



FINAL REPORT
BARBADOS TOURISM MASTER PLAN
2014–2023

REPORT II: THE ENVIRONMENT



Environmental Planning Group Inc.

HLA Consultants

2014

BARBADOS TOURISM MASTER PLAN 2014 – 2023

REPORT II: THE ENVIRONMENT

Ministry of Tourism and International Transport

Lloyd Erskine Sandiford Centre

Two Mile Hill

St. Michael, Barbados

Prepared by

Environmental Planning Group Inc.

HLA Consultants

2014

DISCLAIMER

This report, prepared by Environment Planning Group Inc. in association with HLA Consultants, has been reviewed and approved by the Ministry of Tourism and International Transport. The contents indicate the challenges that are existing as determined by the consultant, and the consultant's recommendations, strategies and actions for their mitigation. The foregoing does not signify that the contents always necessarily reflect the policies and views of the Ministry.

Consulting Team and Acknowledgements

Geoffrey M. Ramsey	Environmental Planning Group Inc.
Roger Lefrancois	HLA Consultants
Pamela Wight	Pam Wight & Associates
Annalee Babb	ACB Knowledge Consultants Inc.
Peter Wild	G.P. Wild (International) Ltd.
Deborah Riven	Environmental Planning Group Inc.
Ruth Durant	Environmental Planning Group Inc.
Neville Edwards	Caribbean Consultants & Project Management Group Inc.
John Stewart	Commonwealth Resource Management Ltd.
Heidi Schless	Touristics Consulting
Trevor Carmichael, KA	Chancery Chambers
Guy Griffith	Guy M. Griffith Engineers
Janice Cumberbatch	CERMES
Norma Shorey-Bryan	Catalyst Consultants
David Senior	RWA Associates
Michael Scantlebury	University of Grand Rapids
Horace Hord	HC Marketing Inc

The consulting team wishes to thank the Hon. Richard Sealy, M.P., Minister of Tourism & International Transport, Ms. Shelley Carrington, Permanent Secretary (Tourism), Ms. Gale Yearwood and Ms. Sherry Waithe of the Tourism Master Plan Project Unit and the staff of the Ministry of Tourism & International Transport for their support and participation in the TMP process.

Many representatives from government ministries, NGO's and industry stakeholders went out of their way to collaborate in wide ranging discussions over the duration of the project. These also included CTO, BMHS, BTII, BHTA, BTA, TDC, IICA, TCPO, CZMU, BWA, Central Bank of Barbados, Barbados Garrison Historical Committee, Natural Heritage Department, Barbados National Trust, Cruise Tourism Task Force, Barbados Chamber of Commerce, Barbados Council for the Disabled, Future Centre Trust and the Barbados Youth Business Trust.

In addition, we wish to express appreciation to all those who took time to attend meetings, share advice and information, and provide us with written comments/inputs in the workshop sessions.

In the production of these documents, the work of local artists has been featured as an opportunity to showcase the visual arts in Barbados.

REPORT II: THE ENVIRONMENT

TABLE OF CONTENTS

Summary	4
1.0 Physical Environment	14
1.1 Overview	14
1.2 Natural Environment	17
1.2.1 Terrestrial Resources	18
1.2.2 Coastal and Marine Resources	24
1.2.3 Energy	35
1.2.4 Water	39
1.3 Built Environment	45
1.3.1 Bridgetown	49
1.3.2 St. Lawrence Gap	50
1.3.3 Oistins	50
1.3.4 Holetown	53
1.3.5 Speightstown	55
1.3.6 Brownfield Sites	58
1.3.7 Rural Settlements	59
1.3.8 Land Use Impacts	60
1.4 Waste Management	61
1.4.1 Solid Waste and Sewage, Reduction and Recycling	62
1.4.2 Illegal Dumping	64
1.5 Climate Change and Disaster Management	65
1.5.1 Overview	65
1.5.2 Regional Programmes	66
1.5.3 Local Studies	70
1.5.4 Local Initiatives	73
2.0 Stewardship and Sustainable Tourism	75
2.1 Overview	75
2.2 Green Economy	75
2.2.1 Standards and Certification of Tourism Businesses	78
2.2.2 Scope for Business and Employment Opportunities	79
2.2.3 Promoting a Green Economy	80
2.3 Tourism Capacity	82
2.3.1 The Current Situation	82
2.3.2 Capacity Issues at Select Sites and their Potential Mitigation	84
2.3.3 Management by Numbers Does not Work Effectively	100
2.3.4 Managing for Sustainability	101
2.3.5 Managing Bottlenecks	102
2.3.6 Interpretation	106
2.3.7 Managing for Desirable Conditions	107
3.0 Recommended Actions to Support Environmental Management	107
List of Acronyms	134
References	136

Summary

Introduction

There have been a number of environmental studies, strategies, and action plans completed in Barbados over the last several decades, including the National Park Development Plan 1998; the Environmental Management and Land Use Planning for Sustainable Development Project 1998; the National Biodiversity Strategy and Action Plan 2002; and the Gully Ecosystems Management Study 2003. There have also been a number of environmental projects implemented in the corresponding period (e.g. the Harrison's Cave Redevelopment Project, 1998 - 2010; the Coastal Infrastructure Programme 2002 – 2009; the South Coast Sewerage Project 2001). However, without overarching environmental legislation that is necessary to enforce critical environmental regulations, the integrity of the natural environment in Barbados, both land and marine-based, will continue to be at risk from ongoing developmental practices, including those from the tourism sector.

An Environmental Management Act (EMA) was drafted over 15 years ago, but has not been approved by Government to date (pers. comm., L. Nurse, Permanent Secretary, Ministry of Transport and Works, July 2013). The draft EMA bill is currently with the Chief Parliamentary Council. It is to include various pieces of existing environmental regulations to provide a formal legal and procedural guide to environmental management in Barbados.

The Physical Development Plan (PDP; Government of Barbados, 2003) is an important document whose policies guide all development practices in Barbados, including those targeted within the National Park boundaries on the east coast. In the absence of a legislated EMA, the PDP is critical in helping to control the development of the island's resources.

Terrestrial Resources

Due to extensive deforestation in previous centuries and the dominance of agriculture since colonization, forests are essentially non-existent in Barbados (Government of Barbados, 2002, p. 37). Whereas most of the island was originally covered with forests, about 80% of the woodlands were cleared for agriculture within 30 years of British colonization in the 17th century (Watt, 1966). Currently, only 2% of the island is covered in forest, with the largest located at Turner's Hall, a tropical mesophytic (semi-deciduous) wooded habitat covering an area of approximately 21 ha. Other *natural* plant communities in Barbados are found primarily on beaches and sand dunes, sea cliffs, and in gullies (Government of Barbados, 2002, pp. 33-34). Although part of the island is under sugar cane cultivation, many cane lands are now abandoned and replaced by secondary forest and regenerating vegetation (Government of Barbados, 2002, p. 32).

As a result of the limited range of undisturbed natural habitats, the terrestrial fauna of Barbados is sparse, unlike other Caribbean islands that exhibit greater species diversity. The avifauna in Barbados is more diverse than other terrestrial fauna, although it is dominated by migratory species.

Potential major impacts on biodiversity in Barbados are from tourism development and uncontrolled grazing of livestock. Tourism development commenced in the 1960's, with hotels being constructed along west coast beaches in St. James (see also Report V, Section 2.0). The construction of hotels and marinas, particularly along the west and south coasts, has caused the destruction of native plant communities and introduction of exotic species in areas not already developed (Government of Barbados, 2002, p. 41).

The common practice of full site clearing before construction activity and resultant denuding of site vegetation, including mature trees, compromises the integrity of the natural environment in both coastal and inland areas. In addition to residential and commercial developments, the building of private villas has escalated particularly in the last few decades, thereby contributing to the conversion of green areas into higher density urbanized environments. Without adequate replanting schemes, these conversions contribute to habitat destruction, soil erosion, and rainwater run-off, which can be problematic in coastal areas with near-shore reefs that protect the island's beaches and coastlines.

Coastal and Marine Resources

Visitors to the island continue to seek sun, sea and sand as a vital aspect of their vacation packages, thus the coastal belt serves as a very important aspect of the total visitor experience. Activities within the coastal zone have multiplied over the years, ranging from beach volleyball or paddleball to scuba diving and snorkeling.

Biological diversity in the island's marine environment and freshwater ecosystems is rich, with over 1,500 species identified (Inniss, 2001). The increase in human activity in the coastal zone has been accompanied by a commensurate increase in impacts on associated natural habitats, including an increase in the amount of waste in the marine habitat. It has also been recognized that the coastal environment, and by extension tourism within the coastal zone, are both adversely affected by activities originating inland, i.e. outside of the coastal zone. The disposal of residential wastewater and industrial solid and liquid wastes all have a natural tendency either to flow over-land towards the coastline, or leach into the soil and groundwater, and impact over time on the fragile and delicately-balanced coastal ecosystem.

There is an urgent need to address these issues, which supports the aim of a greener economy for Barbados; strategies and actions have been proposed to help reduce the pace of degradation of the coastal zone and to diversify the tourism activities being offered therein, which will be reliant on the cooperation of the both the public and private sectors.

Energy

In order to foster greater energy efficiency, reduce high operating costs, and promote sustainable energy consumption in the tourism sector, the most practical and cost effective solutions should be implemented that are least harmful to the environment.

According to Hotel Energy Solutions (2011), a hotel's daily operations require significant and consistent energy consumption. The two main areas of energy consumption in the hotel

industry involve the use of air conditioning and lighting. Improved efficiency in air conditioning can be achieved by replacing old units with new ones, while efficiency in lighting can be promoted by replacing incandescent bulbs with newer energy saving fluorescent bulbs, and by shifting energy generation from a fossil fuel base to one that's based on renewable sources, such as solar or wind energy.

In the tourism industry, the challenge to be more competitive, the importance of reducing costs, and the growing sensitivity to protecting the environment combine to create the need to implement energy efficient solutions and introduce renewable energy options.

Recognizing the significance of this, Government has indicated its intention to create conditions whereby renewable energy generation would account for 29% of electricity consumption over the next twenty years (Alleyne, 2013).

Water

Water resources in Barbados have been under increasing pressure, as water production is approximating the capacity of its fresh water resources. According to Dr. Mwansa of the Barbados Water Authority, "we know that we have a limited resource, we are classified as a water scarce country"(Selman Moore, 2012). Production levels in Barbados are currently 42 million gallons per day (BWA, 2014).

It is generally accepted that the tourism industry demands both high quality and high quantities of water and wastewater services. The combined energy and water costs in the hotel sector can approximate as much as 20% of operational costs, with electricity representing up to 70% of energy costs (Duffy-Mayers and Oven, 2010); however, the cost of water supply was noted to be an average of 5% of annual expenses and therefore is a lesser concern than energy expenditures (Charara et al., 2010). Nevertheless, water is an indispensable commodity. Sub-metering, which is one method of monitoring consumption, was not present in many of the hotels surveyed.

The primary thrust for improving the efficiency of hotel operations is cost savings and the positive impact on green certification. Challenges to the implementation of water conservation measures in the hotel sector have been identified as:

- High price of work and imported technologies
- Limited budget for investments particularly for small hotels
- The perception that customer satisfaction decreases with water conservation devices (particularly for the luxury hotels)
- More emphasis placed on comparatively higher energy costs

One obstacle slowing the development of green management is the widespread perception among service providers that becoming environmentally green means higher and more prohibitive costs. Whereas technological modifications may necessitate significant initial investment, behavioural and operational changes can regularly be accomplished at no or minimal costs, and can result in long-term benefits (Jönsson, 2005).

With respect to recreational tourism uses, golf courses are the largest consumers of water resources. The TCDPO has imposed conditions on groundwater recharge to ensure adequate levels of groundwater are maintained. The BWA has recommended that future tourism development applications should be reviewed in accordance with their potential for water intensive demands.

Transitioning to a green economy (refer Section 2.2) will entail, among other natural resource management initiatives, the conservation of the island's precious water resources. Given that Barbados is a water scarce country, and the tourism sector demands high quantities of water to service its visitor demands, the widespread adoption of water conservation initiatives by the accommodation and hospitality sector is warranted and critical.

Along with local incentives relative to the use of renewable energy (refer Government of Barbados, 2008), *similar provisions relative to water use would be beneficial to stimulate more determined action regarding water conservation measures*. Included in Government's recent Ten-Point Plan announced by the Minister of Tourism on July 18, 2013, is a provision entitling tourism entities to a 5% rebate on their water bills for a 12 month period, to be extended to those entities that undertake a credible water management programme (Alleyne, 2013). These types of incentives are helpful in supporting water conservation practices in Barbados. Moving forward, research into the number of entities that adopt these management programmes will need to be undertaken in order to monitor the scope of water conservation measures being instituted by the tourism sector. This will help to inform further incentives and programmes to be developed.

Built Environment

With respect to land use management, particularly tourism development, PDP policies seek to direct new beach-oriented hotel and tourism development primarily to existing tourism areas along the south and west coasts (Government of Barbados, 2003, p. 3-14). All new development and redevelopment projects in coastal areas must be consistent with the directives of the 1998 Barbados Integrated Coastal Zone Management Plan. Waterfront properties must also respect public beach access. The development of tourist facilities and infrastructure in more inland areas has also been pursued, albeit to a lesser degree, to offer a more diverse product.

Indiscriminate land clearance in major developments has long been the trend in Barbados, notwithstanding the current TCPDO policy framework. Comprehensive enforcement of the Tree Preservation Act (1985) is seldom seen to occur in Barbados. The resultant effects have led to a harsher environment where developments occur. Tourism areas are also affected by such practices.

It is recommended that the planning authorities be more stringent in the acquisition of detailed landscape plans from developers prior to construction, and the imposition of penalties if there is no adherence to the legislative requirements.

The environmental character of the Garrison and Queen's Park, each large green spaces in otherwise densely built-up areas, should be preserved and extended beyond the immediate UNESCO World Heritage property boundaries. The paradigm shift must be in a new direction, aimed at initiatives that will protect the physical environment island-wide, promote green development practices, and complement the Barbados Visitor Economy.

Waste Management

Waste management continues to be an island-wide problem. Ample legislation exists to counteract the practice of illegal solid or liquid waste disposal, and further statutes are being developed to reinforce current laws. Natural areas should benefit measurably upon the implementation of solid waste management legislation currently under development by the Sewerage and Solid Waste Project Unit. Alternative measures, including public education, stiffer penalties, and monitoring of waste disposal operations, have been proposed to severely discourage offences.

Public education into proper waste disposal methods, maximizing the efficiency of disposal services, and obtaining community assistance in identifying and prosecuting offenders are primary goals under current and proposed waste management policies. The principal need is for monitoring and enforcement practices to be considerably strengthened.

Littering and dumping still occur island-wide, including in gullies where water is discharged into our sensitive coastal ecosystem. "People are still dumping without realizing they are destroying their homeland. And right off a little bridge by the Pot House Spring, persons dump vehicles, mattresses, stoves and dead animals, and that stream runs out into Bath Beach where persons would take a sea bath" (Cooke, 2012). Mitigation will require more prohibitive penalties combined with more rigorous enforcement.

Illegal dumping in nature tourism sites, including gullies, compromises both their integrity and tourism potential, and can have far-reaching effects on the environmental health and integrity of the island. According to the Gully Ecosystem Management Study (EPG et al., 2003), 266 gully segments were found to contain 369 dumpsites. It was estimated that approximately 10,000 tons of waste existed in those dumpsites at the time of analysis, and that did not include liquid waste data. Gullies in the vicinity of highly populated and developed areas are more prone to dumping. On a parish basis, the more populous parishes of St. James, St. Peter and St. Michael had the most dumpsites; the former two parishes are high tourism development areas in Barbados, and the latter parish includes the capital city of Bridgetown and prime commercial centre of the island, now a designated UNESCO World Heritage Site.

The White Paper (Strategic Solutions Inc., 2012, p. 123) emphasized the need to enforce national anti-litter programmes, particularly in the capital of Bridgetown, to strengthen the Barbados Brand and distinguish Barbados as a clean destination. The enforcement of health regulations prohibiting dumping, particularly in nature-based areas, will need to be more rigorous to avoid the deleterious effects of this practice. In this regard, the Ministry of the Environment has indicated that it is actively considering the introduction of environmental police to patrol beaches and open spaces in Barbados to help control illegal dumping and littering, and to have offenders prosecuted (Rawlins-Bentham, 2013).

The transitioning to a green economy, within the context of a Barbados Visitor Economy, will require greater land stewardship principles and actions, inclusive of appropriate waste management systems and practices.

Climate Change and Disaster Management

Given that the island's natural ecosystems, particularly in the coastal zone, feature prime assets for a vibrant tourism industry (e.g. sandy beaches, coral reefs, and calm coastal waters), it is imperative that these assets are safeguarded from negative impacts due to development and non-sustainable use. Improper planning of development projects, including tourism infrastructure, can also be exacerbated by climate change and natural disasters. Tourism stakeholders will therefore need to have a greater understanding of the role of the environment as it relates to the viability of the island's economy in order for sustainable development to be achievable.

The United Nations World Tourism Organization (UNWTO) has described tourism as a vector and victim of climate change: a victim since changes in temperature, sea levels and land use will radically change tourism capabilities and hence development patterns of nations; and a vector since the tourism value chain has a carbon footprint that will increase based on growth projections (UNWTO, 2007). Experts recognize that the environment, including climate, is a tourism resource, and the industry is highly susceptible to the impact of climate change and increased warming. The fortunes of tourism-dependent economies are sensitive to these types of global external factors (CCMF, 2011).

Disaster risk management efforts are required by tourism stakeholders at the local, national, and regional levels in order to reduce vulnerability and assure continued sustainable development following hazard events.

When the tourism industry is negatively impacted by natural hazards, the expected domino effect is a decline in agriculture, manufacturing, transportation, financial services and a host of services in the economy that are vital linkages to the tourism industry. The sustainability of the tourism sector therefore equates to the sustainability of economic, social, cultural and environmental assets.

