, the Wigton Wind Farm Centre of Excellence, Barbados Renewable Energy Centre).

Some of the challenges for the Caribbean region in adopting a larger percentage of renewables into the energy mix are summarized below:

Solar: While this energy initiative is being used quite widely in Barbados this is mainly due to the incentives provided by government and focuses primarily on water heaters. It must be noted however that solar companies in Barbados and St. Lucia have extended their services to other CARICOM states. Despite the obvious interest and potential in this form of power, solar is very expensive to install and in reality only a subsidy makes it feasible (this is also the case in other countries such as Germany and France). National utilities are currently not considering solar as an option, however it remains an option for individual hotels for logistically geographic and economic reasons (and possibly marketing purposes). In such cases solar power in the Caribbean is often more reliable than traditional energy sources.

Wind: Whilst this source of power is one of the most viable, along with solar, it is also expensive to install and off shore wind farms in particular extremely so. This tends to throw out any sense of economic benefit. Having said this, national utilities in the Caribbean are considering an energy mix that sources a maximum of 25% of their energy from wind power. Problems with wind farms also stem from land use issues including aesthetics, cost of acquiring land and competing interests for land use, such as hotels and other tourist facilities.

Geothermal: Islands that could seriously consider geothermal power (from volcanic activity) include Montserrat, St. Vincent and St. Lucia. However, the exploratory costs for this type of power are extremely high and capital costs are also very expensive. This energy source is very reliable but the gases used in geothermal power are highly corrosive increasing the cost of installation making economies of scale unrealistic. Although there is some discussion about Dominica supplying Guadeloupe with power from a geothermal system this is only at the concept stage.

Biofuels: The 'jury is still out' on biofuels. The sugar cane and banana industries have been in decline for years in the Caribbean and as a result the use of sugar as a biofuel has attracted the interest of politicians, particularly from a 're-employment' perspective. St. Kitts have had Brazilian energy consultants studying the possibilities on the island. Again, a critical issue with this energy for small islands is economies of scale.

Hydro: Dominica and St Vincent both use hydro power as part of their energy mix, but only as a small percentage. Hydro is not fully reliable due to varying volumes of water and the power plants on these islands are not producing their capacity or even near to it. Unfortunately small islands are too vulnerable for this to be a truly practical option. Guyana, however, are investigating a 11,000 megawatt hydro power plant to supply a number of Caribbean islands ultimately as far north as Puerto Rico. The main concern with this plan surrounds the issue of the sovereignty of the production and supply of power, which lies in the hands of each individual Caribbean state.

On a micro/individual resort or user scale, as seen in some of the case study examples in section 3.2 of this report there are a number of energy conservation technologies that can be implemented individually or in combination to achieve lower costs and lower carbon emissions. These include guest room controls for hotels, high efficiency air-conditioning systems and solar hot water systems. Barbados has been leading the way on the use of solar hot water systems for over 30 years; as mentioned above this has mainly been due to the tax incentives provided by the Barbados government.

An example of systems that are currently growing in popularity are absorption cooling systems as they are low maintenance, and instead of emitting waste heat into the atmosphere it is reused to fuel an absorption chiller to provide cold water for cooling and hot water for heating. The system can also use a number of different fuels including liquid petroleum gas, solar and biogas, thereby not only reducing costs to individual hotels but also their carbon emissions. The system shown below in Figure 8 has recently been installed by the Accra Beach Hotel and the Crane Resort in Barbados.

