Identification of Climate Compatible Tourism Adaptation Options for Belize

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1.0 Overview of the Belize Tourism Industry

The Belize Tourism Industry is one of the cornerstones of the Belizean economy. There is no definitive estimate of the sector's contribution to the GDP but most assessments indicate that tourism contributes anywhere from 18% to 25% of the total GDP and accounts for about 28% of total employment (National Sustainable Tourism Master Plan of Belize, 2011). In 2012 direct tourism contribution to the GDP was estimated at 12% and its total contribution was 34%. This equated to approximately $567 Million BZD being injected into the economy through tourism (WTTC Travel & Tourism Economic Impact, 2012).

Belize's tourism industry is eco-tourism and culture based and depends on the country's natural and cultural assets, in particular its marine resources including the Belize Barrier Reef. Based on a vulnerability assessment of the Belize tourism sector, 80% of visitors to Belize seek out reef-based activities (Richardson, 2007). These include diving and snorkeling, which are supported by the Belize Barrier Reef and coastal zone.

The National Sustainable Tourism Master Plan of Belize 2011 highlighted numerous challenges to the tourism industry some of which are further exacerbated by climate change. These include:

- **Poor level of accessibility on land**, mainly due to a limited amount of paved roads leading to tourism destinations.
- **Inadequate natural asset management**, mainly due to lack of awareness, knowledge and financial issues that leads to degradation of the natural resources and destination.
- **Insufficient waste disposal and sewage systems,** which results in pollution.
- **Lack of urban land planning and land use regulation** results in haphazard, inadequate urban development, beach erosion, and land use conflict.
- **Lack of public awareness programmes** leads to unsustainable use of natural resources, such as the reef, national parks and rainforests.

1.1 Tourism of the Future

The 2030 vision for tourism in Belize is that ***"Belize is an exclusive multicultural sustainable destination in the Central American Caribbean. It is a destination where the authenticity and friendliness of its people, coupled with the uniqueness of an exotic natural environment can be actively experienced within a conserved world".*** By 2030, the enhanced overnight destinations are expected to double in overnight tourism arrivals, with tourists spending US$213 a day and the industry generating approximately 6 million overnight stays in tourism facilities. This would translate to an economic contribution of US$1.2 billion a year. Cruise tourism development is expected to be tightly controlled at an average compound growth rate of 3.8% with no more than 1.5 million cruise passengers visits per season. The optimized economic contribution of cruise tourism to the Belizean economy is estimated at US$90 a day per tourist with a projected US$134 million per year from cruise tourism.

The Tourism Master Plan calls for mid to high end tourism facilities and mid to low density infrastructure development. High density development was not considered as this was seen as inappropriate for the quality standards and long-term development of Belize. The projected expansion in destinations along the coast, on the cayes and associated with the reef, is for mid to low density sun and beach resorts drawing on beaches, marine life, nautical and rainforest attractions. As we have seen this vision relies heavily on Belize's natural assets, especially it's coastal and reef assets, as evidenced by the areas of focus for development. These natural assets are increasingly threatened by climate change, in particular the beaches and reef.

2.0 Impacts of Climate Change on Tourism

Global tourism is increasingly impacted by climate change with Small Island Developing States (SIDS) being the most vulnerable to climate change owing to their unique geographic placement (low lying coasts), their dependence on tourism and their economic realities – developing countries. Belize is classified as SIDS and as a tropical, coastal state is very vulnerable to variable climate and weather patterns. The tourism sector is vulnerable to climate change arising from three major impacts: increased air and sea surface temperatures; sea level rise; and increased frequency and severity of storms.

2.1 Increased air and sea surface temperatures

Global trends for air and sea surface temperatures are for average air temperatures to increase in all seasons and more inland than over oceans and in coastal locations and increasing sea surface temperatures. Warmer temperatures on land will result in more humid and hot conditions that could influence tourist arrivals. Warmer sea surface temperatures threaten Belize's coral reefs and the longest barrier reef in the western hemisphere, with bleaching and poor health. Belize's reefs attract thousands of tourists annually for snorkeling and diving activities. Coupled with increased air and sea temperatures is reduced precipitation. Climate models project that annual rainfall in the Caribbean will decrease by 5-10% as temperatures increase (Simpson *et al*., 2011).