Tourism Capacity

In Barbados, tourism capacity is more relevant to visitor activities and management techniques, than to numbers of visitors. The Barbados tourism economy has shrunk since 2006, thus in the next 10 years it will be a challenge to get back to that level or grow beyond it. Thus with appropriate management, Barbados should be able to absorb the numbers of visitors predicted for the next 10 years with minimal environmental impact. However, there must be an appropriate suite of management tactics adopted and implemented for this to happen.

It is of particular relevance that Barbados is concerned with:

- Maintaining or increasing the contribution of tourists and tourism to the economy
- Ensuring a quality visitor/user experience is maintained for high satisfaction
- Conserving Barbados destinations

Stakeholders identified those areas with emerging or actual problems, particularly: high-use beaches; St. Lawrence Gap; Oistins. Issues included: high visitation, diminished visitor experiences, parking problems at peak periods, small parking areas, no overall management responsibility for the problem areas.

There is a clear need to balance the quality of the visitor experience with the impact on the environment, the local community, and the protection of natural and developed tourist sites.

The Tourism Capacity section of the TMP explains how management by numbers does not work effectively. Management for sustainability involves:

1. **Managing the supply** (of tourism or visitor opportunities, e.g. by increasing space or time available to accommodate more use)
2. **Managing the demand** (e.g. through restrictions of stay length, total numbers, use type)
3. **Managing the resource** (e.g. through hardening sites or developing facilities)
4. **Managing the impact** (reducing the impact of use, e.g. modifying the type of use, or dispersing or concentrating use)

Not only do managers need to take various approaches, but they need to adapt their management tools as they learn what the responses are to various management techniques. In essence, the management mix will likely need to change over time.

The types of management approaches, and a range of tactics, are presented in Table 2.3, Section 2.3.4. Of these approaches, interpretation is a strong but underutilized tool in resource management, which assists in modifying behaviour, and adding value to the experience.

For some time, management thinking has moved from only considering the *numbers*, towards determining the social, environmental and experiential conditions which should prevail. Although exact numbers relative to carrying capacity and visitor management statistics are becoming less important, a general indication can inform basic decision-making relative to tourism capacity at a given destination. However, the focus should ultimately be on identifying desirable conditions for sustainable tourism, which typically incorporate both the state of the environment as well as the quality of visitor experience.

Promoting a Green Economy

Promoting sustainable resource management that translates into a greener economy will require a range of responses necessary to develop a holistic approach to the management

of the island's natural resources that fosters a healthy environment in which the tourism industry, and indeed society as a whole, can thrive. These responses include local support, land stewardship practices, financial support, and political will, all contributing to the creation of fair decisions and sustainable practices, and ultimately the nurturing of resilient landscapes (see Figure 2.1, Section 2.2.3).

Ogden (2009) also outlined a number of challenges to achieving sustainable development, which are applicable to Barbados, including:

- Public apathy, lack of understanding and environmental awareness, and resistance to investment in national environmental programmes
- Lack of coordination between the various public sector departments whose mandate is to address environmental issues
- The need to implement initiatives required by any environmental conventions to which Barbados is a signatory
- The need to link private sector / NGO initiatives in environmental management with associated public sector ones
- Ongoing natural habitat fragmentation and associated loss of connectivity, within and between land and marine-based resources, driven by development pressures
- The competition for physical space, including terrestrial or marine, for the development of goods and services (e.g. tourism infrastructure, residential developments, commercial and agricultural industries, coupled with the need to adhere to strict zoning laws to minimize same)
- The lack of mature woodlands and the need for sustainable forest regeneration programmes, especially on abandoned agricultural lands
- Maintaining important areas of biodiversity through appropriate protection and management schemes
- The need to promote integrated and sustainable economies that reflect high environmental standards, and provide local food and energy security

Achieving a green economy, inclusive of a sustainable tourism product for Barbados, will be dependent on requisite regulations that are established to support development that is not harmful to the environment on which it depends. In this regard, passing the draft Environmental Management Act with supporting regulations, along with strict enforcement regimes, is critical to achieving this objective. In the absence of such a regulatory framework for Barbados, the desire to establish a green economy can only be discussed and debated, but impractical to put into practice.

Under a legislated EMA, public sector departments that are responsible for environmental matters, including the EPD, NHD, NCC, SSA, BWA, CZMU, Division of Energy, and Ministry of Environment, will have the basis upon which to operate more effectively, and be capable of driving environmental policy, programmes, and strategies that have been compiled to date, and which will be developed moving forward, in order to transition to a green economy for Barbados. Efforts to convert to renewable energy from our current fossil fuel driven economy are well underway, and can be further promoted island-wide through ongoing and future initiatives and incentives, promoting greater buy-in from the private sector, and

stimulating developers and investors to embrace the goal of national sustainable development.

The Scotland District, which is a protected area covering one-seventh of the island, is to be considered the primary 'breathing space' in Barbados. It represents more than a rural landscape which possesses striking views. It provides a sense of wellbeing and the potential for significant revenue streams.

Barbadians collectively will require a paradigm shift in mindset that is geared towards greater land stewardship to foster a Barbados that visitors will seek, admire, and enjoy. Since residents of Barbados are also potential domestic tourists, this will entail a scenario similar to the concept of 'cleaning up your own backyard', for the benefit all. The younger generation will be best able to embrace this concept, but greater environmental awareness and training will be necessary for all levels of society. This concept is embraced through one of the White Paper's sustainable tourism development policy statements (Strategic Solutions Inc., 2012, p. 217) that states that Government will:

“develop programmes to educate and sensitize all Barbadians, tourism and other businesses about the benefits of sustainable development and the Government's alternate energy programmes, and acquaint them with the incentives and concessions available to encourage the transition to a more energy efficient nation”.

Developers will have to become greater land stewards and avoid the traditional practice of total site clearance before commencement of construction projects; planners will have to design sites that incorporate natural elements, maintain the integrity of the natural environment and promote the reduction of carbon footprints prior to seeking planning approvals.

Tree replanting schemes on existing properties that lack vegetation cover and those planned for all new developments, along with the promotion of reforestation projects will help to create an environment for users, both local and international, that is more comfortable, appealing and satisfying for the benefit of all.

Organic and sustainable farming practices that can feed the local population will help to reduce the heavy reliance on food importation, prevent the addition of toxins into the environment, and promote greater health and well-being for all. With an ideal year-round climate, and the incorporation of renewable energies that drive sustainable agriculture, Barbados can act as a model for sustainable living. Starting in the rural communities of St. Andrew, St. Joseph and St. John, these communities can become well established and foster other similar initiatives throughout the island.

With the implementation of reliable Farm to Table programmes (see also Report V, Section 3.6.1.3) that link with food outlets, restaurants, and visitor accommodation establishments, locals and visitors will be able to enjoy farm fresh, healthy Barbadian foods on a consistent basis, and be confident of where the food originated and how it was grown. The production of sustainable foods and promotion of local small businesses, while enhancing the tourism product offering, will drive the national economy towards a thriving tourism industry.

Actions Recommended to Preserve and Enhance the Tourism Environment

Barbados has a high dependency on the natural environment for the resources required to sustain vital tourism products such as accommodation, attractions, and associated goods and services. Whether it pertains to the maintenance of a healthy and clean terrestrial and near-shore marine environment, or the provision of adequate, high quality food and water resources to supply the nation's residents and guests, the sustainability of the island's natural resource base is critical to the viability of a successful tourism industry.

The quality of the Barbados visitor experience is highly dependent on the quality of its physical environment. A large part of the reason for the development of a major international tourism industry in Barbados is the very existence of what was once its pristine beaches and rural areas. Visitors note, and are impressed with, the cleanliness of the destination they visit; they are equally negatively impressed by any lack of cleanliness and environmental degradation. Barbados needs to address this, and not doing so will result in loss of revenues to the Barbados Visitor Economy (BVE).

Environmental stewardship in any destination requires an extensive degree of participation and awareness (see also Report III, Section 4.0), and an understanding of the principles of tourism sustainability and responsible tourism. In this regard, it is necessary to recognize the critical linkage between environmental integrity, tourism, and the well-being of all residents in Barbados.

Actions that are proposed to mitigate negative environmental impacts, support the objectives of a Green Economy, and promote enhanced visitor experiences and subsequent growth of the BVE are listed below, and more fully described in Section 3.0. These Actions are in support of Strategic Imperative 11 on '**Mainstreaming Environmental Management**' and corresponding Strategy 11.1 which states: "*Bring environmental management into the mainstream through improved protected area management and enhanced physical environs, implementation of conservation initiatives, and expanded capacity to provide environmental education and public awareness*". Some of the recommended Actions relate to Strategic Imperative 12 on '**Update and Enforce Policy and Legislation to Support the BVE**', and corresponding Strategy 12.1 which states: "*Review local legislation to update existing and enact new laws to facilitate functioning of the BVE*" (refer Report I, Sections 4.4 and 5.0).

- 11.1-1 Develop a Beach Accreditation Programme**
- 12.1-1 Ratify the Draft Environmental Management Act**
- 11.1-2 Implement an Energy Saving Programme for the Tourism Sector**
- 11.1-3 Conduct a Sand Fluidization Programme for Beaches**
- 12.1-2 Create an Environmental Hotline**
- 12.1-5 Enforce Marine Pollution Legislation**
- 11.1-4 Support the Waste Reduction Programme**
- 11.1-5 Develop a Programme for a Greener Bridgetown**
- 11.1-6 Improve the Garrison to Oistins Corridor**

- 11.1-7 Implement a Reforestation Programme**
- 11.1-8 Develop an Environmental Stewardship Programme**
- 11.1-9 Preserve and Enhance “Open Windows” to the Sea**
- 11.1-10 Develop an Energy Credit Programme**
- 11.1-11 Implement a Climate Change Awareness Programme**

1.0 Physical Environment

1.1 Overview

Caribbean island states are characterized by small land masses that require sensitive developmental approaches for fostering economic and environmental integrity. According to IBM (2009), these small states are susceptible to a number of food, water, and energy stress factors, including environmental shocks from climate change events, food resilience issues due to major food importation practices coupled with limited local food production, health issues due to imported diets and lifestyles, economic shocks due to fragile, developing economies susceptible to external pricing variations, and energy shocks from limited deployment of renewable energy technologies and a heavy dependence on imported fossil fuels. IBM (2009) also noted issues specific to Barbados, including that the island:

- ranks as the 15th most water scarce country in the world
- produces approximately 25% of food locally
- 60% of the population lives within an urban corridor of 3 coastal parishes, with 25% living less than 2 km from the coastline
- expends approximately 7% of GDP on fossil fuel imports annually, and provides fossil fuel based electricity that is generated within 2 km of the coastline

In recognition of the challenges faced by small island states in the region, the St. George's Declaration of Principles for Environmental Sustainability, prepared in 2001 for Eastern Caribbean states, promoted a concept related to sustainable island resource management that considers the whole island ecosystem and its marine and terrestrial resources as a capital asset. If properly managed and protected, these resources would yield a flow of vital goods and services (e.g. water, physical shelter, adaptive capacity) that are necessary for sustainable economic development (OECS, 2006). These principles also relate to Barbados, which faces similar environmental challenges to OECS member states.

The physical environment is generally comprised of (a) natural systems that function without human alteration, and (b) built infrastructural development that is man-made. Environmental issues that are relevant to the tourism industry in small Caribbean states typically involve terrestrial resources, coastal and marine resources, water resources, energy, and solid waste management. A viable tourism industry is reliant on the health and integrity of environmental resources upon which it depends; the quality of the environment, both natural and man-made, is therefore essential to the provision of a successful tourism product. In this

regard, it will be important to promote environmental integrity and institute best management practices in order to mitigate any negative impacts resulting from tourism development. As declared in the recent Barbados National Assessment Report (Government of Barbados, 2010, p. 1):

“For an island, conservation goes hand in hand with sustainable economic development, a delicate balance where both humans and habitats can prosper”.

Tourism related activities cause both positive and negative impacts on the environment. Tourism has the potential to create beneficial effects by contributing to environmental conservation and raising awareness of environmental values. It can also serve to protect natural areas and increase their economic importance. However, tourism can also gradually destroy environmental resources if the industry’s infrastructure and services are developed unsustainably (UNEP, 2001).

The need for greater sustainability in the approach to tourism development is widely advocated. The UNWTO (2011) predicts that international tourist arrivals will reach 1.8 billion by 2030; meeting this growth in a way that reinforces economic development, environmental protection and social welfare is the challenge that the tourism industry faces, and all forms of tourism should strive to be sustainable. The OECS defined sustainable tourism in the Sustainable Tourism Development Strategy and Plan of Action for the Caribbean (CTO, 1999, p. 1) as:

“...the optimal use of natural, cultural, social and financial resources for national development on an equitable and self-sustaining basis to provide a unique visitor experience and an improved quality of life through partnerships among the government, the private sector and communities”.

As articulated in the White Paper (Strategic Solutions Inc., 2012, p. 62), environmental management is an important element that influences the valuation of a competitive tourism destination, and in particular:

“...product quality in the tourism industry is more closely related to environmental quality than in any other industry”.

With specific reference to Barbados, the White Paper (Strategic Solutions Inc., 2012, p. 64) noted that:

“...over the years, lack of controlled management and development has resulted in serious impacts on the environment...The negative impact of tourism on the natural environment and other ecosystems is ultimately hurting the tourism industry itself and compromising its viability”.

The White Paper also emphasized the Government’s ultimate goal for the tourism industry, underpinned by the need for its sustainable, long-term development, as follows (Strategic Solutions Inc., 2012, p. 97):

“Tourism benefits must always outweigh their costs in order to ensure that the sector gives back more than it takes. The industry has the capacity to propel Barbados into further social development, as well as to act as a catalyst for the conservation of the physical environment. Tourism is one of the few industries in the world that, when planned and managed properly, takes nothing from a country, leaves behind hard currency, fosters education and job creation, significantly contributes to socio-economic development and environmental consumption, and promotes peace and stability”.

The White Paper provided a policy statement on sustainable tourism development for Barbados (Strategic Solutions Inc., 2012, p. 216) as follows:

“Government recognizes that the environment...is an indispensable resource base for the tourism industry. As a result, the Government will ensure that the principles of sustainable development inform all areas of tourism planning and management, with respect to adherence to physical environmental policies for the conservation of natural resources...”

Assessment of environmental impacts as a result of tourism activities in the Caribbean can be challenging since locals and visitors utilize the same resources, and environmental changes in the absence of inadequate baseline data conditions are often the norm. For example, impacts such as littering can be observed and quantified directly, depending on the precise location of the activity. However, those involving damage to coral reefs may occur cumulatively from actions such as sedimentation from an adjacent construction development, runoff from a watershed discharging into the coastal zone, or warming of the seas due to climate change, rendering the discrete cause to be unclear (Silva, 2000).

If tourism is not well planned and managed, it can generate the following negative environmental impacts as identified by the Caribbean Tourism Organization (CTO; see Silva, 2000, p. 14):

- Disturbance of natural areas, archaeological sites, and historic areas through overuse / misuse and inappropriate tourism development in vulnerable areas
- Waste disposal challenges, e.g. littering, inadequate waste disposal by tourism facilities
- Pollution of the environment, including water, air, noise, and visual pollution
- Social conflicts that generate imbalances in application of resources and benefits between visitors and locals
- Cultural changes, e.g. increased crime, prostitution and further social dilemmas

In comparison, the CTO (Silva, 2000, p. 13) outlined the following positive environmental impacts that can be generated if tourism is well planned and managed:

- Revenues gained from the conservation of key natural areas and wildlife as major attractions for tourists
- Revenues gained from utilizing archaeological and historic sites as tourist attractions
- Improved environmental quality through incentives to clean up environments for tourism
- Heightened local environmental awareness, particularly among the youth

- Exposure of local communities to ideas, people and languages, as well as the economic benefits of tourism. Also increases the local pride through greater exposure to aspects of cultural heritage
- Cultural revival through increased demands for local crafts that stimulates skill development and preservation of heritage sites by local artisans

CTO (Silva, 2000, p. 27) also provided a list of key issues to be considered in defining a framework for sustainable tourism standards and indicators. These issues include:

- *Land use planning and management* - Environmental hazards and land use problems can result from poor planning, positioning and development of tourist attractions
- *Waste management* – High quality waste management systems are recommended since tourism establishments generate greater amounts of solid waste on a per capita basis; in addition, the management and safe disposal of chemicals or hazardous substances is required
- *Pollution* from tourism sources
- *Energy efficiency, sustainable design, conservation and management* – Design of less polluting /more efficient tourism products; reducing the consumption of non-renewable fossil fuels
- *Freshwater management* – Monitoring and managing freshwater consumption patterns
- *Ground Transport* - Transport facilities and services operating at high efficiencies; lowering vehicular emission levels by reducing the reliance on fossil fuels (see Report V, Section 1.1)
- Community and stakeholder involvement, and the development of public private partnerships in promoting sustainable development goals are seen as critical factors for all these issues

This report examines a number of these key issues, including land use, waste management, energy and water use, and also investigates issues related to climate change and disaster management, all of which have significant implications for the tourism industry. A discussion on stewardship and responsible tourism follows, including the pursuit of a green economy, the need for greater environmental awareness, and the importance of visitor management to help reduce the negative effects of tourism on the environment. Strategies and actions are presented in Section 3.0, focusing on the conservation and sustainable use of the environment upon which the tourism product depends, and aligning with the policy statements presented in the White Paper on sustainable tourism development in Barbados.

1.2 Natural Environment

Barbados has had a high dependency on the natural environment for the resources required to sustain vital tourism products such as accommodation, attractions, and associated goods and services. Whether it pertains to the maintenance of a healthy and clean terrestrial and near-shore marine environment, or the provision of adequate, high quality food and water resources to supply the nation's residents and guests, the sustainability of the island's natural resource base is critical to the viability of a successful tourism industry.