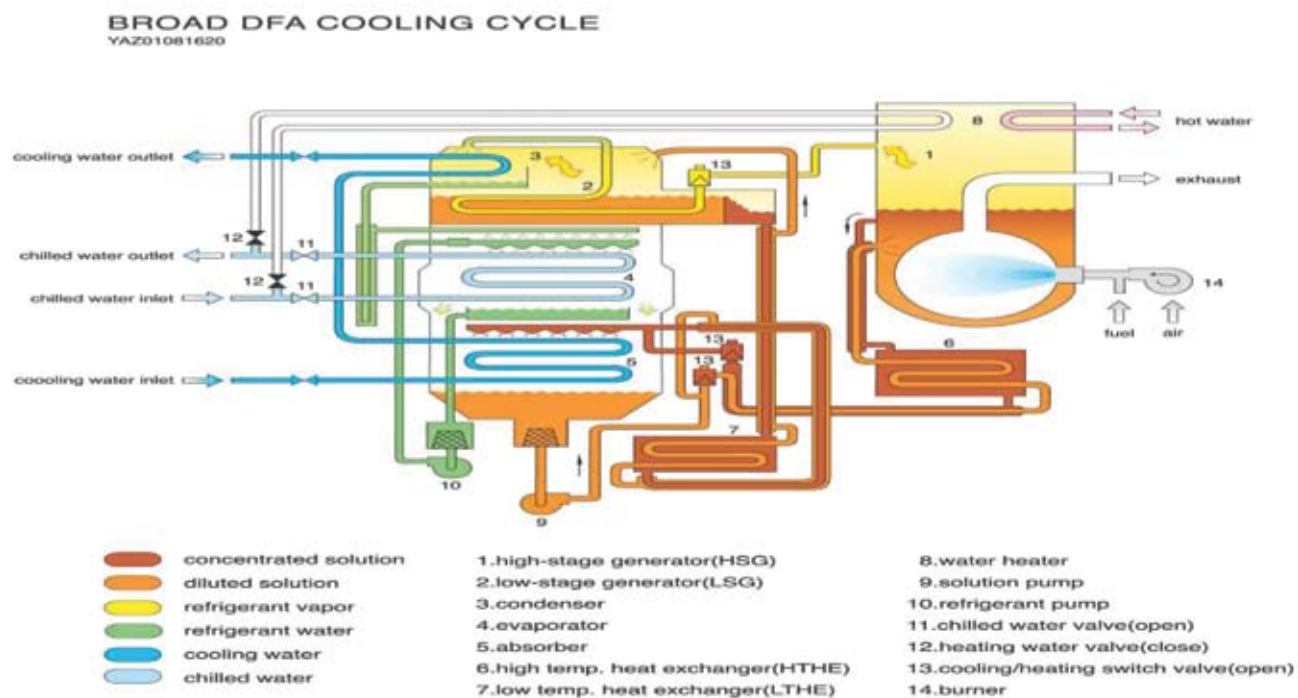


Figure 8: Natural Gas Absorption Cycle

As illustrated through the inclusion of some of the case studies in Chapter 4 there are other ways for hotels to reduce both costs and carbon emissions. Table 14 gives a selection of these solutions and provides the approximate cost for each, the annual energy savings (based on US\$ 0.30/kWh) and the simple payback period.

Table 14: (ESO) Energy Saving Options

E.S.O	USE	UNIT COST US\$	ANNUAL ENERGY SAVINGS US\$	PAYBACK (years)	REMARKS
Electronic Timers	Pool pump, AHU automatic switch off after hours	\$100.00	\$876.00	0.12	Savings for a 1.0 kW motor
Occupancy Sensors	Lamps off when no person in washroom/office	\$100.00	\$200.00	0.5	
T-12 (40W) to T-8 (32W) or T-5 (28W) florescent lamp retrofit	Offices florescent lamp retrofit	\$30.00	\$15.00	2.0	Good for new buildings design
Premium Efficiency Motors	Pumps, air handling units	\$100.00	\$131.00	0.76	Based on 1 kW @ 24/365
Low flow showerheads	Showers 1.5 gpm	\$5.00	\$96.80	0.05	Water –US\$3.5/ m ³ saving 1.0gpm
Faucet aerators	1.5 gpm	\$1.00	\$75.00	0.01	Water cost US\$3.5/m ³ saving 0.5gpm
Low flush toilets	1.6gpf instead of 3.0 gpf	\$120.00	\$70.00	1.7	
Refrigerant retrofit	Replace existing refrigerant with new hydrocarbon refrigerant	\$100/ton	\$150.00	0.75 to 1.5 years	Saves 10% to 15% of energy

Source: Energy Dynamics 2007

5.0 Overall Conclusions and Recommendations

This report provides an analysis of how various policies to stabilize or reduce emissions from aviation could influence tourism development in the Caribbean. Results indicate that Caribbean tourism products are energy intense, in large measure due to their proximity to many major outbound markets (Northern US, Canada, EU). If climate policy is implemented as currently envisaged by the EU, **prices for air travel would increase by an estimated average of US\$42.2 per t of CO₂ emitted in 2012**, and subsequently reach a price level of US\$72.3 per tonne (t) of CO₂ by 2020. In comparison to current air fares, this would result in a price increase on average air fares and considering known price elasticities for holiday air travel (of -0.45 to -1.0) **an estimated decline in demand in the order of 0.6% to 1.8% in the year 2012 is likely, compared to overall holiday travel costs**. However, given strong growth in arrival numbers, as currently observed in most islands in the Caribbean, **it is likely that the islands would see continued net growth in arrivals** despite EU climate policy in subsequent years. At the moment, increases in costs would only affect the European source markets, as other regions have not as yet started to explicitly discuss climate policy with regard to aviation. Furthermore, it is another three years before climate policy in the EU will begin to affect the costs of airfares from the EU.