2.2 Sea level rise

In addition to warming, the world's oceans have also been slowly but steadily increasing with more rapid increases predicted in the next three decades. Sea level rise observed from the Caribbean is following the global trend over the last 40 years and is at around 1.5–3 millimeters a year (Bindoff *et al*., 2007). Recent studies project global sea level rise of 0.5–2.15 meters by 2100 (Rahmstorf, 2010). Due to its geophysical and gravitational factors, the Caribbean may be expected to experience a significant increase above global averages. This poses a significant risk of flooding, salt water intrusion and erosion all of which threaten water supply, infrastructure and coastal areas.

2.3 Increased frequency and severity of storms

Associated with warmer sea surface temperatures is the increasing frequency and intensity of tropical cyclones. Hurricanes and tropical storms in the North Atlantic seem to have increased

in intensity over the last 30 years with larger peak wind speeds and more heavy precipitation associated with increased sea surface temperatures. It is likely that tropical cyclones will become more intense and this will pose significant threat to coastal populations and infrastructure (UNWTO, 2008).

2.4 Direct and Indirect Impacts of a Changing Climate

A changing climate will have both direct and indirect impacts on tourism. Studies indicate that a shift in attractive climatic conditions for tourism will very likely occur towards higher latitudes and altitudes. These shifts in the length and quality of suitable tourism seasons (i.e., sun-and-sea or ski holidays) could have major implications for competitiveness among destinations. Another direct impact is the change in seasonal operating costs, such as heating, irrigation and water supply and annual insurance costs. A third direct impact of changes in climate is weather extremes. The IPCC has reported that a number of changes in weather extremes are also probable due to projected climate change. These include higher maximum temperature and more hot days over nearly all land areas (very likely), greater tropical storm intensity and peak winds (likely), more intense precipitation events over many land areas (very likely), and longer and more severe droughts in many mid-latitude continental interiors (likely). These types of changes will affect the tourism industry through increased infrastructure damage, additional emergency preparedness requirements, higher operating expenses (e.g., insurance, backup water and power systems, and evacuations), and business interruptions (UNWTO, 2008).

In contrast to the direct impacts, the indirect effects of climate induced environmental change are likely to be mostly negative. Island and coastal destinations are considered particularly sensitive to climate-induced environmental change, as are nature-based tourism market segments. Belize falls under destinations that are especially sensitive to climate induced environmental change. Indirect impacts from climate change includes changes in water availability, biodiversity loss, reduced landscape aesthetic, altered agricultural production (e.g., wine tourism), increased natural hazards, coastal erosion and inundation, damage to infrastructure and the increasing incidence of vector-borne diseases, all of which will impact tourism to varying degrees (UNWTO, 2008).

The major impacts of climate change and implications for tourism are listed below in Table 1.

Table 1 Major climate change impacts and implications for tourism

Impact	Implications for Tourism
Warmer temperatures	Altered seasonality, heat stress for tourists, cooling costs, changes in plant-wildlife-insect populations and distribution, infectious disease ranges
Increasing frequency and intensity of extreme storms	Risk for tourism facilities, increased insurance costs/loss of insurability, business interruption costs
Reduced precipitation and increased evaporation in some regions	Water shortages, competition over water between tourism and other sectors, desertification, increased wildfires threatening infrastructure and affecting demand
Increased frequency of heavy precipitation in some regions	Flooding damage to historic architectural and cultural assets, damage to tourism infrastructure, altered seasonality
Sea level rise	Coastal erosion, loss of beach area, higher costs to protect and maintain waterfronts
Sea surface temperatures rise	Increased coral bleaching and marine resource and aesthetics degradation in dive and snorkel destinations
Changes in terrestrial and marine biodiversity	Loss of natural attractions and species from destinations, higher risk of diseases in tropical-subtropical countries
More-frequent and larger forest fires	Loss of natural attractions, increase of flooding risk, damage to tourism infrastructure
Soil changes (moisture levels, erosion, acidity)	Loss of archaeological assets and other natural resources, with impacts on destination attractions and agriculture

Source: Adapted from UNWTO-UNEP-WMO (2008) *Climate Change and Tourism: Responding to Global Challenges*

3.0 Vulnerability of the Tourism sector

Vulnerability has been defined as the degree of sensitivity to and inability to cope with negative impacts of climate change (McCarthy *et al*., 2001; Bijlsma *et al*., 1996). Based on the 2007 tourism vulnerability assessment, 45-70% of the tourism sector is vulnerable to the effects of climate change due to the nature of the destinations and attractions (Richardson, 2007). Richardson (2007) determined that vulnerability arises from supply and demand based risks.