The Barbados National Assessment Report (Government of Barbados, 2010, p. 7) recognized the need to address critical environmental issues, including changing unsustainable patterns of consumption and production, in order to achieve sustainable development. The Report noted the status of some key issues, consistent with those provided by CTO above, as follows:

(i) *Water Resource Management* - Barbados is the 15th most water scarce country globally, and the water delivery infrastructure is an aging one. The Barbados Water Authority (BWA) is pumping at near maximum capacity, which places the nation's groundwater aquifers under significant pressure.

(ii) *Coastal and Marine Resources Protection* - The Government has placed a high priority on the protection of its vulnerable coastal resources. A Coastal Zone Management Act was passed in 1998, and a Barbados Beach Management Plan was completed in 2008, creating clear guidelines for the sustainable management of beach resources. The work of the Coastal Zone Management Unit (CZMU) includes engineering against coastal erosion, collecting data on coral health, and ensuring that sustainable development practices are instituted on the coastline.

(iii) *Pollution Management* - The Environmental Protection Department (EPD) executes policy development, monitoring and evaluation. The Department's activities include the revision of air quality policy and the development of guidelines on fuel and waste oil handling, storage and disposal practices.

(iv) *Establishment of Parks, Protected Areas, and Green Spaces* - The Natural Heritage Department (NHD) is facilitating the establishment of the Barbados National Park and a system of protected areas on the island, which will help to safeguard the island's biodiversity.

These issues will be discussed further in this section, together with assessing the demands placed on the island's natural resource base, identifying areas where services may be improved, and commenting on negative impacts that may result through the ongoing development of the tourism industry in Barbados.

1.2.1 Terrestrial Resources

Due to extensive deforestation and the dominance of agriculture since colonization, forests are essentially non-existent in Barbados (Government of Barbados, 2002, p. 37). Whereas most of the island was originally covered with forests, about 80% of the woodlands were cleared for agriculture within 30 years of British colonization in the 17th century (Watt, 1966). Currently, only 2% of the island is covered in forest, with the largest located at Turner's Hall, a tropical mesophytic (semi-deciduous) wooded habitat covering an area of approximately 21 ha. Other *natural* plant communities in Barbados are found primarily on beaches and sand dunes, sea cliffs, and in gullies (Government of Barbados, 2002, pp. 33-34). Although part of the island is under sugar cane cultivation, many cane lands are now abandoned and replaced by secondary forest and regenerating vegetation (Government of Barbados, 2002, p. 32).

Due to the limited range of undisturbed natural habitats, the terrestrial fauna of Barbados is sparse, unlike other Caribbean islands that exhibit greater species diversity. The avifauna in Barbados is more diverse than other terrestrial wildlife, but dominated by migratory species or those that reside over winter.

Potential major impacts on biodiversity in Barbados are from tourism development and uncontrolled grazing of livestock. Tourism development commenced in the 1960's, with hotels being developed along west coast beaches in St. James (see also Report V, Section 2.0). The construction of hotels and marinas, particularly along the west and south coasts, has caused the destruction of native plant communities and introduction of exotic species (Government of Barbados, 2002, p. 41). The common practice of full site clearing before construction activity and resultant denuding of site vegetation, including mature trees, compromises the integrity of the natural environment in both coastal and inland areas.

In addition to residential and commercial developments, the building of private villas has escalated particularly in the last few decades, thereby contributing to the conversion of green areas into higher density, urbanized environments. Without adequate replanting schemes, these conversions contribute to habitat destruction, soil erosion, and rainwater run-off, which can be problematic in coastal areas with near-shore reefs that protect the island's beaches and coastlines.

The Barbados National Biodiversity Strategy and Action Plan (NBSAP; Government of Barbados, 2002, p. 156) described the challenges relative to the protection of the island's natural resources, including effects from any ongoing tourism activities, as follows:

“The conservation of biodiversity in Barbados relies heavily on the effectiveness of the GOB to streamline the operations of the various Ministries and agencies which are involved in environmental management. The formulation and delegation of clear biodiversity protection mandates among these institutions, enhanced levels of communication and documentation of biodiversity related information, in addition to the optimal utilization of resources at hand is essential if they are to effectively carry out their functions. The Environmental Unit...needs to fully embrace its role as the lead agency for biodiversity, and protected area management and also seek to establish committees in order to effectively administer National Park and other protected habitats which impact upon the livelihood of the nation's biodiversity. With the implementation of these initiatives, the GOB can no doubt vastly improve upon its goals of sustainable environmental management and biodiversity conservation”.

In this regard, the consolidation of departments responsible for environmental management would significantly improve the critical focus and action required to transition to a Green Economy (refer Action 12.1-1). Since tourism and environment are inextricably linked, this initiative would also contribute to the development of sustainable tourism in Barbados.

The NBSAP identified the following areas that would enhance Government's capacity to undertake effective conservation and management of the island's biodiversity (Government of Barbados, 2002, p. 149):

- Improved protected area management and conservation

- Revising / updating legislation and regulations for the protection of habitats and species
- On-going research and compilation of biodiversity information into a central repository, including the collation and maintenance of a comprehensive GIS database
- Expanding the capacity to provide biodiversity and related environmental education and public awareness to locals
- Enhancing the capacity to effectively prosecute violators of existing regulations to ensure the protection of biodiversity

According to the Barbados National Assessment Report (Government of Barbados, 2010, p. 20):

“Open green spaces once established and properly managed, present an opportunity for both social and economic development in that they can be used for recreational, educational and cultural events, as well as being marketed as a natural ecotourism destination”.

1.2.1.1 The Scotland District and Other Sensitive Natural Areas

The Barbados National Park, also referred to as the Scotland District, is a prime rural landscape that can foster nature-based attractions and also land stewardship programmes (e.g. refer Actions 11.1-7 and 11.1-8 in Section 3.0). The development and maintenance of nature-based attractions (see Figure 1.1) can help to sustain healthy environmental processes, promote environmental education for local stewardship, and enhance tourism awareness regarding the importance of preserving the natural environment.

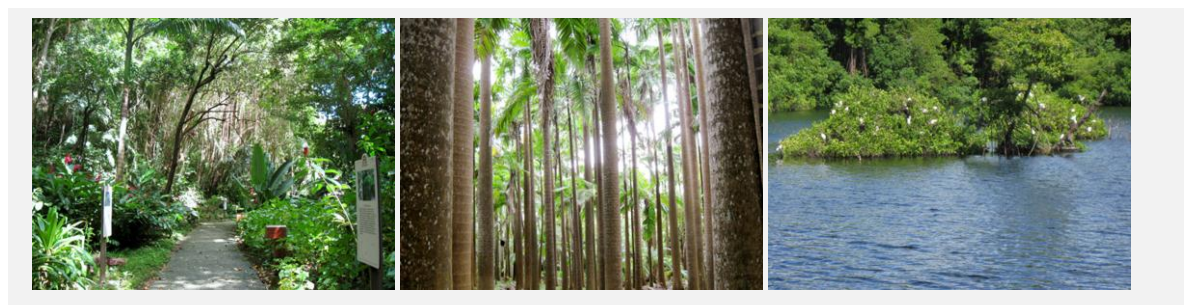


Figure 1.1. Select nature tourism sites in Barbados: Gully walk at Harrison’s Cave (left); mature palm forest in the Scotland District (middle); Graeme Hall Swamp, with cattle egrets roosting in White Mangrove trees (right).

The National Park Development Plan (NPDP; Government of Barbados, 1998) offers the best opportunity for the development of nature tourism sites in Barbados. The NPDP goals include ecosystem protection and restoration, ecosystem and human use linkages, species protection and enhancement, and management of development proposals.

In order to identify the most vulnerable or significant natural areas, the NPDP stipulates National Heritage Conservation Areas (NHCA) which contain:

- Core areas – cohesive landscape units, e.g. remnant forests, major stream systems
- Corridors – passageways / linear features, e.g. drainage ways, gullies and shorelines

- Connecting links – passageways connecting isolated core areas

The Barbados National Park zone is ideally suited to enhancement and further development of nature tourism, agro-tourism, organic farming and, in addition, rural entrepreneurship schemes (see Figure 1.2). Since the majority of lands encompassed by the proposed National Park slated are frequently in private ownership, the NPDP advocates the formation of partnership agreements with private land owners for proposed conservation or recreational use.



Figure 1.2. Typical rural scenes from the Scotland District, part of the Barbados National Park area (Source: Studio Max, Barbados, 2013).

For example, the majority of gullies are in private ownership; therefore public recreational activities would require permission for access. Agreements with individual owners will be required to develop nature tourism uses in such areas. Previous successes included the Arbib Nature Trail where an established Landowner Agreement was put in place and subject to annual renewal. Outside the National Park boundary, Jack-in-the-Box Gully is the primary site with an NHCA listing.

Also within the National Park, the redevelopment of Harrison's Cave, one of the primary tourism attractions in Barbados, was completed in 2010 and serves as a best practice example of a sustainable tourism development in Barbados (Axys Environmental Consulting Inc. et al., 2000). Other examples of initiatives being planned by Government include the proposed National Botanic Garden that lies within a primary water catchment area in St. Michael and aims to protect aquifers. This project has the potential to increase the economic and environmental value of lands currently not in major use (Nation News, 2007; Government of Barbados, 2010, p. 58).

Another example is Graeme Hall Swamp, which is partly in private ownership (i.e. 42%). This site represents the largest mangrove swamp remaining on the island, covering an area of 81 acres that, in December 2005, was designated a Ramsar Convention site for Wetlands of International Importance (Government of Barbados, 2011, p. 102). It acts as an important 'green lung' in an otherwise heavily developed zone on the south coast, and features interesting plant and animal species including nesting birds, vegetation tolerant to brackish conditions, and a variety of aquatic organisms. There is significant nature tourism potential

at this site, which would require a continued partnership between the private owner and Government.

Gullies are a key recreational resource. There are approximately 348 km of wooded gullies in Barbados, some featuring indigenous and endangered species that require conservation. It has been recommended that Government prioritize gullies and open areas that are critical for nature tourism, and utilize public-private agreements to facilitate long-term nature activities within a framework of biodiversity conservation (EPG et. al., 2003).

In particular, passage of the Environmental Management Act, (drafted about 20 years ago but still to be enacted), would provide the critical legal support for Government departments responsible for environmental management (the consolidation of which is recommended above; refer also Action 12.1-1 in Section 3.0), and would embrace the stewardship required for the island’s natural habitats.

Figure 1.3 illustrates a best practice example of the social, economic, and environmental value of National Parks. This particular example is taken from the Wales model (Campaign for the Protection of Rural Wales (CPRW), 2014). Since tremendous value can be derived from the development of National Parks, consideration must be given to management of the Scotland District area to realize the potential for significant revenue flows and employment generation, while promoting the country’s sustainable development goals and objectives towards a green economy.

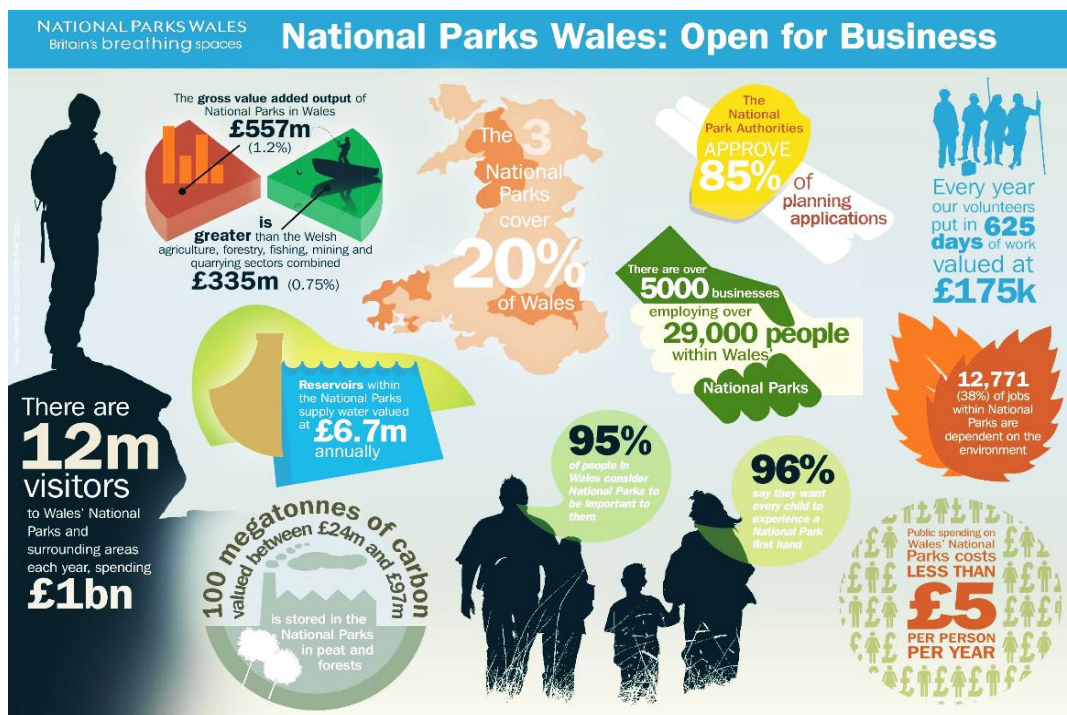


Figure 1.3. An indication of the social, economic, and environmental value of National Parks in Wales (CPRW, 2014).

1.2.1.2 Farming the Land

Agriculture continues to be an important sector for Barbados although its contribution to GDP has been severely eroded, from approximately 60% in the 1970's to 6% in 2011 (ECLAC, 2011). Many locals are directly employed in the sector and its ancillary services, which are necessary in supporting both the domestic and the tourism markets. Despite the importance of being able to grow your own food to feed the local and visiting populations, it has been noted that *“there is tremendous pressure from other sectors, especially tourism and housing, to change agricultural land to other uses. Barbados relies heavily on food imports and it has been recognized that climate change may affect the availability of these imports. Imported food is becoming more expensive and harder to obtain (ECLAC, 2011).”* Balancing the spread of development with the need to retain agricultural land in fresh food production is therefore of high priority to the stability of Barbados as a whole.

According to the Physical Development Plan (PDP; Government of Barbados, 2003, p. 3-40), a primary policy objective for Barbados is to preserve agricultural land, thereby creating a vital constraint and absolute barrier to land development. In terms of further development of agricultural lands, only small-scale tourism or recreational uses are permitted therein by the PDP. However, there are areas within the rural landscape that have been designated for ‘rural settlements with growth potential’ in order to accommodate projected urban growth for Barbados.

Since the agricultural industry requires land, energy, and water resources for food production, there are issues pertaining to the natural environment that influence its ongoing development. For example, the more traditional use of fertilizers and pesticides to increase crop production can compromise the integrity of the natural environment through the introduction of chemical pollutants. Adopting more organic practices of food production would help to reverse this trend and foster the production of healthy local foods for consumption. Other issues provided by IBM (2009), include the following:

- Land is increasingly being converted for housing and commercial activity, reducing the rural landscape for agribusiness
- The appeal of real estate returns and resulting urban sprawl reduces the desire to produce food locally and increases the importation dependence to feed the population
- Barbados imports 75% of its food
- 10-20 days of food are stocked on the island at any point in time
- There is no local traceability through the supply chain of local or imported foods
- The continued national economic development hinges on the access to and affordability of food
- There are no large scale renewable energy implementations relative to farm production

The proposed Government of Barbados/UWI Centre for Food Security & Entrepreneurship's 40 acre Model Farm in St. Thomas will help to address some of these issues through the provision of green energies, organic farming practices, and food traceability. A link with the Ministry of Tourism is also recommended (pers. comm., L. Grieg, IBM Corporation, February, 2013). The main objective of the Centre as provided by IBM (2009) is:

“...to be a model for the production, distribution, marketing and use of food crops in an environmentally and economically sustainable manner. It is the first step in improving the capabilities of the current and next generation of farmers, to teach, through theory and practical application, how to run a farm as a business, while growing a range of indigenous foods, respecting the ecology of the island/state -and while improving the nutritional levels of food available to Barbadians and improving the export/import balance of the national diet. The farm will utilize cutting edge agribusiness techniques, technology and information to marry economic development with environmental sustainability...”.

The Centre will assist Barbados in improving its food security and reducing its high food import bills, and is expected to be operational from 2013 (Dr. C. Brathwaite in CBC News, 2013).

Organic and sustainable farming practices that can feed the local population will help to reduce the heavy reliance on food importation, prevent the addition of toxins into the environment, and promote greater health and well-being for all. With an ideal year-round climate, and the incorporation of renewable energies that drive sustainable agriculture, Barbados can act as a model for sustainable living. Starting in the rural communities of St. Thomas, St. Andrew, St. Joseph and St. John, these sustainable communities can become well established and foster other similar initiatives throughout the island. With the implementation of reliable Farm to Table programmes (e.g. Slow Food Barbados; see also Report V, Section 3.6.1.3) that link local organic farmers with food outlets, restaurants, and visitor accommodation establishments, locals and visitors will be able to enjoy farm fresh, healthy Barbadian foods on a consistent basis, and be confident of where the food originated and how it was grown. The production of sustainable foods and promotion of local small businesses, while enhancing the tourism product offering, will drive the national economy towards a thriving tourism industry, and support the objectives of a green economy for Barbados (refer Section 2.1).

1.2.2 Coastal and Marine Resources

Barbados has approximately 92 km of coastline bounded by coral reef systems and incorporates 80 beaches that help to attract visitors from around the world (IADB, 2013; see Figure 1.4). In 2013, two of Barbados' beaches were listed among the top 100 in the world and ranked high amongst a total of 19 beaches recognized within the Caribbean region (CNN Travel, 2013). According to Minister of Environment, Hon. Dennis Lowe, *“Barbados' coastal footprint is our country's most valuable, natural and economic asset”* (Rawlins-Bentham, 2012¹). Beach protection and conservation is therefore critical not only in safeguarding the island's coastal resources, but also in helping to sustain the economically important tourism industry (refer Action 11.1-1).



Figure 1.4. Coastal resources important that help to attract visitors: Browne's Beach (left), Batts Rock Beach (middle), and Crane Beach (right).