While the report has thus shown that **EU climate policy and similar policy implementation across important source markets may not substantially disrupt demand for Caribbean holidays in the next 10-15 years**, the vulnerability of the region to climate change, compounded by volatile oil prices, highlights the need for stakeholders in the region to focus on opportunities to reduce the dependency on carbon- and emission-intense tourism, while simultaneously incorporating measures to adapt to climate change. **In a carbon-constrained tourism marketplace, the focus of destination planning and management will need to be on tourist profitability, rather than simply absolute growth in arrivals**. There are now numerous tools to achieve “carbon smart” tourism, such as eco-efficiency which offers opportunities to combine both economic and environmental perspectives. These measures are often economical.

Carbon offsetting also has potential for reducing emissions from tourism, but the means by which it is implemented is vitally important, specifically in relation to the choice of credible partners. **The best standard for offsets is UNFCCC verified Gold Standard Certified Emission Reductions (GS CERs)**, combining emission reductions and sustainable development (including adaptation). Projects should ideally be implemented within the Caribbean, offering tourists the opportunity to visit “their” project. This, in turn, would benefit the region’s image as taking global leadership in sustainable tourism development.

Overall, it is clear that a major challenge lies ahead for destinations that rely heavily on energy -intense tourism products such as the Caribbean region. Moving towards low-carbon tourism is an essential strategy to mitigate the effects of climate change and avoid the potential impacts of rising world market prices for oil, in order to be in a strong position to compete within a developing ‘carbon aware’ marketplace. In this way, the expectations of the international community to address climate change will be met as well as the demands from stakeholders for a sustained response to potential declines in the growth of tourist numbers.

Recommendations:

- Inter-ministerial cooperation and cross-ministerial collaboration is required to assist in the fulfilment and meeting of the following recommendations.
- Caribbean states should embark on a pro-active strategy to support the Kyoto-integration of aviation plus support voluntary carbon offsetting.
- Caribbean countries should review the energy use of their source markets in comparison with their cost-effectiveness to restructure their tourism economies with the overall goal of reducing energy use and thus the vulnerability to oil price volatility, climate policy, environmental awareness of tourists, and the consequences of unlimited climate change. There are now many tools to achieve this, considering economic bottom lines. The overall goal should be to reduce the dependency on highly energy intense markets, while developing new products to increase average length of stay and revenues per tourist (i.e. begin to restructure markets to focus on 'low emissions, high economic yield' segments).
- The Caribbean should seek to become the world's first 'carbon neutral' tourism region, which would generate huge media attention and create a positive, environmental image for the region. Tourists are generally willing to support pro-climate measures, and there is thus considerable potential to co-finance energy-efficiency, renewable energy and adaptation measures with payments and donations by tourists. Ideally, projects should have multiple sustainability dimensions, such as offset provider Atmosfair's proposition of saltwater greenhouses providing locals and hotels with organic vegetables, resulting in lower emissions (imports), reducing dependency, and providing local jobs.
- Voluntary or 'opt-out' carbon offsetting of flights should be incorporated in packages as soon as possible (by 2009), possibly based on an incentive approach (i.e. tour operators would match payments made by tourists on a 1:1 basis) or as part of a national hotel or departure tax.
- The money collected from tourists should be re-invested in the region. Projects should focus on energy-efficiency and renewable energy, as well as adaptation to climate change, and tourists should be able to visit these. This will stimulate positive feedback, and tourists may be willing to make additional donations. Offset projects in the Caribbean should include livelihood enhancements as well as environmental protection and enhancement.
- In order to guarantee a high level of transparency and credibility, the region should seek to cooperate with a high-quality voluntary carbon offset provider offering GS CERs, i.e. all projects should be registered through UNFCCC and provide sustainable development benefits. Some offset providers such as not-for-profit Atmosfair offer comprehensive solutions, i.e. they can provide the emissions calculator, debiting software for tour operators, advice on suitable and innovative projects, and carry out the certification process through UNFCCC.
- Governments should combine voluntary with mandatory measures to ensure that the tourism industry in the Caribbean supports these goals. Dodds and Kelman (2008) include the following aspects: 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.
- 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.

Conclusions and Recommendations

Pragmatic strategies should be developed in harmony with other regional initiatives such as the Sustainable Tourism Zone for the Caribbean currently being established by the member states of the Association of Caribbean States.

- 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 and evaluating resilience and adaptive capacity; and evaluating current and future adaptation and mitigation activities.
- The needs of destinations, nations and the region should be addressed as a whole by using a sectoral approach i.e. addressing tourism through its integral sectors; energy, water, waste, agriculture, biodiversity and coastal planning. Funding should be sought and provided for further robust studies to clarify priorities and specifics for the different levels of the tourism supply chain and for sub-sectors / different activities conducted as part of tourism in the Caribbean.
- Carbon emissions should be measured with transparency through the tourism supply chain and the use of low carbon technologies and renewable energy should be encouraged by the use of incentives and regulation. Efficiencies should be sought through economies of scale and business investment in low carbon infrastructure should also be encouraged.