3.1 Supply-based vulnerability

Supply based vulnerability is a function of the tourism industry's exposure to climate hazards as well as its capacity to adapt and keep supplying tourism services and opportunities. This supply or production of services is directly vulnerable to the effects of climate change as a result of the risks to natural resources and attractions. The vulnerability of Belize's coral reefs is one of the most significant threats to the tourism sector owing to the industry's dependence on this natural asset and its supply of attractions and services. Supply-based vulnerability also comes from risks to infrastructure due to tropical cyclones and flooding, and the loss of coastal land due to rising sea levels. Our low lying cayes are especially vulnerable to rising sea levels because they rarely exceed 3-4 meters above sea level and are often below sea level. Inland areas are less vulnerable to the impacts of climate change but still face the risk of damage from hurricanes and tropical storms, river flooding and biodiversity loss. Availability of inputs is an

indirect source of vulnerability to climate change as much of the building materials, food, beverages and energy are imported from abroad. Rising fuel prices have resulted in increases to many products and services and are responsible overall for the increased inflation. Rising sea levels also threaten the marketability of coastal and island real estate resulting in escalating housing costs.

3.2 Demand-based vulnerability

The vulnerability of the sector is also based on the demand for tourism which depends on the tastes and preferences of tourist visitors and the price elasticity of the demand for tourism products and services. As climatic conditions change, people will continue to travel but where they travel to and what they do will most likely change. There is very little data on the preferences and priorities of tourists towards environmental features and implications of climate change for Belize. A study on contingent visitation would significantly inform knowledge on demand-based vulnerability of tourism in Belize (Richardson, 2007).

4.0 Adaptation

4.1 What is Climate Adaptation?

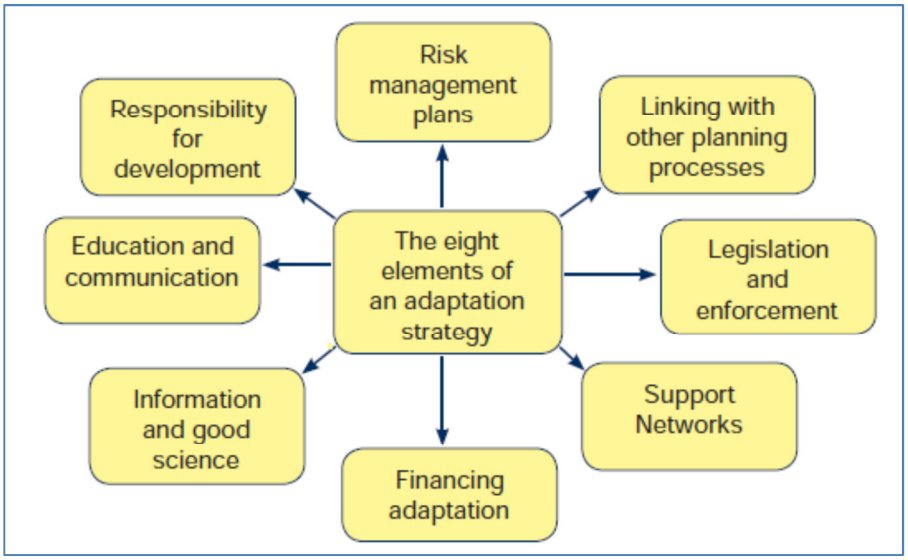
The UNWTO-UNEP-WMO (2008, p.81) defines adaptation as "….. an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities." Adaptation is a very detailed and long-term process that requires updated information, policy changes and financial investments, and therefore the process of adaptation needs to begin immediately so that Belize can be in a position to address these projected impacts from climate change, in particular to its tourism industry. The process of adaptation must involve the government, private sector, academia and local communities.