In general, the maintenance of beaches is reliant on a healthy near-shore marine environment and associated coastal zone. Infrastructural encroachment onto beaches, water quality deterioration, coastal reef and wetland destruction, and loss of public beach access are all examples of the effects of development in the coastal zone (UNEP, 2010, p. 4). The degradation of reefs and marine biodiversity through pollution from land-based sources is monitored by the Coastal Zone Management Unit (CZMU), which operates under the framework provided by the Coastal Zone Management Act (2000).

A number of coastal projects have been initiated to address the negative environmental impacts on the coastal zone due to infrastructural development. For example, NCC, in association with CZMU, promotes a beach maintenance programme, 'Adopt-a-Beach', that features beach and underwater clean-ups, the provision of beach amenities including waste bins, benches, and tables, and replanting of vegetation on specific beaches (pers. comm., L. Brewster, CZMU, November 2010).

Biological diversity in the island's marine environment and freshwater ecosystems is rich, with over 1,500 species identified (Inniss, 2001). The increase in human activity in the coastal zone has been accompanied by a commensurate increase in the impacts on associated natural habitats and supporting species, including an increase in the amount of waste ending up in the marine habitat. Given that coastal infrastructure can impact on habitats and disrupt ecosystems important to inhabiting wildlife, and recognizing the value of environmental protection to the tourism industry, the Government implemented the Coastal Infrastructure Programme (CIP) from 2002 to 2009. This programme included the following 6 projects, the first 3 of which have been completed:

- Hometown Beach Improvement Project
- Rockley to Coconut Court Waterfront Improvement Project
- Welches Beach Improvement Project
- Tent Bay Boat Access Improvement Project
- Hometown Lagoon Water Quality Improvement Project
- Crane Beach Improvements Project

Additional work on the west coast includes upgrades to the Folkestone Marine Park and Reserve, which will improve the coastal environment in this area. The CIP programme also

incorporated shoreline changes along the west and south coasts, with protective boardwalks and headlands that serve as popular recreational areas (Barbados Advocate, February 13, 2012). The overall goals of these 6 projects are to:

- Stabilize shorelines
- Control erosion
- Restore coastal habitats
- Improve public coastal access
- Strengthen coastal management institutions

Although protection of the island's primary coastal resources is a high priority, drainage outfalls still pollute prime beaches such as Carlisle Bay, discharging litter and runoff along the shoreline, and highlighting a need for improved environmental standards. The placement of drainage wells to allow alternative drainage would be beneficial. It is recommended that where drainage outfalls impact coastal areas within tourism areas, the institution of drainage wells or catchments to filter debris or divert runoff should be considered (refer Action 11.1-3).

Clean-up of debris in coastal areas including Carlisle Bay, Holetown and associated marine communities would improve the health and integrity of the coastal zone that are enjoyed by visitors and locals (refer Action 12.1-5).

Another important coastal project currently underway is the Coastal Risk Assessment and Management Programme (CRMP) 2012-2018 involving the following implementation measures:

- Collection of updated data on risks in the coastal zone and improved quantitative assessment, monitoring and management of tools
- Holetown Improvement Project- coastal improvement structures, offshore breakwaters from Holetown to Heron Bay
- Restoration of the Holetown Lagoon to improve water quality and reduce flooding
- Design and feasibility study of new infrastructure projects aimed at providing long-term shoreline protection and enhancing the recreational value of beach areas
- Demonstration projects to implement an ecosystem-based approach to climate change adaptation

These projects will help to ensure that the environmental integrity of the coastal zone is maintained at an appropriate standard. However, more efforts are required through Government initiatives and environmental stewardship by all Barbadians, which will augment these efforts and ensure the conservation of the island's biodiversity and a healthy environment for generations to come.

1.2.2.1 Tourism Activities in the Coastal Zone

From its inception, tourism in Barbados has been promoted with an emphasis on elements of the coastal zone, i.e. sea and sand, along with the sun, which forms part of the ideal, year round, weather conditions that Barbados has to offer. The combination of these naturally

occurring elements have become synonymous with rest and relaxation for visitors and domestic tourists, hence the focus for tourism-related activities continues to be primarily within the coastal zone.

Recreational activities within the coastal zone have increased over the years. Other than passive activities including sea bathing and sun tanning, other activities include surfing, water skiing, scuba diving, snorkeling, jet-ski operating, sports fishing, boating and yachting (including glass bottom boats and underwater submarine), and beach volleyball.

Other than beaches, coastal areas of interest for tourism include:

Folkestone Park and Marine Reserve (FPMR) – This coastal attraction is located on the west coast and is the home to a variety of fish and other marine organisms. Bellairs Research Institute of McGill University uses this Park as part of their programme of research. The park is in need of further development, and recognition of this aspect was implemented by the commissioning of a Feasibility Study that was completed in 2000 (AXYS Environmental Consulting Inc. et. al., 2000). The final report contained 109 recommendations.

A follow-up project was conducted in 2006 to focus on the marine management component of FPMR, and contained specific recommendations on the establishment of a Marine Management Area and potential solutions for operational funding. However, financial support for FPMR has been lacking. With limited resources, FPMR has implemented only a few of the project's recommendations. In fiscal year 2011/2012, NCC was given a modest budget to undertake some improvements of visitor services, and development plans have progressed for a Sustainable Eco-Tourism centre at FPMR. The museum within its Visitor Centre is to undergo a new planned refurbishment programme. This is being guided by a Blackbird Design (2012) redevelopment proposal for the NCC, with implementation of completed plans awaiting further funding support (refer Report VI, Section 8.0).

Graeme Hall Swamp (GHS) and Nature Sanctuary – This important wetland ecosystem is the largest remaining mangrove swamp in Barbados, located on the south coast in Worthing. [Other mangrove stands are located in small, discrete patches, generally at the seaward end of gullies.] The Sanctuary, closed since 2008, was developed as an ecological, educational, research, and tourism facility in which a variety of birds, wetland vegetation, and aquatic organisms are featured. To help preserve the area, less than 10% of the Sanctuary's habitat was developed with interpretive exhibits, trails and support facilities. This area of natural beauty has the potential to be a major nature attraction on the island. Currently, only a café is open on the site, where visitors can relax in a relaxing, green setting. Efforts to reopen the Sanctuary should be considered as an important element of any nature tourism drive for Barbados. Given the competition from other Caribbean islands that can offer many unique options relative to nature tourism, it would be beneficial to showcase Barbados' prime nature tourism attractions, including the wetland at Graeme Hall.

Chancery Lane Swamp - This swamp in Christ Church is a unique area on the southeast coast that attracts a variety of interesting resident and migratory shore birds. Although there were proposals to develop this area for residential purposes, the surrounding community was not in favour, and the plans have not materialized to date. Given that there are so few remaining mangrove areas left in Barbados, the conservation of this area would be beneficial

to the biodiversity resources of the island, and the variety of sites being offered for nature tourism purposes.

Animal Flower Cave –This popular tourist attraction located in St. Lucy is the only accessible sea cave on the island. It was discovered in 1780 and features a variety of sea anemones from which the cave derived its name, although their populations have dwindled appreciably over the years due to visitor impacts. Access is by steps through a natural “blow-hole” in the surface leading to the floor of the cave that is approximately 1.8 m above sea level, offering spectacular views of the sea through openings naturally formed on the seaward side. This is a good example of a natural site that is negatively impacted due to the lack of appropriate management of the resource.

The effects of recreational activities on the environmental integrity of the coastal zone can be significant if measures are not implemented to control them. For example, coastal cruising and charters have become very popular, however they had a tendency to drop anchor relatively close to the shore to allow patrons to swim. Results of this practice led to living corals and seabed plants being destroyed. Measures have since been put in place to provide specific points of anchorage for these vessels, thereby eliminating further reef degradation.

1.2.2.2 Sea Access Points

The issue of ‘open windows’ to the sea and beach access has been the subject of public debate for decades. Tourism development areas extending from Speightstown to Oistins are all located in densely built-up coastal areas. The majority of hotels *‘lie in close proximity to the coastal zone and approximately 75% of visitors to the island stay in beachfront accommodation’* (Schuhmann, 2012). Given that there are so few remaining ‘windows to the sea’, particularly on the west and south coasts of the island, they should be protected from further development. Policies in this regard have been addressed in the PDP (Government of Barbados, 2003, pp. 4-2, 4-3 and 4-13) and presented with particular reference to the National Open Space System and the importance of protecting existing ‘open windows’ to the sea from further encroachment.

The PDP (Government of Barbados, 2003, p. 4-16) also underscores maintaining and creating Shore Access Points as part of the development or redevelopment process, and identifying them by standardized signs and placing garbage disposal facilities at appropriate points. An example of this is an open, coastal lot situated at Enterprise, Christ Church where frequent public access to Freight’s Bay needs to be enhanced, particularly for the safety of all users. This would include the growing popularity of surfing activities by locals and international visitors (see Action 11.1-9).

In addition to ‘windows to the sea’, other tourism resources on the coast that provide sea access include coastal parks. These parks provide a range of services, including safe vehicular access, amenities such as shops and food stands, and children’s play areas. Currently, two new parks are proposed at Ragged Point, St. Philip and Harrison Point Lighthouse, St. Lucy. Under the aegis of the NCC greening initiative, which is utilizing solar energy to power amenities such as lighting and irrigation systems, parks can be used as public models regarding the potential use of green services (pers. comm., Keith Neblett,

General Manager, NCC, June 2012). Generally, additional parks and open green spaces that are developed for recreational purposes should be promoted to balance the densely built-up environment, particularly on the south and west coasts, and to provide resources for locals and international visitors to enjoy, rest and relax.

1.2.2.3 Impacts on the Coastal Zone

While mitigating measures have been implemented to protect the physical damage of the reef ecosystems around Barbados, there is also degradation potential via industrial effluents, e.g. liquid effluent from the rum refinery at Brandon's Beach. Therefore the effects of discharge on the marine environment require careful monitoring.

Erosion of beaches due to unusual sea swells is an annual natural occurrence which impacts on beach profiles. High sea swells can also impact on the programming and scheduling of coastal activities, and can have devastating effects on beaches and coastal structures such as revetments (see Figure 1.5).



Figure 1.5. Coastal property with adjacent shoreline modifications in Freshwater Bay.

Increasing human settlement on the island required the clearance of natural vegetation and forests to accommodate residences and supporting infrastructure, e.g. the need for potable water, electricity, sewage disposal, and roadways. Along the coastline, important coastal vegetation includes mangroves and littoral vegetation. Mangroves are unique habitats that provide fish nurseries, breeding grounds for migratory birds, floodwater retention, and the trapping of sediment / nutrients discharged from the land.

Over the past 300 years, development has modified the littoral vegetation communities in coastal areas, and destroyed mangrove stands. The majority of the island's wetlands have now disappeared due to human impact, with only 20 hectares of mangrove species remaining.

During the last three decades of the 17th century, island-wide clearance of vegetation accompanied colonial agricultural practices, and it is suspected that in the absence of systems to retard sediment transport through gullies, significant quantities of sediment-laden water would have entered the coastal zone and influenced water quality and reef health.

The quality of near-shore marine water is of great importance to the overall maintenance and functioning of the coastal ecosystem. Near-shore water quality impacts on the diversity and abundance of marine life and the recreational quality of the coast. In the tropics, decreasing

near-shore water quality was noted by Delcan (1994¹) to have adverse effects on the following:

- The health and productivity of coastal communities including coral reefs, seagrass beds, and mangroves
- Near-shore (shelf) fisheries and coastal stability

In addition, Delcan (1994¹) stated that it could also substantially reduce the aesthetic qualities of the coastal zone, and threaten public health through contamination of bathing waters and bioaccumulation of toxic substances in harvested seafood. Anthropogenic activities continue to lead to the deterioration of near-shore water quality in Barbados, and can have serious economic consequences since commercial shelf fisheries, stability of beaches, tourism, and public health are all heavily dependent on good near-shore water quality. The main sources of marine pollution are terrestrial, and the primary pathways for pollutants to the marine environment are surface water runoff, ground water discharge, and direct discharge or dumping.

Major sources of pollution in the coastal waters of Barbados are summarized by Delcan (1994¹) in Table 1.1. Deteriorating near-shore water quality has been identified as one of the primary causes of coral reef degradation and as a potential cause of seagrass declines. Furthermore, land-based solid waste pollution of the beaches and near-shore reefs through direct littering and/or dumping is apparent at a number of beaches and popular picnic sites. Land-based solid waste pollution of coastal waters through polluted river and drainage runoff also occurs along the west and south coasts, particularly off Speightstown, Holetown, Bridgetown, and Graeme Hall, the latter via the sluice gate from the swamp.

Coral reefs and seagrass beds have been particularly susceptible to these various marine pollutants. Degradation of coral reefs have a direct impact on the sustainability of beaches, since reefs form the first line of defence during periods of adverse sea conditions, forcing waves to break over them, thereby reducing energy and minimizing beach erosion. Additionally, reefs are the home to parrot fish and sea urchins, both acknowledged for their sand producing capabilities (Delcan, 1993).

Human health can be negatively impacted by the contamination of near-shore water with sewage through recreational activities involving body contact with, or ingestion of, seawater. The wider implications of increased human health risks in the marine environment include loss of aesthetic and recreational value of beaches and near-shore water, loss of tourism potential in the coastal zone, loss of potential yield from near-shore fisheries, and increased public health costs (Delcan, 1993).

Table 1.1. Major sources of marine pollution in Barbados coastal waters.

Marine Pollutant	Main Pollutant Sources
Nutrients	<ul style="list-style-type: none"> • Terrestrial erosion and surface water runoff • Industrial and domestic sewage and waste water effluents • Nutrient enriched ground water discharge • Agricultural area surface water runoff
Sediments	<ul style="list-style-type: none"> • Terrestrial erosion and surface water runoff • Industrial and domestic sewage and waste water effluents • Coastal construction, dredging and land reclamation
Chemical toxins	<ul style="list-style-type: none"> • Industrial and domestic waste water effluents • Surface runoff and ground water discharge from intensive agricultural areas • Surface runoff and ground water discharge from urban areas • Accidental spillage and routine discharge from marine shipping • Poison fishing
Pathogenic bacteria	<ul style="list-style-type: none"> • Surface runoff and ground water discharge from residential areas • Domestic sewage effluents
Solid waste	<ul style="list-style-type: none"> • Surface runoff from urban areas • Direct littering of beaches and nearshore water • Garbage disposal from marine shipping
Raised temperature	<ul style="list-style-type: none"> • Heated effluent from power generating plant
Lowered salinity	<ul style="list-style-type: none"> • Surface runoff and groundwater discharge • Industrial and domestic waste water effluents
<i>Source: Delcan, 1994¹</i>	

Coordinated efforts will be required between the Ministry of Health, Ministry of the Environment, Ministry of Transport and Works, CZMU, TCDPO, and affected stakeholders to ensure that inland activities are constantly monitored to minimize the introduction of pollutants into the coastal and marine environment. Additionally, regular monitoring of the quality of water in the near-shore zone at various beach locations must be instituted to ensure that water quality threshold levels are maintained within current international human health standards (see Action 11.1-1 in Section 3.0).

Inland catchment areas located in more elevated sections of the island discharge water towards the sea via inland gullies. This scenario is typical of the west and east coasts than the south coast, where most flows reach the sea through the ground water system. On the east and west coasts, discharges terminate in drains which have been constructed across beaches. At all of these terminal areas, sand bars have been formed blocking the free exit of water into the sea, thereby creating stagnant pools of water in drains or on surrounding lands. These stagnant pools of water are breeding grounds for mosquitoes, which can be a health risk to humans (Delcan, 1993).

Taking into consideration the passage of water from its source to the point of discharge, it is likely to come into contact with many pollutants. The presence of pollutants in the discharge to the sea not only has implications for the health of coral and seagrass communities on the coastline, but also on human health. The primary pollutants within the marine environment are nutrients, suspended particulate matter and sewage pathogens. The main sources of marine pollution are terrestrial, and the main transport mechanisms are surface water runoff, ground water discharge and direct discharge or dumping (Delcan, 1993).

Sources and description of pollutants transported through terrestrial waters, or by direct dumping to the near-shore area, were described by Delcan (1993) and include:

- Agriculture – fertilizers, animal waste, pesticides, herbicides
- Industrial and commercial activities – chemicals, suspended solids, nutrients
- Residential and tourism activities – pathogenic bacteria and nutrients
- Construction – suspended particulate matter
- Landfills – nitrates and heavy metals in leachate

1.2.2.4 Coastal Erosion and Accretion

Shoreline response to physical processes varies along the south and west coasts of the island. On the south coast, the majority of major beaches are held in place by beach forming structures. This approach to shoreline stabilization has been successful because there is a good supply of sand originating from the Cobblers and Bow Bells Reefs. Cliff undermining and erosion occurs in the Atlantic Shores area. Between 1954 and 1991, the beach area on the south coast (including Carlisle Bay) increased from 175,000m² to 237,000m² (Delcan, 1993). While there has been a general accretion trend on the south coast, to the benefit of the tourism industry in that area, there are also a small number of beaches that are eroding.

On the west coast, beaches are typically held in place by natural features such as fringing reef headlands. The supply of sand to this shoreline is significantly augmented by sand derived from fringing reefs. Cliff undermining and erosion occurs at a number of areas on this coastline. Between 1954 and 1991, the beach area on the west coast has decreased by 18% from 277,000m² to 227,000m². Along extensive stretches of the west coast, setbacks are inadequate to allow natural coastal processes to occur unimpeded (Delcan, 1993). This would be expected to have a negative impact on the tourism industry in that part of the island if the trend continues.

The critical marine communities within the coastal zone are seagrasses and coral reefs. There is qualitative evidence of declining seagrass areas along both the south and west coasts due to over-exploitation and decreasing water quality. The west coast fringing reefs are in poor health, and quantitative data has demonstrated that they have deteriorated significantly over the last fifteen years. Historical data for west and southwest coast fringing reefs also indicate extensive loss of elkhorn coral over the last 100 years (Delcan, 1993).