6.0 Additional Sources of Information and Relevant Organisations

6.1 Selected Organisations

Caribbean Alliance for Sustainable Tourism (CAST)

1000 Ponce de Leon Ave., San Juan, Puerto Rico
Tel: +787 725 9139
Fax: +787 9108
Email: cast@cha-cast.com
www.cha-cast.com

Caribbean Community Climate Change Centre (CCCCC)

P.O. Box 10827, Georgetown, GUYANA
Tel: +(592) 222 0001-75
Fax: + (592) 222 0171
Email: info@caricom.org
<http://www.caricom.org/jsp/community/ccccc.jsp?menu=community>

Caribbean Natural Resources Institute (CANARI)

Fernandes Industrial Centre, Administrative Building,
Eastern Main Road, Laventill, Trinidad
Tel: +868 626 6062
Fax: +868 626 1788
Email: info@canari.org
www.canari.org

Tourism Concern

Stapleton House, 277-281 Holloway Road,
London, England
Tel : +44 (0) 20 7133 3330
Fax: +44 (0) 20 7133 3331
Email: info@tourismconcern.org.uk
www.tourismconcern.org.uk

Travel Foundation Tobago Ltd.

The Travel Foundation, The CREATE Centre,
Smeaton Road, Bristol, England
Tel: +0117 9273049
Fax: +0117 9300076
Email: tftobago@tstt.net
www.thetravelfoundation.org.uk

6.2 Additional Sources of Information

Clean Air Cool Planet

www.cleanair-coolplanet.org

This not for profit NGO specialises in fields related to climate change, for example awareness raising and the provision of energy efficiency strategies. An example of its awareness raising activities include the Consumer's Guide to Retail Carbon Offset Providers which is referred to in this report.

"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 WTO 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 WTO 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.

EcoBusiness

www.ecobusinesslinks.com

This is an international market place for all forms of consumer related products and sustainable development. It also operates a Carbon Emissions Offset Directory.

European Climate Policy Dossier

www.eel.nl/categorieen/index.asp?sub_categorie=168&c_nr=5&linktwee=ja

The European Environmental Law website contains text cases, legislation and other documents related to European Environmental Law. Dossiers offer a more in depth view on specific issues, for example on climate change. The website is hosted by the T.M.C. Asser Instituut.

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.

Intergovernmental 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.

Organization of Petroleum Exporting Countries (OPEC)

www.opec.org

OPEC's mission is to coordinate and unify the petroleum policies of Member Countries and ensure the stabilization of oil markets in order to secure an efficient, economic and regular supply of petroleum to consumers, a steady income to producers and a fair return on capital to those investing in the petroleum industry. It is thus a key player in issues relating to transport and for example releases a monthly oil market report which is useful reading.

Stern Review on the Economics of Climate Change

http://www.hmtreasury.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.

Tufts University Climate Initiative

<http://www.tufts.edu/tie/tci/index.htm>

The Tufts Climate Initiative (TCI) is a pioneer in the field of climate change mitigation at institutions of higher learning and in 2005, Tufts and TCI won the prestigious Environment Protection Agency (EPA) Climate Protection Award. The website includes many useful resources, including a Voluntary Carbon Offset Information Portal.

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.

Additional Information Sources and Relevant Organisations

The 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 SIDS.

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 World Tourism Organization

<http://www.unwto.org/aboutwto/index.php>

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 WTO and its activities; data and statistics of relevance to tourism; a news release service; events listing; online library and bookshop of WTO publications.

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 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.

7.0 Glossary

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).

Anthropogenic

Resulting from or produced by human beings.

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.

Carbon compensation or offsetting

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

Capacity Building

The mobilization of individual and organisational 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 CO₂-equivalent emissions reduced or sequestered through a Clean Development Mechanism project, calculated using Global Warming Potentials.

Clean Development Mechanism - Defined in Article 12 of the Kyoto Protocol, the Clean Development Mechanism is intended to meet two objectives: (1) to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the convention; and (2) to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments.

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”.

CO₂-e, or CO₂ 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.

Emissions Trading

A market-based approach to achieving environmental objectives that allows those reducing greenhouse gas emissions below what is required to use or trade the excess reductions, 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 is 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.

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.

Greenhouse Gas

Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb 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. Besides CO₂, N₂O, and CH₄, the *Kyoto Protocol* deals with the greenhouse gases sulphur hexafluoride (SF₆), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).

Joint Implementation

A market-based implementation mechanism defined in Article 6 of the Kyoto Protocol, allowing Annex I countries or companies from these countries to implement projects jointly that limit or reduce emissions, or enhance sinks, and to share the Emissions Reduction Units. JI activity is also permitted in Article 4.2(a) of the United Nations Framework Convention on Climate Change.

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 sources or enhance the sinks of greenhouse gases.

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 CO₂ 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.

Sequestration - The process of increasing the carbon content of a carbon reservoir other than the atmosphere. 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.

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.

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