4.2 Process of Adaptation

In order to achieve adaptation there must be the required adaptive capacity to do so. "Adaptive capacity is the ability or potential of a system to respond successfully to climate variability and change, and includes adjustments in both behavior and in resources and technologies" (Brooks & Adger 2005). The presence of adaptive capacity has been shown to be a necessary condition for the design and implementation of effective adaptation strategies that successfully reduce the harmful effects of climate change. This also enables countries to take advantage of opportunities or benefits from climate change, such as the tourism sector benefiting from better seasons. Based on Belize's Second National Communication to the UNFCC, Gordon and Green (2011) concluded that Belize has limited capacity for its tourism sector to adapt to the impacts of climate change due in large part to the unsustainably high level of public debt. However within the tourism sector and line ministries responsible for natural resources and land use there is significant capacity to develop adaptation measures.

Climate change has the potential to affect a country's sustainable development in multiple ways, including water resources, energy, health, agriculture and biodiversity, all of which will impact the tourism industry. UNDP (2005) has identified four guiding principles for adaptation that are very relevant for tourism. ***Adaptation must be placed in a national development context*** to ensure that it is a high priority and factored into all levels of planning – development of policies and strategies. Secondly, there is the ***need to build upon current adaptive experience to cope with future climate variability***. The tourism sector has had extensive experience coping with change and climate variability to date. In developing adaptive capacity it is important *to* ***recognize that adaptation occurs at different levels, of particular importance is the local level***, which is where the on-the-ground implementation occurs by industry stakeholders. So their buy in to the process of adaptation is key to success. Finally it must not be forgotten that ***adaptation is an ongoing process*** that often takes many years and needs to be an iterative process of implementing and evaluating strategies as climate conditions continue to evolve. The process of adaptation has been summarized into eight key steps or elements that form an adaptation strategy (Figure 1).

Figure 1: Essential Elements of an Adaptation Strategy



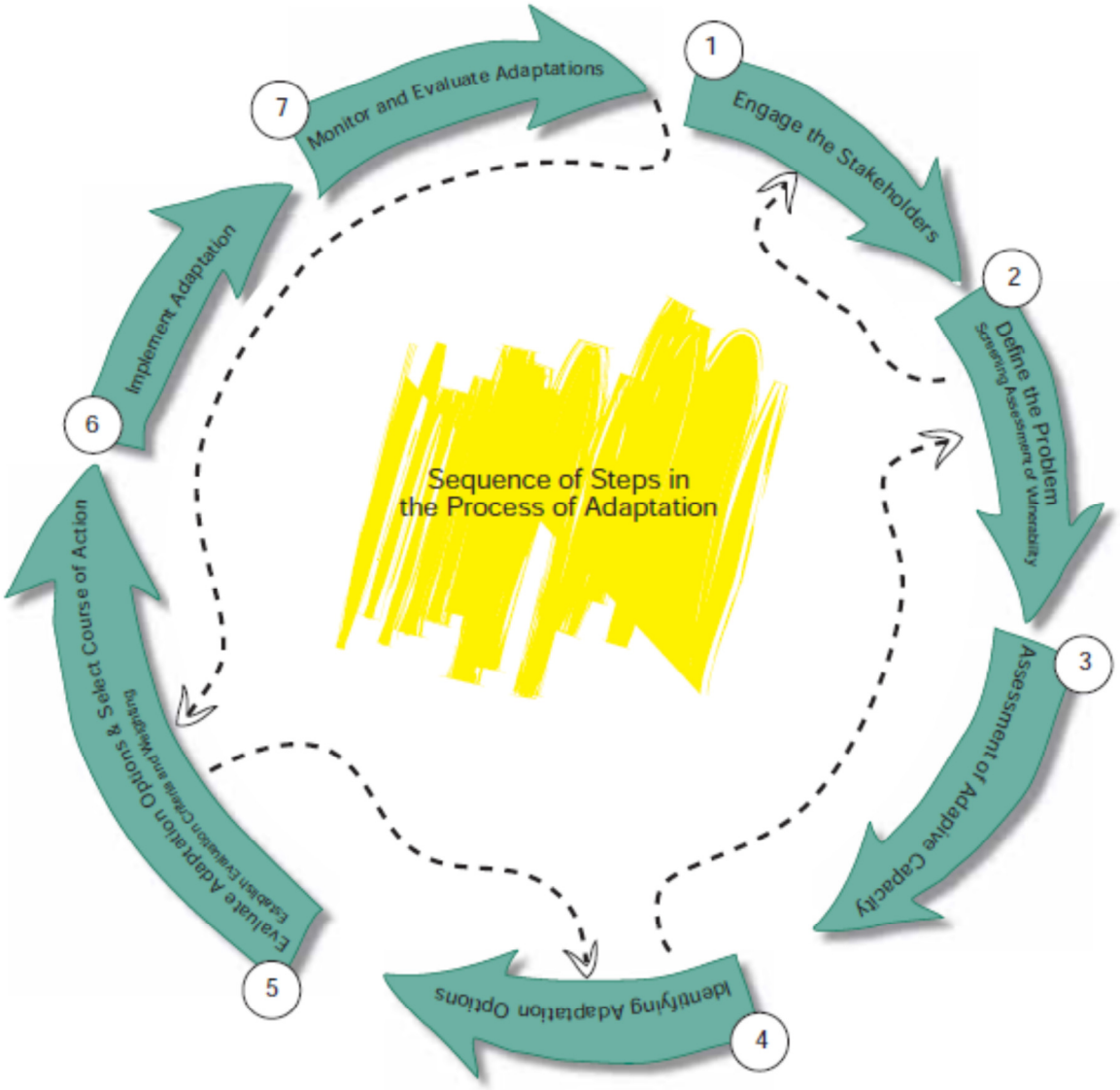
Source: Tompkins *et al*. 2005 - "Surviving Climate Change in Small Islands"