The patch reefs along the southwest coast show significant deterioration, but the bank reefs are generally in good health, although there are reports of over-exploitation of fish and corals, and sediment related damage off the Hometown Hole. The major causes of coral reef community degradation include poor water quality, over-harvesting of corals and reef fish,

sea urchin die offs, and physical damage from dynamite fishing, anchoring and recreational damage (Delcan, 1993). Since the fringing coral reefs help to protect the beaches of Barbados, their demise would have a deleterious effect on the tourism industry, as well as the enjoyment of the beaches by locals.

1.2.2.5 Coastal Zone Improvement Projects

The CZMU has been charged with the responsibility for maintaining and enhancing conditions within the coastal zone. Protection of coastal ecosystems will help to improve the quality of coastal amenities important to the tourism sector. The following are areas earmarked for maintenance and improvement on the west and south coasts (pers. comm., L. Brewster, CZMU, 2010):

(1) West Coast Projects

Holetown area:

- Headland protection works in the vicinity of the Holetown Police Station
- Offshore breakwaters between the zone adjacent to the Holetown Police Station and Heron Bay
- Short groyne at Heron Bay

Speightstown:

- Due to the narrowness of the beach and in order to offer greater protection to properties during periods of adverse sea conditions, it has been decided to construct a revetment at Sand Street, Speightstown, St. Peter

Mullins:

- The beach at Mullins St. Peter, a popular area for visitors to relax, has shown signs of erosion for a period of time. In order to combat this trend, a series of breakwaters and groyne will be constructed

Shermans:

- The main vehicular roadway at Shermans, St. Peter is situated directly adjacent to the beach, the width of which continues to decrease with the passage of time. A walkway and offshore breakwater are the structures which will be used to halt this erosion

Coastal Drainage Issues:

There is the constant challenge of surface water flows in natural channels, drains or culverts being impounded behind sand bars on beaches, thereby creating stagnant waters and the accompanying health issues associated with mosquitoes and dengue fever, not to mention the stench from anaerobic conditions. To help address this, there is a proposal to introduce a fluidizer system to the sand bar across the mouth of the following watercourses:

- "The Hole" in Holetown, St. James
- The watercourse on the northern side of the Holetown Police Station
- The natural watercourse between Colony Club Hotel and Coral Reef Hotel in St. James

(2) *South Coast Projects*

(a) There is a proposal to introduce a water taxi service between Oistins in Christ Church and Half Moon Fort in St. Lucy. Jetties are to be constructed at the following locations. Lands at each of these sites must be Government-owned and large enough to provide for adequate car parking.

- Oistins, Christ Church
- Dover, Christ Church
- Rockley, Christ Church
- Bridgetown
- Fitts Village, St. James
- Holetown, St. James
- Weston, St. James
- Speightstown, St. Peter
- Half Moon Fort, St. Lucy

(b) The existing boardwalk in Hastings extends from Sierra Beach Hotel to Accra Beach. It is intended to extend this boardwalk from Accra Beach to Pisces Restaurant in St. Lawrence Gap.

(c) The sluice gate which controls the flow of brackish water from the Graeme Hall swamp into the sea, has been a source of concern for some time. At present, the opening of this gate is carried out spasmodically, allowing stale anaerobic waters to flow into the swimming environment. Work is to be carried out so that the sluice gate will be opened on a more regular basis.

(d) The damaged seawall at Pebble beach will be repaired. This beach is located between the Hilton Hotel and Radisson Aquatica Resort Barbados, and is regularly used by locals and visitors alike. The seawall behind the back beach was badly damaged by rough seas a number of years ago and now offers little protection to the back-shore on which is located structures and the roadway. Additionally, it has been and continues to be an eyesore.

(e) Sections of the coastline along the south coast, e.g. Atlantic Shores, can be categorized as "cliff", where no beach exists and where there is general under-cutting. If left on its current path, structures constructed on top of the cliff could be in danger within a short period of time. General cliff stabilization will be undertaken.

(f) Hauling out of fishing boats for general repairs is a hazardous and arduous undertaking at the Tent Bay Fishing complex in St. Joseph. New facilities have been designed, including a haul-out ramp and boat park.

(g) Residents of Conset Bay, St. John have expressed concerns regarding land slippage in the area. Investigations have revealed that the instability has been caused by flows in a watercourse that have been undermining the toe of the adjacent hillside. Lining the sides of the watercourse and placing a revetment at the hillside toe are measures proposed to combat these issues.

Two new development proposals are Sugar Point Development situated at the Bridgetown Port and the Pierhead Marina Project. These will be important considerations along the coastline from the Port to Carlisle Bay. Marinas and the development of breakwaters can modify currents and coastlines; hence the impact of future planning will be of high importance.

1.2.3 Energy

Tourism infrastructure and services represent a key aspect of the travel and tourism industry, and their associated operations require significant and consistent energy consumption. According to Hotel Energy Solutions (2011), a hotel's main environmental impact occurs during its operational phase, providing resource-intensive services that can result in a significant ecological footprint. The challenge to be more competitive within the industry, the need to reduce high operating costs, and the growing sensitivity to protecting the environment create the need to implement energy efficient solutions.

Barbados currently has a heavy reliance on fossil fuels. According to the Inter-American Competitiveness Network (2012), almost all of the country's electricity generation is based on fossil fuels (i.e. heavy fuel oil and diesel). The main use of these fuels is for power generation and transport. When burned, petroleum products emit carbon dioxide, carbon monoxide and other air toxins, all of which have a negative effect on the environment. The challenge for Barbados will be to plan mitigation efforts against these harmful fossil fuel emissions. According to Christiana Figueres, Executive Secretary of the UNFCCC, and with specific reference to Barbados, *"there is still a very important dependence on fossil fuels that has a huge toll on the economy"* (Rawlins-Bentham, 2012³).

The two main areas of energy consumption in the hotel industry involve the use of air conditioning and lighting. Improved efficiency in air conditioning can be achieved by replacing old units with new ones, while efficiency in lighting can be promoted by replacing incandescent bulbs with newer energy saving fluorescent bulbs, and by shifting energy generation from a fossil fuel base to one based on renewable sources, such as solar or wind energy.

Achieving more energy efficiency in the tourism sector is also one of the critical success factors that was identified by the White Paper (Strategic Solutions Inc., 2012, p. 39), and the action required was articulated as:

"promotion of the benefits of greening initiatives, such as alternate forms of energy, energy efficiency and water conservation and carbon emission credits to ensure the success of the sector and drive down high operating costs to increase competitiveness".

For many decades, Barbados has promoted the use of solar water heaters as an energy efficient means of producing hot water from a renewable energy source. Further back in time, sugar producers in Barbados exploited wind energy to grind canes and pump water, and used bagasse, a by-product of the sugar cane industry, as a fuel source for heating. Solar water heaters are still widely used, and Barbados is seen as a leader in this technology (Fair Trading Commission, 2012). There are more than 40,000 solar water heaters installed in Barbados, and the island boasts the 5th highest penetration of solar water heaters in the world (i.e. over 45%; Inter-American Competitiveness Network, 2012). The challenge for Barbados is to continue to harness renewable energy sources that are in abundant local supply (e.g. sun power), which will help maximize energy efficiencies in the tourism sector and reduce environmental impacts.

Although renewable energy sources are cleaner, they can also impact on the environment. For example, solar energy produces no air or water pollution, nor greenhouse gases, but toxic materials are produced through the manufacturing of photovoltaic cells. Wind is a clean energy source, but may affect avian wildlife mortality (Energy4Me, 2013). With respect to wind turbines, visual impacts on the landscape may also be a cause for concern.

1.2.3.1 Local Sustainable Energy Initiatives

The legislative framework for the energy sector is outlined in the Electric Light and Power Act, (Cap 278), the Fair Trading Commission Act (Cap 326B), and the Utilities Regulation Act (Cap 282). This legislation does not facilitate the establishment of independent power producers, i.e. commercial entities that generate and transmit electricity to the national grid for profit, unless a license is gained. However, the law does allow for domestic generation and consumption. Electricity tariffs and standards of service are set by the Fair Trading Commission in accordance with the provisions of the Utilities Regulation Act. The Commission ensures that the electric utility complies with these laws by monitoring the company's financial and operational principles and practices (Fair Trading Commission, 2012).

Although the cost of electricity generated from renewable energy sources has fallen over the last decade, electricity generated from green sources is still unable to compete with electricity generated from fossil fuels. In recognition of this, the Government will provide an enabling platform for the adoption and application of renewable electricity systems (Fair Trading Commission, 2012).

Government is seeking to reduce its dependence on fossil fuels through a number of initiatives, including a Smart Energy programme that will support the implementation of green energy technologies, energy efficiency measures and conservation practices, the lowering of energy costs, and the reduction in the nation's dependence on imported fuel. This programme is to be supported through loans and grants by the IADB and EU (IADB, 2012). Goals of the initiative include:

- Replacement of the majority of public street lights with energy-efficient lamps
- Installation of solar power systems in 12 government buildings
- Deployment of new conservation technologies across the country's public sector
- Creation of a government fleet of electric vehicles and charging dock stations with an independent solar power system

Christiaan Gischler, IADB Team Leader of this Smart Energy programme, stated that:

“Both the private and public sectors of the country will be actively contributing to the achievement of the overall objective of reducing the country's fossil fuel dependency” (IADB, 2012).

Government is planning to generate renewable energy that will account for 29% of electricity consumption over the next 20 years. Government will prepare a Renewable Energy Bill and establish a \$150 million Hotel Refurbishment, Energy Efficiency and Food Production Fund.

This Fund will be mandated to provide equity financing for investments related to energy efficiency in the agriculture, manufacturing and tourism sectors (Jordan, 2013).

In addition, Government's recent Ten-Point Plan (Alleyne, 2013) includes initiatives involving the energy sector, including a provision for BDS\$10 million to retrofit air conditioning and lighting systems in the tourism sector; extension of the 50% land tax rebate to tourism entities that invest in renewable energy and implement credible energy efficiency programmes; 5% electricity cost rebates over the next 12 months for tourism entities, which are to be ongoing for those entities that implement credible energy efficient plans and/or invest in energy from renewable sources; and implementation of an international marketing strategy that promotes Barbados as a Clean Energy destination.

Barbados is participating in the ongoing Caribbean Hotel Energy Efficiency Action (CHENACT) Project, an energy efficiency programme being conducted by CTO. The first phase was implemented from December 2009 to October 2010, and the project is currently in its second phase. CHENACT aims to improve the competitiveness of small and medium sized hotels (less than 400 rooms) in the Caribbean region through improved use of energy, with the emphasis on renewable energy and micro-generation. The overall goal is to incorporate energy-efficient practices within the tourism sector (Duffy-Mayers and Oven, 2010; Duffy-Mayers and Bhattacharjee, 2012). Objectives of the CHENACT programme are as follows:

- Reduce greenhouse gas emissions associated with hotel operations through reduced energy (electricity and gas) use
- Increase investment in cost-efficient and energy efficient renewable energy technologies through green hotel design and efficiently operating mechanical and electrical systems
- Improve the energy intensity of Barbados hotels by reducing the kWh per guest night ratio

A case study of Barbados hotels was presented at a conference on Sustainable Tourism Development that was held in Bermuda in April 2011. Results indicated that over 57% of electricity utilized was to power air conditioning (44.3%) and lighting (12.8%). Energy audits produced energy saving recommendations that included the introduction of guest room controls, the modification of air-conditioning systems, and the retrofit of incandescent and halogen bulbs to CFL's (compact fluorescent lamps) and LED (light emitting diodes) lights (Meade, 2011). In this regard, an action is being proposed to address these recommendations (refer Action 11.1-2).

In 2010, the Government approved an IADB funded Sustainable Energy Framework for Barbados aiming to source investments in renewable energy and energy efficiency for cost reduction, improve energy security, and enhance environmental sustainability (Inter-American Competitiveness Network, 2012; UNEP, 2010). According to the Fair Trading Commission (2012) in Barbados, the renewable energy potential presently being considered includes:

- *Wind Energy* - Barbados Light & Power Company Limited has been given planning permission to construct a wind farm at Lamberts in St. Lucy. Its designed generation capacity is 32 million kWh/year
- *Biomass cogeneration* - This type of scheme has been successfully implemented on individual farms
- *Waste-to-Energy System* - This technology has been proposed for the landfill site at Mangrove in St. Thomas, but is still at an initial stage of development
- *Natural Gas* -The Governments of Barbados and Trinidad and Tobago have entered into negotiations on a long proposed undersea natural gas pipeline that is expected to deliver approximately 25 million cu.ft. of gas a day to Barbados by 2014

Ahead of the 2012 International Sustainability Conference, the Minister of Environment and Drainage affirmed that Barbados would lead the regional drive towards sustainability, part of which will involve the construction of a waste to energy plant and an integrated solid waste management plant, at a cost of BDS\$300 million. Other research was to be conducted into waste steam energy, wind farms, and landfill gas energy. The Minister noted that the tourism-based economy could not be solely fossil fuel dependent (Alleyne, 2012).

Additional renewable energy projects in the public sector include photovoltaic installations at Harrison's Cave (see Figure 1.6) and the Ministry of Public Works main office and 10 kW wind turbines at the St. Lucy, St. Andrew, St. John and St. George depots (see Figure 1.7; pers. comm., L. Nurse, Permanent Secretary, Ministry of Public Works, Barbados, July 2013). Also, future projects in renewable energy are being planned by UWI, Cave Hill.



Figure 1.6. Use of photovoltaic technology to generate electricity at the redeveloped Harrison's Cave in St. Thomas.



Figure 1.7. Examples of renewable energy installations in Barbados: Wind turbine in St. Lucy (left); photovoltaic panels on the Ministry of Public Works’ office building (right).

The transitioning to a greener economy, with specific reference to the tourism sector, will involve the incorporation of renewable energy technologies in all new tourism developments, and the retrofitting of existing developments so that energy costs are reduced (refer Action 11.1-10). For this reason, all new attractions proposed in the TMP are to utilize renewable energies to generate electricity and minimize environmental impacts (e.g. see Action 6.1-4 in Report V, Part 1, Section 2.0). The White Paper supports this concept (Strategic Solutions Inc., 2012, p. 67), noting:

“Tourism businesses need to drive down [these] high energy costs by adopting renewable energy technology...”.

According to Williams (2013), Barbados is on the path to a new energy future, and although this transformation will take time, the nation is well on its way to charting that path.

There are a number of initiatives that can be implemented by the tourism sector to help the island transform to a greener economy, including incentive programmes that support the conversion of visitor accommodation to the use of renewable energy, and the adoption of same by accommodation owners (refer Action 6.1-4 in Report V, Part 1, Section 2.0).

1.2.4 Water Resources

It is generally accepted that the tourism industry demands both high quality and high quantities of water and wastewater services. According to Dakers et al. (2004):

“in small population centres, tourism growth can significantly increase pressure on the infrastructure that is typically funded by ratepayers, and sometimes provoke demands for ‘tourism taxes’. However, information is seldom available on tourists’ level of use of these services and debate over the pressures due to tourism is often speculative”.

For Barbados in particular, water resources have been under increasing pressure as water production is approximating the capacity of its fresh water resources. According to Dr.

Mwansa, Engineering Manager of the Barbados Water Authority, “we know that we have a limited resource, we are classified as a water scarce country” (Selman Moore, 2012). Barbados has a total water catchment of approximately 44.7 million gallons a day of pumping capacity in its aquifers that provides 32 million gallons per day, with an additional 12 million gallons per day pumped in farming districts. According to the Minister of Agriculture, Barbados is virtually “pumping water from our aquifers at the exact rate that it is being recharged”(Skeete, 2012). Furthermore, the White Paper (Strategic Solutions Inc., 2012, p. 64) noted that:

“The pursuit of more numbers as opposed to yield, has put a strain of the island’s scarce water and energy resources and waste disposal systems, due to the fact that a large proportion of tourists chose to maintain their relatively high patterns of consumption when on holiday”.

Charara et al. (2010) conducted a water use efficiency study in the Barbados hotel sector, and found that most Barbadian hotels did not score well relative to water use efficiency to international standards. Utilizing BWA data on water use by the Barbados hotel industry for hotels having 20 rooms and over, Charara et al. (2010) also noted that the hotel sector utilizes a comparatively larger volume of water than the general population, i.e. approximately 756 vs. 240 litres per capita per day. The overall purpose of the study was to provide benchmarks that can be used to identify opportunities for saving water in the tourism sector.

The combined energy and water costs in the hotel sector can approximate as much as 20% of operational costs, with electricity representing up to 70% of energy costs (CHENACT, 2010); however, the cost of water supply was noted to be an average of 5% of annual expenses and therefore is a lesser concern than energy expenditures (Charara et al., 2010). Nevertheless, water is an indispensable commodity. Sub-metering, which is one method of monitoring consumption, was not present in many of the hotels surveyed.

Table 1.2 presents the water conservation activities instituted by a sample of 21 hotels in Barbados, as conducted by Charara et al. (2010). Results included: less than half of the hotels reused rainwater, and only 24% utilized drip irrigation systems for gardens.

One of the challenges identified by Charara et al. (2010) is the lack of success in reducing hotel water consumption due to the fact that water bills represent such a small percentage of annual hotel expenses (i.e. averaging 5% as previously noted). This suggests that current consumption patterns in the local tourism sector will be difficult to change since there is no major incentive for adopting new approaches to water conservation.

Table 1.2. Analysis of water conservation activities at 21 Barbadian Hotels (Charara et al., 2010).