4.3 Developing and Implementing a Climate Change Adaptation Process

As has been discussed there are many steps, factors and players involved in the climate adaptation process and there is no one 'correct' method for implementing climate change adaptation in the tourism sector. Based on various frameworks developed by UNEP (1998), UNFCCC-NAPA (2001), UNDP (2004) and USAID (2007), Simpson *et al*., 2008 has summarized a seven step process for 'A Framework for Climate Change Adaptation in the Tourism Sector' which is an integration of the commonly recommended components from these frameworks (Figure 2). This represents the best practices that have been learned and shared from other economic sectors implemented by different countries. This seven step process is an iterative

cycle of problem definition, adaptation implementation and evaluation of outcomes, that has identified feedback between steps.

Figure 2: Sequence of Steps in the Process of Adaptation



Source: Simpson *et al*., 2008 "Climate Change Adaptation and Mitigation in the Tourism Sector - Frameworks, Tools and Practices"

4.4 Global Adaptation Strategies

There are a variety of adaptation strategies that have been identified, compiled and presented globally for different conditions and economic realities. These adaptation strategies have been compiled from recommendations from public, private, NGO and research institutions based on their research or experience. UNWTO (2008) lists these global strategies according to a diverse

range of technological, managerial, policy and behavioural adaptations (Table 2). These tools are currently in use globally by tourism stakeholders to address climate variability at destinations. It is rare that individual climate adaptations will suffice for a destination and often adaptation involves multiple strategies specific to the destination. Then there are special situations that call for specific adaptation strategies: coping with two of the major climate change impacts (extreme events and changing availability of environmental resources) and for two of the most vulnerable destination types – mountains and islands, and the need for adaptation at the national policy level. In this case we will focus only on islands in the context of SIDS.

For destinations, such as Belize that are vulnerable to extreme events such as hurricanes, tourism depends on intact ecosystems and infrastructure and this threat provides the incentive to ensure that tourism infrastructures are designed and built to withstand climate change impacts without severe economic loss. Adaptation strategies in such locations may include building or retrofitting infrastructure to be hurricane proof. This could be achieved through building codes and standards for withstanding high average wind speeds. Early warning systems are also another important adaptation strategy to ensure proper preparation and planning to weather and extreme event. Another commonly implemented adaptation strategy is the use of insurance against extreme weather events to absorb climate related risks that cannot be avoided by other adaptation measures. There needs to be coordination between insurance companies and the tourism sector to ensure that proper measures (improving building structure, emergency plans, staff training, etc) are in place to reduce uncertainty and risk. One final key strategy in adapting to extreme weather events is to promote awareness of the impacts of climate change and the need for preparedness for natural disasters through capacity building and strategies for disaster risk management. In Belize, our tourism depends heavily on the coral reefs along our coast. Conserving this biodiversity and maintaining ecosystem structure of the coral reefs are important climate change adaptation strategies to ensure that functions such as shoreline protection and services such as fisheries and recreation are continuously available in relation to the tourism industry's demands. For small islands and coastal destinations, water supply is a challenging aspect of managing the tourism industry and requires adaptive strategies in response to changing climate conditions. Table 2 gives a list of climate adaptation strategies that have been used by tourism stakeholders globally.

Table 2 Portfolio of climate adaptations utilized by tourism stakeholders

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

Source: *Climate Change and Tourism: Responding to Global Challenges,* UNWTO-UNEP-WMO (2008)

For Small Island countries there is a suite of adaptation strategies specifically suited to their special circumstances to address the different climate change impacts of increased temperatures, changed precipitation and wind and sea level rise. UNWTO (2008) gives a list of possible adaptation measures for small islands and coastal zones (Table 3). Some of these have been implemented in various small islands. The table also lists a number of barriers to achieving successful implementation of these measures and how to remove these barriers. An important point to note with adaptation strategies is that for these strategies to be successful they need to be presented and supported at the national level through national policy or frameworks such as an Integrated Coastal Zone Management approach or a National Climate Adaptation Policy.

Therefore, mainstreaming of climate change adaptation strategies into national policies and sectoral plans must be a standard component of any response to climate change, and in particular for the tourism sector when planning for development.

Table 3 Potential tourism adaptation measures in small island countries and barriers to implementation

Adaptation measures	Relevance to tourism	Barriers to implementation	Measures to remove barriers
'Soft' coastal protection	Many valuable tourism assets at growing risk from coastal erosion	Lack of credible options that have been demonstrated and accepted	Demonstration of protection for tourism assets and communities
Enhanced design, siting standards and planning guidelines	Many valuable tourism assets at growing risk from climate extremes	Lack of information needed to strengthen design and siting standards	Provide and ensure utilization of targeted information
Improved insurance cover	Growing likelihood that tourists and operators will make insurance claims	Lack of access to affordable insurance and lack of finance	Ensure insurance sector is aware of actual risk levels and adjusts premiums
Shade provision and crop diversification	Additional shade increases tourist comfort	Lack of awareness of growing heat stress for people and crops	Identify, evaluate and implement measures to reduce heat stress
Reduce tourism pressures on coral	Reefs are a major tourist attraction	Reducing pressures without degrading tourist experience	Improve off-island tourism waste management
Desalination, rainwater storage	Tourist resorts are major consumers of fresh water	Lack of information on future security of freshwater supplies	Provide and ensure utilization of targeted information
Tourism activity/ Product diversification	Need to reduce dependency of tourism on 'sun, sea and sand'	Lack of credible alternatives that have been demonstrated and accepted	Identify and evaluate alternative activities and demonstrate their feasibility
Education/awareness raising	Need to motivate tourism staff and also tourists	Lack of education and resources that support behavioral change	Undertake education/ awareness programs

Source: Becken, S. and Hay, J. (2007)

Gordon and Green (2011) recommended a few adaptation strategies that could be applied to the tourism sector in Belize based on global examples. These include: construction of sea wall defenses, restoration of natural defenses, beach nourishment, more emphasis on disaster preparedness planning and a diversified tourism product to promote more inland attractions.

4.5 Adaptation Options for Belize's Tourism Sector

Overall adaptation strategies for the tourism industry in Belize include product and market diversification from marine to inland destinations. Education and awareness programs need to be developed to share practical information on adaptation measures with the tourism industry and the public. Training programs on climate change adaptation must be provided to tourism operators and tourism industry association. Research into the awareness of businesses and tourists re: climate change and identification of knowledge gaps needs to be done.

Specific recommendations based on case studies in SIDS include: building setback of at least 2.6m above mean sea level and 30 m off the high tide mark and disaster preparedness at or before start of the season (staff training, food/water storage, first aid kits, trimming trees, inspection of facilities such as water, communication system, etc). The Belize tourism industry should also explore these adaptation options: marketing and advertising campaign promoting Belize as 4-season destination, and 'Blue Chip Hurricane Guarantee' for replacement stay of the same duration or equivalent value as the original booking.