Water Conservation Strategy	Number of Hotels
Green Certified	4
Low flush toilets & low flow showerheads	11*
Faucet aerators (Spray taps/showerheads)	13
Laundry facility onsite	12
Towel / linen reuse programme for guests	13
Wastewater treatment and reuse for irrigation	3
Staff awareness training and an environmental management programme with an environmental officer	6
Drip irrigation	5
Rainwater reuse	10
Collection and reuse of water condensate from air-conditioning systems	6
Informal environmental management programme	6
Daily monitoring of water consumption	4
<i>*2 hotels instituted only partial installations</i>	

The following recommendations for encouraging sustainable water practices were provided by Charara et al. (2010) as follows:

- Promotion of water use conservation principles among hotel guests
- Development of mechanisms to promote the financial benefits of water conservation by relating unit water pricing to total consumption
- Increasing the awareness of water consumption issues among hotel managers
- Systematic record keeping of water consumption to be executed by hotel managers as well as the BWA

The installation of rainwater storage tanks at hotels is a critical requirement, particularly where potable water is used for grounds irrigation. Hotel activities such as laundry services, whether on or off site, are also a significant factor in water usage. Efficiency of hotel laundry operations therefore needs to be a priority. Currently, tax incentives are offered under the Tourism Development Act (2002) for the purpose of hotel upgrades, acquisition of green certification, and improving wastewater disposal systems. In support of the drive to achieve a Green Economy, special emphasis should be given to renewable energy and water conservation initiative for hotels.

With respect to 'green' certified hotels, it was found that certification was not an indicator of water efficiency since the presence of facilities such as spas and whirlpools typically require

higher water consumption (Charara et al., 2010). This underscores the need to assess not only hotel size, but also types of services offered per hotel to be able to rate water consumption patterns relative to accepted standards. Additionally, since there may be reluctance by some operations to accommodate audits, the property maintenance and reporting initiative proposed under the TMP may need to be mandatory in order to ensure rigorous management practices and upkeep of the local tourism plant and services (refer Action 6.1-1 in Report V, Part 1, Section 2.0).

Since water demand varies with the category of accommodation, and water consumption per guest-night for luxury accommodation may exceed that for home accommodation, it is recommended that this data would enable service providers to establish appropriate billing policies for provision of water-related services. According to Dakers et al. (2004), whether tourism-specific charges are economically justifiable would best be determined after assessing the role of tourism in demand for the services, and comparing the costs that tourism imposes as opposed to the share that revenue tourism provides.

1.2.4.1 Upgrades to National Water Supply Systems

Key areas affecting future water supply and availability in Barbados are as follows (pers. comm., J. Mwansa, Barbados Water Authority, November 1, 2012):

- Provision of new wells as planned for St. Philip
- Water loss that is unaccounted for
- Impacts from water usage by the hotel industry
- Water pollution control

Under a recent public/ private sector initiative, new wells tapping reserves in the St. Philip catchment area have been commissioned in order to meet increasing demands for new housing and tourism developments where projected demand is estimated to be 5 million gallons per day. System upgrades are also planned for zones in St. Lucy. Additional augmentation is needed for the remainder of the island (Selman Moore, 2012).

Forecasting of water requirements is difficult since it depends on data from multiple agencies. Storage and retrieval of data can be also be a challenge (Selman Moore, 2012). Consequently, the BWA, Town & Country Planning Department, Environmental Protection Department, Ministry of Agriculture, and Coastal Zone Management Unit have collaborated on an Integrated Water Resources Management Information System that was recently introduced by the FAO to the region (pers. comm., J. Mwansa, Barbados Water Authority, November 1, 2012).

The expansion and planned introduction of new and extensive tourism establishments across the island (e.g. Merricks, Four Seasons, etc.), particularly those within water-scarce parishes such as St. Philip, has required concerted planning efforts by Government agencies responsible for natural resource management (e.g. TCDPO, BWA and EPD). Since, in the case of Barbados, 'water in' basically means 'water out', the significance of water reuse in addition to rainwater harvesting and reuse, will have to become a major part of service planning.

According to Jönsson (2005), the primary thrust for improving the efficiency of hotel operations is cost savings and the positive impact on green certification. Participating hotel operators identified the following challenges relative to audits and water conservation activities:

- High price of work and imported technologies
- Limited budget for investments particularly for small hotels
- The perception that customer satisfaction decreases with water conservation devices (particularly for the luxury hotels)
- More emphasis placed on comparatively higher energy costs

One obstacle slowing the development of green management is the widespread perception among service providers that implementing environmental greening means higher and more prohibitive costs. Whereas technological modifications may necessitate significant initial investment, behavioural and operational changes can regularly be accomplished at no or minimal costs, and can result in long-term benefits (Jönsson, 2005).

Barbados' water service challenges were identified by the BWA as follows (Selman Moore, 2012):

- A notable rise in chemical constraints in our water quality that arises out of negative land use practices and pollutant sources. Review of the Groundwater Protection Zoning Policy was noted as one action for improving the situation
- A poor hydro-meteorological data collection network for rainfall assessment
- Limited access to finance for implementing solutions
- An ageing infrastructure in need of replacement
- Relatively high unaccounted for water levels (49%), or non-revenue water
- Rates charged for water are inadequate for covering all the operating expenses and capital investment requirements
- Limited in-house research capacity requiring collaboration is needed with other stakeholders in Barbados and the region
- The need for a multi-disciplinary approach to achieve sustainability of the local water supply
- Measures are necessary for improving efficiencies and augmentation of the water supply through the reuse of treated water

At a national level, the island's Road Map towards Integrated Water Resources Management (Government of Barbados, 2008¹) advocated the facilitation of improved technical expertise for data collection and resource monitoring, and identified the need to regulate and enforce water extraction activities. It was also noted that Government is seeking financing towards the implementation of the West Coast Sewerage Project which is aimed at supplying millions of gallons of treated waste water to be utilized in golf course irrigation and ground water recharge (Barbados Advocate, 2013).

In order to advance goals for improvement of local supply systems, Government received financing of US\$50 million from the IADB, a portion of which will be allocated for water and sanitation upgrades. The project aims to improve water resources management and

sustainable water and wastewater services provided by the BWA. Approximately 49 km of water mains are slated to be replaced (Cumberbatch, 2013).

Objectives of the project include:

- Reorganization and modernization of the BWA, including institutional strengthening, training and public awareness
- Rehabilitation of potable water supply including infrastructural modernization, equipment upgrades and energy efficient alternatives. These improvements will aid in minimizing unaccounted for water loss
- Development of a wastewater reuse master plan to assess water reuse impacts and viability, and a South Coast Sewerage System improvement project system

Expansion of the use of desalination technology is also seen as a viable option for providing Barbados with an alternative to water shortages and incidences of low water pressure (Alleyne, 2013¹). The existing desalination plant produces 30,000 m³ of water per day, supplying approximately one sixth of the population.

Reverse osmosis is seen as another option for augmenting water supplies. The presence of high salinity levels becomes a prohibitive factor, as more energy is required for the desalination process of pressurization. Brackish water operating pressures are lower than for seawater desalination. Spring Garden is the preferred location for achieving the requisite levels, as other locations, e.g. Sandy Lane, record non-viable saline levels (pers. comm. J. Mwansa, Barbados Water Authority, November 1, 2012).

With respect to recreational tourism uses, golf courses are the largest consumer of water resources. The TCDPO has imposed conditions on groundwater recharge to ensure adequate levels of groundwater are maintained. It is recommended that future tourism development applications should be reviewed in accordance with their potential for water intensive demands (pers. comm. J. Mwansa, Barbados Water Authority, November 1, 2012).

The EPD, which monitors water quality and wastewater discharge, is developing standards for wastewater use. It is noted that all hotel operators should urgently install water storage tanks. A Draft Water Reuse Act (2006) was commissioned, as the Plumbing Code (Draft, 1982) did not address water reticulation. The Act, once finalized, will be incorporated into the draft Environmental Management Act. Modifications to the existing water zoning system are expected to mitigate against unsustainable land use practices and sources of water pollution. Under the policy, a draft Groundwater Management Act was also prepared, which is under review by the Chief Parliamentary Counsel (Chandler, 2013).

Transitioning to a Green Economy (refer Section 2.2) will entail, among other natural resource management initiatives, the conservation of the island's precious water resources. Given that Barbados is a water scarce country, and the tourism sector demands high quantities of water to service its visitor demands, the widespread adoption of water conservation initiatives by the accommodation and hospitality sector is warranted and critical.

Along with local incentives relative to the use of renewable energy (refer Government of Barbados, 2008), **similar provisions relative to water use would be beneficial to stimulate more determined action regarding water conservation measures.** Included in Government's recent Ten-Point Plan announced by the Minister of Tourism on July 18, 2013 is a provision entitling tourism entities to a 5% rebate on their water bills for a 12 month period, to be extended to those entities that undertake a credible water management programme (Alleyne, 2013). These types of incentives are helpful in supporting water conservation practices in Barbados. Moving forward, research into the number of entities that adopt these management programmes will need to be undertaken in order to monitor the scope of water conservation measures being instituted by the tourism sector. This will help to inform further incentives and programmes to be developed.

1.3 Built Environment

One of the objectives of the National Biodiversity Strategy and Action Plan (NBSAP) is to incorporate conservation requirements into land-use planning (Government of Barbados, 2002, p. 55). In recognition of the principles set out in the NBSAP, the Physical Development Plan (PDP) for Barbados (Government of Barbados, 2003, pp. 3-14 and 3-15) sets out a policy framework for tourism development that speaks to the need for more environmentally sensitive tourism implementation as follows:

“The designation establishes development and redevelopment policies for tourist accommodations and associated uses, primarily in the beach-oriented coastal tourism districts of the west, south, and south-east coast. The policies pertaining to tourism seek to promote the industry while recognizing the detrimental impacts that tourism can bring, especially along sensitive coastal areas. Therefore, a new tourism must be developed so as to reflect the policies of Section 4, with specific reference to policies pertaining to Natural Heritage Conservation Area, Coastal Landscape Protection Zones and Barbados National Forest Candidate Sites.

Within this overall objective of natural heritage protection, the purpose of this designation is to:

- *Focus new beach-oriented tourism development into existing coastal tourism districts and to discourage expansion of coastal tourism districts beyond existing developed areas*
- *Promote redevelopment and enhancement of existing tourism properties*
- *Maintain and improve public access to beaches through the redevelopment process*
- *Promote the enhancement of public infrastructure and the pedestrian environment in tourism districts through the development and redevelopment process and through public initiatives*
- *Ensure that new tourism development will not unduly detract from existing residential neighbourhoods”*

Tourism areas are illustrated in the PDP (Government of Barbados, 2003, p. 3-2) as shown in Figure 1.8. With respect to tourism facilities, including accommodation and associated

amenities, PDP policies seek to direct new beach-oriented hotel and tourism development primarily to existing tourism areas along the south and west coasts (Government of Barbados, 2003, p. 3-14). All new development and redevelopment projects in coastal areas must be consistent with the directives of the 1998 Barbados Integrated Coastal Zone Management Plan. Waterfront properties must also respect public beach access. The development of tourist facilities and infrastructure in more inland areas has also been pursued, albeit to a lesser degree, to offer a more diverse product. According to a policy statement presented in the White Paper relative to sustainable tourism development (Strategic Solutions Inc., 2012, p. 216), Government will continue to “*facilitate tourism development in more rural spaces so as to reduce the spatial imbalance which currently exists*”.

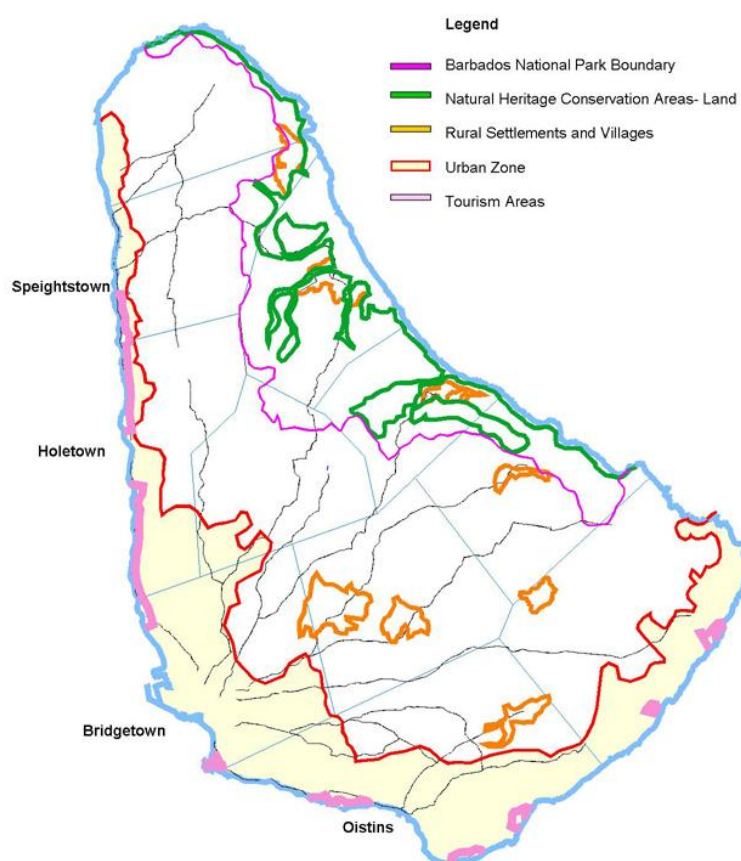


Figure 1.8. Select land use designations in Barbados. Tourism areas are presented in pink (Source: Adapted from PDP Map 4: Land Use Plan, Government of Barbados, 2003, p. 3-2).

Development or redevelopment proposals are also guided by the PDP to incorporate measures that will improve the pedestrian environment along property frontages, e.g. provision of sidewalks, screening from parking, and appropriate lighting (Government of

Barbados, 2003, p. 3-16). The issue of tourism facilities in residential areas is also noted in the following PDP directives:

- All applications for development of tourist uses that are adjacent to residential properties will be subject to policies that relate to noise and visual impacts, adequate onsite parking and vehicular and pedestrian access, as well as the mitigation of traffic congestion (Government of Barbados, 2003, p. 3-20)
- The Government will encourage the conservation of plantation houses for tourism and accommodation uses (Government of Barbados, 2003, 3-16)

Indiscriminate land clearance in major developments has long been a trend in Barbados, notwithstanding the current TCPDO policy framework. Comprehensive enforcement of the Tree Preservation Act (1985) is seldom seen to occur in Barbados. The resultant effects have led to a harsher environment where developments occur. Tourism areas are also affected by such practices. Examples include Holetown's coastline where mature trees were destroyed to facilitate development by a restaurant franchise. In addition, major new commercial buildings along the South coast have resulted in denuded properties along the dense mixed-use corridor of Highway 7 (see Figure 1.9).

It is recommended that the planning authorities be more stringent in the acquisition of detailed landscape plans from developers *prior* to construction, and in imposing penalties if there is no adherence to the legislative requirements.

The environmental character of the Garrison and Queen's Park, each large green spaces in otherwise densely built up areas, should be preserved and extended beyond the immediate UNESCO World Heritage Property boundaries (refer Action 11.1-6 in Section 3.0).

The paradigm shift must be in a new direction, aimed at initiatives that will protect the physical environment island-wide, promote green development practices, and complement the Barbados Visitor Economy.



Figure 1.9. Lack of tree cover and predominance of ‘hardscape’ at various developments along the south coast’s Highway 7. The result is increased ambient temperatures and rainwater run-off, leading to a harsh, less appealing environment for patrons.

A discussion of land use includes a review of the island’s urban and rural areas, brownfield sites, and associated impacts. Towns and urban centres are areas that have significant potential to draw visitors and stimulate commercial activity by both domestic and international visitors. According to the PDP (Government of Barbados, 2003, p. 3-1), Barbados has land use policies for centres and mixed use corridors as follows:

- National Centre: Bridgetown
- Regional Centres: Holetown, Oistins, Speightstown, Six Roads
- Suburban Centres: Warrens, Wildey
- Local Centres: Worthing, Hastings, Eagle Hall, St. Martin’s
- Mixed Use Corridors: e.g. St. Lawrence Gap

The quality of services and physical infrastructure should be of a high standard in the island’s primary centres to maximize their appeal and promote economic activity. The consistent upkeep of primary centres in Barbados, including Bridgetown, Holetown, Oistins, Speightstown, and St. Lawrence Gap, should be viewed as important for the ongoing development of the tourism industry. It will therefore be critical to safeguard the overall quality of the urban environment in which tourism products and services are presented. Hence, it is recommended that, at the public sector level, a Town Centre Management Agency (TCMA) be designated for the long-term management of physical resources in town centres.

For example, the days in which cruise passengers visit the island may require increased public services, such as waste management, to accommodate added impacts from increased usage. The proposed TCMA would liaise with existing municipal agencies, e.g. Environmental Protection Department, Sanitation Services Authority, National Conservation Commission, Ministry of Transport and Works, Ministry of Health, and the Royal Barbados Police Force, in coordinating physical upgrades and requirements that impact programmed tourism events and activities, particularly within the island’s tourism areas.

The primary town centres of Bridgetown, Holetown, Oistins, Speightstown, and St. Lawrence Gap are described separately below.

1.3.1 Bridgetown

The 2011 UNESCO World Heritage designation for the island's capital city of Bridgetown and its Garrison will require the maintenance and conservation of the designated area, to be addressed through a comprehensive management plan. In addition, the PDP tourism designation is intended to capitalize on lands within the Bridgetown urban core to create a unique tourism zone with amenities to serve both business and recreational visitors, including the highlighting of historic sites (Government of Barbados, 2003; see also Figure 1.10).



Figure 1.10. Bridgetown historic sites: Parliament Buildings (left); Lower Broad Street featuring the Mutual Building (centre); Boardwalk along the Careenage flanked by buildings of interest, including the old Spirit Bond (right).

The PDP also states that Government shall support the expansion, improvement and redevelopment of tourist accommodation facilities and related retail and entertainment uses on and around Needham's Point, maximizing the use of the refinery site and developing a pedestrian connection along Carlisle Bay to the Pierhead (Government of Barbados, 2003, p. 6-40 and 6-41). In this regard, the proposed Pierhead Marina Project, and the proposed Sugar Point Development that will facilitate new megaship cruise berths at the Port, are currently both under review by Government. In this regard, any future proposals and development uses are to be sensitive to the guidelines of the UNESCO World Heritage Property.