General adaptations strategies at the National level

The following adaptation strategies must be included in a National Climate Change Policy and Plan and factored into the current National Climate Resilience Investment Plan (NCRIP).

- Incorporate adaptation mechanisms against climate change impacts into existing management plans for coastal and wetland attractions, especially marine protected areas;
- Strategic planning for inland tourism development zones to provide alternatives to coastal tourism land use policies;
- Assistance with emergency planning and management of hurricane shelters for yachts & other recreational craft in particular Placencia;
- Upgrading procedures for Environmental Impact Assessments to incorporate hazard risk and climate change vulnerability assessment (add climate change to the Terms of Reference).
- Training of National Agencies in monitoring climate change effects on coastal resources, natural systems beneficial to tourism and natural attractions (beaches, reefs, wetlands)
- Improving socio-economic data collection systems to measure direct and indirect climate change impacts on environmental goods & services benefiting tourism, e.g. scuba diving and visits to attractions
- Designing & implementing standards for minimum floor level heights and other flood resistant measures for buildings in coastal & flood plain areas
- Providing technical assistance in design standards for marina piers and bulkheads
- Build technical and administrative capacity for managing coastal areas

Specific adaptation options for Belize's Tourism Industry based on key climate change impacts predicted for the Caribbean and SIDS are outlined below.

Adaptation option	Climate Change Impact Addressed	Sector	Benefits	Constraints
Enhanced shade provision for resort facilities	Warmer temperatures	Tourism Industry	Greater energy efficiency and less use of air conditioning; cooler resort facilities	Higher construction costs
Tourism product and market diversification	Warmer temperatures; Sea level rise		Wider range of products for visitors; less dependent on 'sun, sea and sand'; development of inland destinations	Cost to develop and market these products
Provide climatic information to public through collaboration with Meteorological Office	Warmer temperatures; Changes in precipitation; Increasing frequency and intensity of extreme storms		Regular and dependable source of weather information available to public and visitors	
Enhanced building design (including flood prone areas and CAT 3 hurricane force winds) and siting standards (building code, setbacks)		Government	Sound standards enforced and proper development planning	Requires government policy and legislation
Preserve and restore structural complexity and biodiversity of vegetation in estuaries, seagrass beds, and mangroves	Increases in sea surface temperatures; Changes in precipitation		Vegetation protects against erosion, protects mainland from tidal energy, storm surge, and wave forces, and absorbs atmospheric CO2	Cost of restoration and monitoring
Protect ecologically "critical" areas such as nursery grounds, spawning grounds, and areas of high species diversity			Protecting critical areas promotes biodiversity and ecosystem services (e.g., nutrients to coastal systems, refuges and nurseries)	May require government protection
Hurricane proof building design and structure	Increasing frequency and intensity of extreme storms	Tourism Industry	Greater protection from natural disasters, lower occurrence of damage and reduced costs	Higher building costs
Hurricane interruption			Continuous bookings and income,	Costs associated with

guarantees			especially during hurricane season	rescheduling or crediting for future stays
Disaster preparedness and evacuation planning	Increasing frequency and intensity of extreme storms; Change in precipitation		Sound planning and appropriate response to storms and natural disaster resulting in less impacts	May require training for industry
Access to early warning equipment (e.g. radios) for tourism operators			Widely available and timely weather information to support industry	Cost of equipment
Training of tour guides as first responders, and/or building a fleet of emergency responders			Network of trained first responders widely available to respond nationally	
Weather forecasting and early warning systems		Government	Reliable and timely forecasts available for proper planning	Increased costs associated with systems
Disaster risk management			Better planning and response for dealing with disasters	
Upgraded and climate resilient critical infrastructure (roads, airports, sea ports, coastal defenses, and building facilities)	Increasing frequency and intensity of extreme storms; Change in precipitation; Sea level rise		National transportation system no longer vulnerable to effects of climate change	Major redesign and construction costs
Comply with development regulations (e.g. building code, setbacks)		Tourism Industry	Less financial loss from damages due to natural disasters, climate change	
Adjustable insurance premiums		Financial Sector	Lowered insurance cost with better coverage	
Extreme event risk exposure coverage	Increasing frequency and intensity of extreme storms		Better insurance coverage to address damage from extreme events	More expensive insurance packages
Rainwater collection and water recycling systems	Changes in precipitation	Tourism Industry	Reliable potable water supply for tourism sector, especially in coastal areas	
Desalination systems on small cayes			Reliable potable water supply for tourism sector, especially in coastal areas	High cost associated with desalination systems