Bridgetown as a capital city, is generally hot and uninviting to the pedestrian. There is evidence on a daily basis of litter and pollution. In contrast to cities such as Hamilton, Bermuda with its well-kept infrastructure, buildings and streets, Bridgetown is lacking in many respects. In recognition of this, the Barbados Chamber of Commerce and Industry is engaged in an ongoing programme to revitalize Bridgetown since 2008. The programme aims to stimulate increased economic activity, beautify the urban centre, and provide enhanced security features (BCCI, 2013). The TMP also recommends actions to improve the environmental quality of Bridgetown (refer Action11.1-5 in Section 3.0).

The boundaries of the UNESCO World Heritage site for the capital city of Bridgetown and its Garrison to the south, linked by the Carlisle Bay coastal community, are clearly depicted in Figure 1.11. The illustration also shows the buffer zone around the designated site, and the buildings within the designated site.

1.3.2 St. Lawrence Gap

St. Lawrence Gap, popularly known as “The Gap”, is located between the primary town centres of Bridgetown and Oistins, and represents an important hub for both domestic and international tourists on the island’s south coast. Development renewal in recent times has featured improved pedestrian amenities in the Gap, which has benefited hotel and restaurant businesses in the area. Notwithstanding this revitalization, there has been a subsequent ongoing lack of maintenance of the area’s physical infrastructure. Derelict open lots and the lack of upkeep of infrastructural elements have affected the character of the area in recent years. To address this concern, a new thrust being spearheaded by the Dream Makers Millennium Foundation, a private sector group, seeks to establish improvements including street lighting, landscaping, maintenance of street infrastructure, policing of the area, and noise mediation (Cummins, 2013).

The Gap is an example of a mixed use zone for residential and entertainment purposes, which can cause conflict if not properly planned. Noise pollution within the Gap is exacerbated by clubs extending the permitted times of operation for outdoor amplified entertainment. Enforcement of noise pollution policies is a concern, as noted by UWI (Green Economy Scoping Study (Forthcoming), and will be critical to institute if the various uses of the Gap are to be compatible and if the area is to be marketed as a primary hub for tourism in Barbados. The White Paper Roundtable Sessions highlighted the need to focus on St. Lawrence Gap as the primary night-time entertainment centre of the island, its marketing as a premier area for tourism entertainment in Barbados (Cumberbatch, 2011).

1.3.3 Oistins

Oistins is enjoying a level of popularity and growth linked to its role as a fishing centre. The town’s role in the history of Barbados dates back to the 1600’s as a major port where the Charter of Barbados and ‘Articles of Agreement’ were signed in January 1652 at the Mermaid Tavern, which no longer exists. Since the commemoration of the signing of the charter at the Mermaid Tavern is of national significance, it may be used as a catalyst to promote the redevelopment of the Oistins town core in relation to future community services and tourism. In recognition of the historic importance of this event, commemoration is proposed through interpretation (refer Report VI, Section 4.0, Action 2.2a-5).

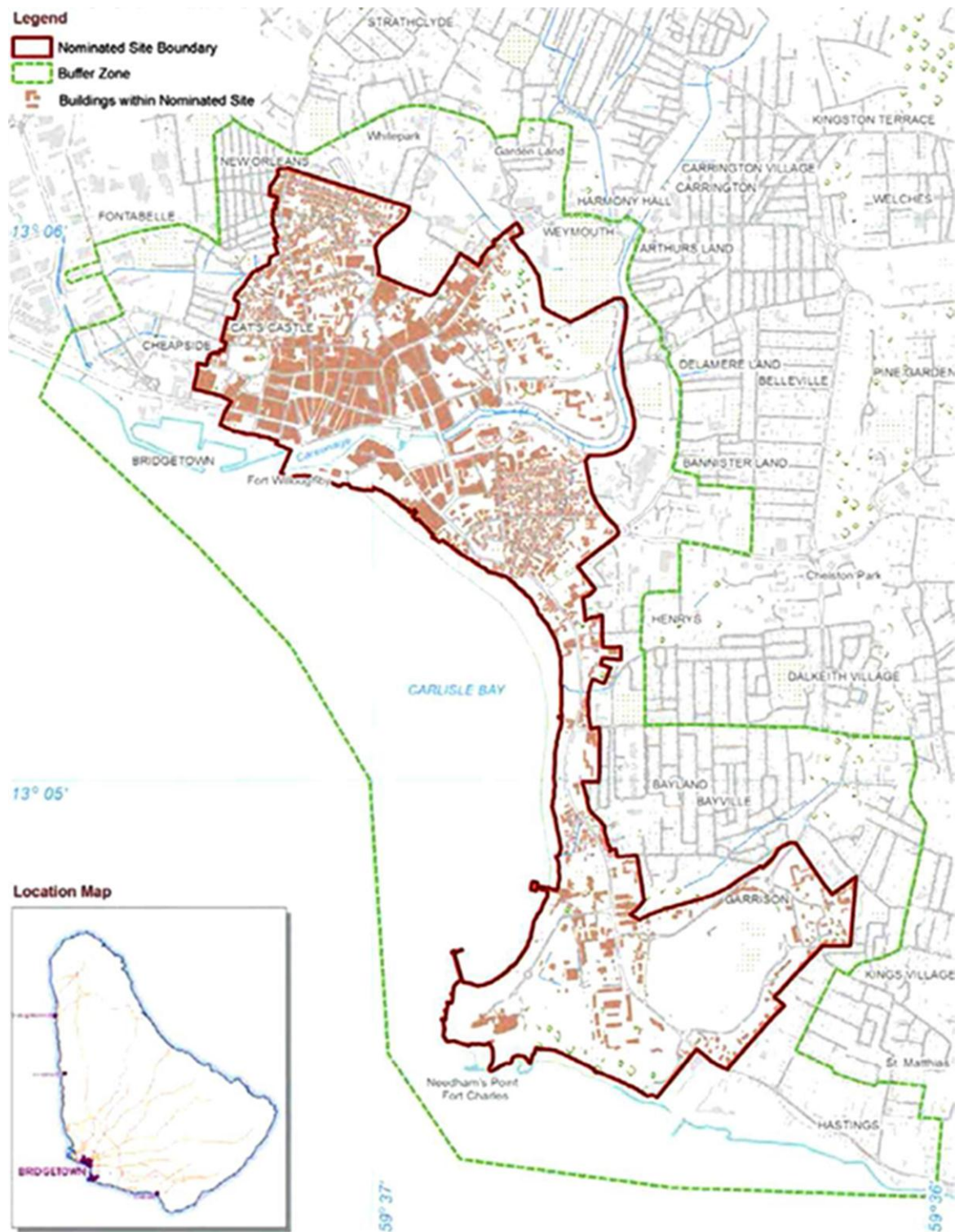


Figure 1.11. Map of historic Bridgetown (top) and its Garrison (bottom section), linked by the Carlisle Bay coastal community, illustrating the UNESCO World Heritage site boundaries (Government of Barbados, 2010¹).

The Oistins Community Plan (Government of Barbados, 2003) confirms the need to maintain the central role of the community as a major fishing centre. The Ministry of Public Works has sought to improve the quality and performance standards of Oistins main fish facility, the Berinda Cox Fish Market, ensuring that visitors are provided with a high standard product. The Oistins Fish Festival has strengthened the community as a popular attraction on the island, serving both locals and tourists.

Within Oistins, there are few outdoor amenities, e.g. site furniture, consistent landscape design and lighting, waste bins; all elements that can improve the character and appearance of the area. Development considerations for the town include improvements to green spaces and community lighting along Highway 7 to improve user security.

Barbados Tourism Investment Inc. (BTII) commissioned a Social Impact Assessment on the relocation of the Oistins Civic Centre that focused on the redevelopment of the existing 2 acre beachfront site (AXYS and Jacques Whitford, 2006). The study emphasized that Oistins residents (i.e. a population of approximately 2,700 with 409 registered fisher-folk at the fish-market and other businesses) are passionate about the maintenance of their history as a fishing village.

Proposals were also made for enhancing the fabric of Oistins through transformation of the site and maximizing its tourism potential through implementation of tourism accommodation. Options were presented for hotel, condo or guest house/villa development. In approaching future options for redevelopment or renovation of the existing Civic Centre site, the AXYS (2006) study recommended that Government take into account the following design guidelines:

- Upgrade civic green space with improved access to Enterprise Beach and the Bay Garden
- Retain and restore historically important buildings; the style of historic buildings should be reflected in the architectural style of all new buildings
- Maintain the scale and size of new buildings aligned with those in the surrounding areas. Prior to any site redevelopment, conduct a detailed archaeological survey to ensure that historical evidence and artefacts on the site are recorded and preserved as necessary
- Provide adequate public parking for users of the public areas, Enterprise Beach and associated facilities
- Allow for easy access to public transportation and other road transportation, including access for physically-challenged individuals
- Retail facilities should meet needs of both locals and visitors
- Tourism activities should not intrude on residents of the area

According to a recent socio-economic study conducted by UWI (Leslie, 2010), 52% of Oistins residents that were surveyed agreed that the town requires greater development, and that future tourism activities should take greater advantage of the beachfront zone through amenities including a boardwalk, or through festival activities that encompass a water-based component. With regard to other infrastructural requirements, an improved bus

terminal, roadways, pedestrian access, additional seating for patrons, and drainage were highlighted as priorities (Leslie, 2010). Recommendations were also made towards the improvement of pedestrian and vehicular circulation patterns within the most heavily used zones. In view of these results, it is proposed that the visitor experience be enhanced through the upgrade of the existing coastal environs and circulation system at Oistins (refer Actions 2.2a-4 and 8.2-9 in Report V, Section 1.1).

The Tourism Development Corporation (TDC) has sponsored tourism-related initiatives in Oistins, including the Barbados Marine Trust's (BMT) proposed sea turtle viewing activity and guided tours of the area (TDC, 2012). The BMT also launched a reef ball project in 2004 with the objective of enhancing the reefs, marine life and fisheries of the area, an example of an environmental best practice for the near-shore zone (Barbados Marine Trust, 2004). The hosting of fishing expeditions for visitors has also been recommended (Mayers, 2012), which would enable visitors to experience the daily life of a local fisherman.

1.3.4 Holetown

The year 2025 will mark the 400th anniversary of the arrival of Captain John Powell and claiming the island in the name of King James I of England, a significant milestone for the island and a prime opportunity for the promotion of tourism in Barbados. The NGO, Jamestown Barbados 1625, aims to promote the historic significance of the area from Holetown to Trents as a cultural heritage site for both recreation and education that focuses on the settlement in 1625 (pers. comm., L. Farnum-Badley, July 2012).

The 'Jamestown Barbados 1625' tourism development project seeks to attract the romantic traveller by taking advantage of Holetown's colonial heritage (see Figure 1.12). The objective is to provide businesses and investors in the tourism sector with a historical theme. Initiatives proposed include replicating the scene of the first landing through sculptural elements. Projects such as these could enhance the offerings along the proposed 'Barbados Trail' network being developed by the BTA, and expected to be launched soon (see www.phixative.com/clients/bta/trails/bta.html). Additional concepts of Jamestown Barbados 1625 include:

- Construction of a boardwalk/pier along the north side of the Holetown lagoon, connecting the streetscape to the shore
- Creating a distinctive historic character through the installation of period-styled amenities (e.g. lamp-posts, cobble-stone surfaces); improving the environment through the planting of large trees
- Establishing recreational trails in adjacent green spaces
- Developing a heritage museum



Figure 1.12. Holetown monument commemorating the landing of the English on the “Olive Blossom”, circa July 1605 (left); Holetown monument inscription (centre); the Holetown mangrove lagoon located just north of the monument (right).

According to the PDP (Government of Barbados, 2003), tourism is the dominant industry in Holetown. The centre is also a hub for high-end visitors, including those staying in and around the Sandy Lane community. The Holetown coastal community includes a marine reserve at Folkestone, historic churches such as St. James Parish Church, and a variety of commercial complexes (see Figure 1.13). The most recent and significant addition is the Limegrove Lifestyle Centre which integrates high-end retail shops and restaurants with luxury residences. This upscale commercial and residential centre attracts both international and domestic visitors, and is unique to the island and the region.

The Holetown Chamber of Trade Inc. (HCTI) aims to encourage visitors and locals to choose Holetown for their shopping needs in order to stimulate commercial activity in the area. There has been a decline in visitor shopping in recent years that has been attributed to declining visitor arrivals. The HCTI is currently developing programmes for improving the physical appearance, social character, and business opportunities of this primary centre, in addition to raising the standards of local businesses (pers. comm., M. Simmons, HCTI, July 2012). Data collection regarding shopping preferences in the area will be valuable for planning purposes. Developing a high quality product in Holetown through the following HCTI initiatives are being considered:

- Generating a green community with an active recycling programme
- Improving business relations through enhanced networking practices
- Upkeeping streetscapes, waterways, and beaches
- Neighbourhood beautification and landscape improvements, with tree planting
- Developing a vibrant training programme for future entrepreneurs that will engage the public and community schools



Figure 1.13. Key landmarks in and around Holetown (adapted from Google Maps, 2013).

Other activities of the HCTI include agro-tourism promotion through the introduction of a farmer's market (pers. comm., M. Simmons, HCTI, July 2012). In addition, the TMP proposes the development of a Heritage Park in Holetown to provide an added attraction within an attractive green space (refer Action 2.3-10 in Report VI, Section 4.0).

1.3.5 Speightstown

Speightstown, also known as Little Bristol, is a small town with significant heritage tourism potential. Its unique character is based on its architectural heritage dating from colonial times- there are still some fine examples of 18th and 19th century architecture that, together with its forts, could be developed into a stimulating heritage experience for visitors (see Figure 1.14).

Notwithstanding the above, the town is in urgent need of rejuvenation (refer Action 2.2a-1 in Report I, Section 4.4, and Report VI, Section 4.0). Many of the Speightstown's buildings

have been declining over the last few decades due to neglect and lack of funding for maintenance. Moreover, the realignment of Highway 1 in that area has led to a reduction of visitor traffic through the town centre.



Figure 1.14. Heritage properties in Speightstown: former Noel Roach & Sons building (left); Arlington House (centre); Old Post Office (right).

The closure of the island's largest hotel at Almond Beach Village, as well as the loss of some retail and restaurant operations, has also reduced both local and visitor traffic in Speightstown. There are plans underway to reopen Almond Beach Village, starting in 2014, which will help to re-invigorate the town and adjacent communities.

The major challenge for further developments in this historic town includes funding mechanisms and enhanced marketing of Speightstown. Port Ferdinand and Port St. Charles marinas near Speightstown have introduced an added tourism dimension to the community. With the potential to travel via ferry from the Bridgetown Port to Speightstown (refer Action 8.1-2), the limitations created by the distance from the Port to Speightstown would be reduced.

In July 2013, visitors were ferried between Bridgetown and Speightstown for a series of musical events during the Crop Over season (Nation News, 2013). This type of activity should be promoted more regularly as a significant tourism draw that would help to boost economic activity in both town centres and establish an important link for both domestic and international visitors. In addition, a diversity of regular cultural activities is recommended to boost the patronage of Speightstown (refer Action 2.1J-8 in Report V, Part 2, Section 3.2.2.2).

Recent public infrastructural development in Speightstown has focused primarily on coastal and drainage works such as the boardwalk, jetty, Salt Pond canal, Highway 1 road works, and the newly installed Speightstown roundabout. However, the building fabric continues to deteriorate as owners have not pursued refurbishment, and the closure of businesses adds to the state of dereliction.

Entrepreneurs in Speightstown identified the discontinued Barbados Transport Board service as a primary contributor to the decline in domestic tourism in the centre (Atwell, 2012). It was noted that shoppers seek more convenient locations along bus routes (pers. comm., J.

Sobers, business owner in Speightstown, February, 2012). In addition, there has been reduced exposure of merchandise and opportunities for on-location promotions owing to diminished traffic through the area. The eastern public carpark has been poorly used owing to its reduced proximity to the town's services. It was therefore proposed (pers. comm. J Sobers, business owner in Speightstown, February, 2012) that:

- Short-term parking be considered for select streets within the town, as currently pertains in other town areas
- The Transport Board schedules a minimum of two daily bus service routes to traverse the town centre for increased visibility critical to Speightstown businesses, and easier access by locals and visitors

Many businesses in Speightstown are small, personally funded enterprises that depend on repeat clientele from the north of the island. They tend to exhibit a high turnover rate owing to rental and utility costs (Atwell, 2012). However, the presence of civic offices and associated services does contribute to increased patronage in the area, e.g. the Speightstown Polyclinic has a high volume of traffic, hence the town centre could benefit from the introduction of a shuttle service (refer Action 8.1-6 in Report V, Part 1, Section 1.1).

The Speightstown Jetty, which is utilized by fishermen and by locals and visitors for recreational purposes, remains in disrepair due to storm events. The Jetty serves a valuable function as a recreational resource in association with the boardwalk that follows the shoreline adjacent to the Speightstown Esplanade. Upgrade and maintenance of the Jetty is an important future goal in improving recreational activities.

There is also an opportunity to develop the indigenous handicraft sector and provide improved vending locations to expand the scope of facilities beyond Pelican Village (Cumberbatch, 2011). The prime seaside location of the Old Post Office building may be considered as one such node upon which to build Speightstown as a creative hub. The Speightstown boardwalk, Caribbean Museum of Art, and key historic forts are all within walking distance. Linkages between arts and crafts and heritage products should be promoted through the development of outdoor markets at these satellite sites within the core of Speightstown.

The PDP states that tourism development shall constitute the main component of the future development of Speightstown, and supports the development of tourism accommodation, and retail, restaurant and entertainment uses within this mixed-use corridor. Support is also given for heritage tourism development and improvement of the pedestrian environment (Government of Barbados, 2003, pp. 7-18 and 7-19).