Water conservation campaign and plans targeting employees and guests			More efficient water usage in resorts and tourism operations	
Drainage and watershed management to reduce flooding and erosion risks		Government	Reduction in flooding and erosion damage to rainfall; lowered losses due to damage	May require adoption of new policy or legislation
Lending incentives for water conservation projects		Financial Sector	Increased water conservation in tourism sector and less dependency on national supply	Building awareness and support among financial sector
Redirect clients away from impacted destinations	Sea level rise; Increasing frequency and intensity of extreme storms	Tourism Industry	Less impact and losses to tourism sector from extreme events; create new destinations	Identifying alternative destinations
Utilize 'soft' coastal protection - restoration of mangroves, beach nourishment, planting vegetation, reef protection			Reduces negative effects of armoring down drift erosion; maintains beach habitat and reduces beach erosion	Can be costly; requires more materials than armoring; requires government guidelines and policies
Web based tools with practical information on adaptation measures			Industry, guests and country well informed on adaptation and measures used in Belize	
Beach erosion and water quality monitoring programs		Government	Improved water quality and reduced beach erosion through effective monitoring	Requires government and industry collaboration to implement
High risk locations identified and structural, land-use and ecological measures for preventing erosion in place			Lessened erosion in high risk locations	
Allow coastal mangroves and wetlands to migrate inland (e.g., through setbacks, density restrictions, land purchases)	Sea level rise		Maintains species habitats; maintains protection for inland ecosystems	In highly developed areas, often no land available for mangroves and wetlands to migrate, or it can be costly to landowners

Remove shoreline hardening structures such as bulkheads, dikes, and other engineered structures to allow for shoreline migration			Allows for shoreline migration	Costly for, and destructive to, shoreline property
Consideration of climate change in credit risk and project finance assessments		Financial Sector	Costs of adapting to climate change factored into planning and funding projects; more tourism projects designed with climate change adaptation measures	
Public education campaign – best practices for in-water activities	Increase in sea surface temperatures; Changes in marine biodiversity	Tourism Industry	Less impact to reefs and marine biodiversity with more responsible behavior	
Reduce tourism pressures on coral	Sea surface temperature rise		Less impact to reefs and marine biodiversity	
Coral Bleaching Response Plan and Bleaching monitoring program		Government	National level response to and management of coral bleaching events	Funding for monitoring and management efforts
Marine biodiversity, coral reef, mangrove, seagrass and water quality monitoring programs	Changes in marine biodiversity		Updated information on health of marine biodiversity and marine ecosystems	Funding for monitoring and management efforts
Effective PA management and conservation of coastal ecosystems to preserve functions and enhance resilience			Well preserved and managed marine biodiversity and marine ecosystems providing climate resilience functions	May require new policies and legislation
Integrated Coastal Zone Management plan (ICZM) – using an integrated approach to achieve sustainability	Changes in precipitation; Sea level rise; Increases in air and sea surface temperatures; Increasing frequency and intensity of extreme storms		Considers all stakeholders in planning, balancing objectives; addresses all aspects of climate change	Stakeholders must be willing to compromise; requires much more effort in planning

5.0 Next Steps Implementation of Adaptation Strategies

Main barriers to implementation of climate adaptation strategies have been: low awareness, especially among industry, lack of coordination between government, lack of integration of climate change aspects into existing legislation and policy, insufficient enforcement and poor environmental management practices.

The feasibility of implementing these adaptation strategies in Belize must be explored through consultations with key government and industry players in an effort to incorporate these recommended adaptation strategies into the national climate change policy and adaptation strategies being planned in Belize. This information will feed into recommendations for policy gaps to address climate compatible tourism development for Belize.

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