Former Minister of Commerce and Consumer Affairs, Haynesley Benn, described other areas that need to be addressed in Speightstown (Burnham, 2012) as follows:

- Revitalization of aging and derelict properties with assistance provided to property owners for upgrades, even if the properties are not listed heritage buildings
- Planning of a higher number of cultural activities, particularly at the Speightstown Esplanade

- Placing of government-related businesses in the heart of the town to stimulate commercial activity from the northern parishes
- Encouraging youth groups and cultural clubs from schools and churches to spearhead the return of culture and entertainment related activities
- Encouraging the return of commercial store chains providing goods equivalent to those available in Bridgetown

Town hall meetings held for the development of the White Paper (Cumberbatch, 2011) also proposed improvements in the following areas:

- Further development of the rich heritage aspects of the town, particularly its historic role as a main port and military stronghold (e.g. Fort Orange and Fort Denmark). Recognition of this significance was important to the realization of full potential of the town
- Repair of the Speightstown jetty
- Upgrade of public bathroom facilities which should be open and accessible to users
- Improvement of drainage associated with the Salt Pond
- Reintroduction of the historic ferry service to Bridgetown

Other important issues pertaining to the country's built environment include brownfield sites, rural settlements and land use impacts, which are presented separately below.

1.3.6 Brownfield Sites

Brownfield sites are defined as any "real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant" (USEPA, 2012). The revitalization of such sites through cleanup and reinvestment is aimed at protecting the environment while expanding opportunities for physical development. In Barbados, where land in tourism and urban areas may be scarce, the re-use of brownfield sites, including derelict properties, provides an opportunity to maximize the use of prime locations and reduce development pressures on undeveloped lands or green sites.

Over the past decade, several tourism accommodation establishments have closed, and the majority remains disused or abandoned. The potential for these properties to contribute to the growth of the tourism product, once returned to active use or redeveloped, is significant and reduces development pressures that may be placed on green-field sites for future tourism accommodation expansion.

There are existing brownfield sites occupying key locations that remain disused, and can be significant future contributors to the tourism product. These include properties such as the Caribbee Hotel, Sandy Beach Hotel, former Mobil Refinery site at Needham's Point (see Figure 16), disused petrol stations on the island (e.g. the former ESSO Station on Bay Street), and resource extraction areas.

Currently, the redevelopment proposal for Needham's point incorporates the site of the former petroleum storage operations conducted by Mobil Oil along with the new Barbados Hilton Hotel. The elimination of environmental hazards there is a critical step for the 12

hectare site that has been unoccupied since the cessation of refinery operations in 1998. The duration for completion of future remedial works is estimated to be 3 years (Nation News, 2012).

The urban revitalization of Needham's Point peninsula would serve as a strong catalyst given its linkage to the city core, integrating various activities and uses along Carlisle Bay in its current PDP designation as a Special Development Area (Government of Barbados, 2003, p. 6-14). The area as a whole has a comprehensive history of military involvement with buildings constructed in 1805 and eventually being used as military barracks through 1831. Needham's Point is also situated within the UNESCO world heritage site, featuring attractions that include St. Ann's Fort, a Lighthouse, and Military Cemetery.



Figure 1.15. Aerial photo of the former oil refinery (centre), a major brownfield site in the key tourism area of Needham's Point (RWA Architects, 2010).

1.3.7 Rural Settlements

There are numerous rural settlements distributed across the island, a pattern resulting from the distribution of sugar plantations that were established since colonization. With the significant demand for coastal properties, especially by holiday home investors over the past several decades, and the ensuing reduction in supply as available property becomes more scarce over time, especially on the south and west coasts, it is reasonable to expect a continuing increase in demand for settlement and residential development in more rural areas.

1.3.8 Land Use Impacts

Tourism impacts on the environment occur most readily in high traffic zones such as beaches and natural areas. Enforcement of building regulations will require vigilance by Government agencies such as the Town and Country Planning Development Office, the Coastal Zone Management Unit and the Environmental Protection Department. The human resource potential for monitoring of both public and private activities would need to be significantly strengthened in this regard (refer also Action 12.1-2).

For large developments, photographs of land areas *prior* to site clearance should be required as part of the development application. This photographic record would be confirmed with area officers of the Town and Country Development Planning Office. Pre-development conditions can thereby be assessed to mitigate against poor stewardship practices and wanton destruction of mature trees. The impacts of tourism accommodation located directly on the coast are reviewed in Section 1.2.2.

Environmental impacts of tourism services and land uses include the following:

- Encroachment of infrastructure and services on natural areas such as beaches, watercourses, and wooded areas. These activities may include land clearance, e.g. for golf courses, destruction of habitats by vehicles or sea-faring vessels, over-use or poor stewardship along beaches, trails, or open areas
- Pollution through run-off or discharges from land based infrastructure or sea-faring vessels; overuse of toxic pesticides; illegal dumping practices; use of fossil fuels
- High use of natural resources, e.g. food, water, energy
- Increase in volume of waste products generated
- Increase in transportation challenges adjacent to tourism facilities and high-density tourism areas
- Noise and visual intrusion from tourism developments
- Conflicting use of near-shore areas by power boats and sea-bathers
- Lighting from establishments along the beach front impacting turtle nesting
- Reduced 'windows' to the sea

With reference to golf courses, some major gully systems traverse these developed areas, which may also intersect with Zone 1 water protection zones. Environmental issues relative to golf course development include the clearing of gullies and their use as drainage reserves, especially pertaining to the impact from regular pesticide and fertilizer use. For new golf courses, site preparation should include silt retention during earthworks and preservation of edge vegetation. Given the continuing trend towards golf course development in Barbados, there is an urgent need to establish cooperation with owners of golf courses relative to an integrated management plan for gullies and other natural areas, and to ensure enforcement of the conditions imposed.

More effective approaches to land stewardship in Barbados would require the adoption of the following practices:

- Retain all existing open windows to the sea along the south and west coasts, and preserve all of those on the north and east coasts
- Ensure the full enforcement of the existing Tree Preservation Act (1985); institute strict measures that ensure the retention of mature trees on sites slated for development and redevelopment, including the requirement of landscape development plans that would need to form part of development proposals for tourism related applications to the Town and Country Development Planning Office
- Institute comprehensive tree planting schemes island-wide to soften harsh, heavily built-up environments. The tree planting on the ABC Highway is an example of a best practice in this regard (refer also Action 11.1-7)
- Encourage community action programs surrounding the development of community gardens that focus on tree replanting and preservation of green spaces (refer Action 11.1-8)
- The Scotland District can provide more public services and benefits, and improve public well-being. In a quality environment, the idea of a 'green gym' should be promoted, branding the area as a wellness destination for all landscapes and seascapes of the island (see also Report V, Part 2, Section 3.2.1.4). Social and economic 'breathing spaces' can aid personal and mental well-being and increase economic prosperity. Public services can include the promotion of outdoor fitness programs, and developing more fitness-oriented recreational areas (refer Action 2.4-2 in Report VI, Section 8.0)
- Develop sustainable agricultural practices, including in the Scotland District, and encourage land stewardship through farmer incentive schemes and the implementation of organic farming practices

1.4 Waste Management

Waste management continues to be an island-wide problem. Ample legislation exists to counteract the practice of illegal solid and liquid waste disposal, and further statutes are being developed to reinforce current laws. Natural areas should benefit measurably upon the implementation of solid waste management legislation currently under development by the Sewerage and Solid Waste Project Unit. Alternative measures, including public education, stiffer penalties, and monitoring of waste disposal operations, have been proposed to severely discourage offences.

Public education into proper waste disposal methods, maximizing the efficiency of disposal services, and obtaining community assistance in identifying and prosecuting offenders are primary goals under current and proposed waste management policies. The principal need is for monitoring and enforcement practices to be considerably strengthened.

1.4.1 Solid Waste and Sewage, Reduction and Recycling

The main landfill in Barbados receives approximately 1,000 tons of garbage daily (Government of Barbados, 2009). Waste collection normally occurs daily in commercial centres and weekly in rural zones. Bridgetown has 13 collections per week, twice a day from Monday to Saturday and Sunday mornings. However, the need for more frequent collection across the island is increasing (UNEP, 2010). Ongoing problems in the city include:

- Businesspersons placing waste materials on the roadside immediately after the daily garbage collection is completed, rather than meeting the scheduled pick-up time or awaiting the subsequent daily collection
- A need for improved recycling practices for cardboard items produced from businesses

As the pressure on local waste management facilities increases, Barbados is focusing more on alternative waste management options, including recycling. The Environmental Protection Department (EPD), in addition to private sector and non-governmental agencies, has sought to institute recycling and composting programmes throughout Barbados. The EPD monitors and regulates solid waste, while the Sanitation Service Authority (SSA) oversees the collection and disposal of non-hazardous solid waste throughout the island, and operates the 4 Government solid waste disposal sites located in the following places:

- Mangrove Pond Landfill
- Bagatelle Bulky Waste Disposal Site
- Rock Hall Asbestos Disposal Site
- Lonesome Hill Blood and Grease Disposal Site

The EPD undertakes the monitoring and regulation of solid waste management and Government-operated solid waste disposal sites. A Solid Waste and Hazardous Substances Section was established in 2005 to improve regulation of solid waste management (Government of Barbados, 2009).

The completed South Coast Sewage Project and the proposed West Coast Sewage Project are aimed at regulating sewage disposal in prime commercial areas that experience the highest volumes, improve environmental conditions and protect coastal and marine ecosystems. The West Coast project will focus on water augmentation and recovery since wastewater reuse can become vital for Barbados, a water scarce country (Government of Barbados, 2009).

A green energy complex is being proposed at the landfill site in Mangrove, St. Thomas, and will comprise a waste-to-energy facility to process approximately 350 tons of solid waste per day and provide 10 - 14 megawatts of electricity. A Landfill Gas Management System is to be designed to capture the greenhouse gases that can be quantified and sold as credits in

carbon trading markets. Solar power and wind energy facilities are also planned, in addition to a Mangrove Pond beautification programme that is intended to improve the public's image of the Mangrove Pond Landfill by beautifying the cells and reducing foul odours (UNEP, 2010).

SSA is planning to install stationary waste management equipment in urban alleys and select rural areas to help manage the volume of waste being generated daily across the island (Nation News, 2006; Government of Barbados, 2009). In the absence of a broad-based recycling programme, these stationary compactors would help to manage shop-generated waste in the central business district. Currently, this programme is still awaiting implementation (pers. comm., R. Knight, Acting General Manager, SSA, August, 2013).

Encouraging the involvement of private sector enterprises and local stakeholders in sustainable waste management initiatives is required for long-term management of solid waste in Barbados. Waste prevention, minimization, reuse, and recycling should also be emphasized as a means towards a healthy environment for both locals and visitors. Programmes that support the reduction in the use of plastics, for instance, would help to reduce the amount of waste ending up in the Mangrove landfill (refer Action 11.1-4 in Section 3.0). The use of reusable bags, biodegradable bags, and recycling bins are examples of products and programmes that need to be integrated into mainstream daily activities to help reduce waste volumes at the landfill. In the absence of a public sector recycling collection programme, there are opportunities for communities to organize their own recycling programmes and link with private companies that offer collection services and distribution of recyclable waste. Most visitors to the island would undoubtedly welcome the opportunity to cooperate with local recycling programmes while they are on holiday, especially those that practice recycling and waste reduction programs in their own homelands.

The Green Business Barbados programme is a public-private partnership between the Government and the Future Centre Trust since 2010. The programme encourages the social and environmental responsibility of corporate entities, including matters relating to waste management (Garafano and Edghill, 2011). EPD, in association with the Future Centre Trust, engages in activities such as Clean Up Barbados and the Ocean Conservancy International Coastal Clean Up (ICC Clean Up). Another programme involving a partnership with the Future Centre Trust is the Travel Foundation UK, which has incorporated waste prevention and reduction into a Travel Foundation programme. This project was completed in May 2012, and provided training in waste reduction measures, with the aim of reducing overall hotel waste by 10% and also generated savings for participating properties (pers. comm., N. Garofano, Future Centre Trust, April 2011). Participants for various project stages included 10 visitor accommodation properties in Barbados.

ReCaribe, the 16th Annual Caribbean-wide waste management conference, highlighted progressive steps in Barbados' waste management system, including the public-private partnership with the Sustainable Barbados Recycling Centre (SBRC) and the Government of Barbados. The Centre receives an average disposal of 1,200 - 1,300 tons per day, of which 70% - 75% is diverted from the landfill (pers. comm., L. Edghill, Future Centre Trust, November 2012).

1.4.2 Illegal Dumping

Littering and dumping still occur island-wide, including in gullies where water is discharged into our sensitive coastal ecosystem. “People are still dumping without realizing they are destroying their homeland. And right off a little bridge by the Pot House Spring, persons dump vehicles, mattresses, stoves and dead animals, and that stream runs out into Bath Beach where persons would take a sea bath” (Cooke, 2012). Mitigation will require more prohibitive penalties combined with more rigorous enforcement.

Illegal dumping in nature tourism sites, including gullies, compromises both their integrity and tourism potential, and can have far-reaching effects on the environmental health and integrity of the island. According to the Gully Ecosystem Management Study (EPG et al., 2003), 266 gully segments were found to contain 369 dumpsites. It was estimated that approximately 10,000 tons of waste existed in those dumpsites at the time of analysis, and that did not include liquid waste data. Gullies in the vicinity of highly populated and developed areas are more prone to dumping. On a parish basis, the more populous parishes of St. James, St. Peter and St. Michael had the most dumpsites; the former two parishes are high tourism development areas in Barbados, and the latter parish includes the capital city of Bridgetown and prime commercial centre of the island, now a designated UNESCO World Heritage Site.

The White Paper (Strategic Solutions Inc., 2012, p. 123) emphasized the need to enforce national anti-litter programmes, particularly in the capital of Bridgetown, to strengthen the Barbados Brand and distinguish Barbados as a clean destination. The enforcement of health regulations prohibiting dumping, particularly in nature-based areas, will need to be more rigorous to avoid the deleterious effects of this practice. In this regard, the Ministry of the Environment has indicated that it is actively considering the introduction of environmental police to patrol beaches and open spaces in Barbados to help control illegal dumping and littering, and to have offenders prosecuted (Rawlins-Bentham, 2013).

It is suggested that environmental officers be utilized in both an educational and policing capacity. The officers could also function within the Barbados National Park and other nature tourism areas, in locations where active nature trails are to be established. Environmental awareness programmes will also be required in schools and across communities (e.g. via community councils) in order to increase awareness of the impacts of poor waste management practices, while promoting good environmental stewardship to benefit the Barbados Visitor Economy.

Visitors to Barbados who come from countries where waste management may be at more advanced stages and where recycling programmes are highly organized may have high expectations relative to environmental cleanliness / orderliness when they travel. Unightly garbage strewn across the landscape, foul odours emanating from illegally dumped waste, and the lack of broad-based recycling programmes island-wide will create a negative impression of Barbados as a desirable travel destination, and may compromise its competitiveness in the region and beyond.

The experience of driving behind a vehicle and witnessing garbage being thrown out of the window, or seeing a driver stop at an open green area to dump waste materials, can be

disconcerting to both visitors and locals. In the absence of a regulated and enforced EMA, it is recommended that a system be set up whereby individuals who witness any illegal littering/dumping can contact an Environmental Hotline that can record incidences and respond accordingly (refer Action 12.1-2) similar to a Neighbourhood Watch or Crime Stoppers system.

The transitioning to a green economy, within the context of a Barbados Visitor Economy, will require greater land stewardship principles and actions, inclusive of appropriate waste management systems and practices.

1.5 Climate Change and Disaster Management

1.5.1 Overview

Whether climatic anomalies are caused by cyclical global changes or specific human intervention, it has become evident that small island states of the Caribbean, including Barbados, are being negatively impacted by changes in climate as temperatures warm and sea levels rise. Impacts include coral reef bleaching, beach erosion, flooding, and landslides. Climate change or variability may impact the tourism sector directly on capital stocks (buildings, infrastructure, heritage assets) or indirectly on the flow of goods and services, including those services provided by natural ecosystems and processes (Jackson, 2002).

Warmer sea temperatures regionally could spawn more hurricanes and storm events; warmer sea temperatures globally could increase the melting of polar glaciers, leading to higher sea levels and resulting beach erosion and other negative impacts on low-lying coastal zones. Thermal expansion and melting glaciers and icecaps are critical influences on the rise of sea level, which was estimated between 0.10m and 0.20m in the 20th century. Predictions are that during this century, sea level rise could be 0.09m to 0.88m. For the Caribbean region, sea level rise could average between 5mm and 10 mm per year (Jackson, 2002).

The United Nations Framework Convention on Climate Change (UNFCCC) 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” (United Nations, 1997). The United Nations World Tourism Organization (UNWTO) has described tourism as a vector and victim of climate change: a victim since changes in temperature, sea levels and land use will radically change tourism capabilities and hence development patterns of nations; and a vector since the tourism value chain has a carbon footprint that will increase based on growth projections (UNWTO, 2007). Experts recognize that the environment, including climate, is a tourism resource, and the industry is highly susceptible to the impact of climate change and increased warming. The fortunes of tourism-dependent economies are sensitive to these types of global external factors (CCMF, 2011).

1.5.2 Regional Programmes

Caribbean island nations support a resident population of about 40 million people who are in a position of increased vulnerability to climate change. Higher temperatures, rising sea levels, and increased hurricane intensities threaten lives, property, and livelihoods throughout the region. Increases in hurricane damages, loss of tourism revenue, and infrastructural damages are projected to total \$22 billion annually by 2050 (Benjamin, 2010). Moreover, costs within Caribbean states could run to 14% of their GDP by 2025, increasing to 39% by 2050 and 63% by 2100 (IIED, 2011).

Of the region's total population, almost 70% live in coastal areas. Tourism, which is heavily reliant on coastal resources, represents up to 70% of GDP for many Caribbean island states (UNEP, 2008); for Barbados it represented 14.8% of GDP in 2010 (Central Bank of Barbados, 2010).

The Caribbean Community Climate Change Centre (CCCCC), created in February 2002 and headquartered in Belize, has provided data that indicates that sea temperatures in the Caribbean have recently increased by 0.8°C, and also predicts a much higher increase by the end of this century. An additional 1°C rise is expected to reduce fisheries and increase coral reef bleaching. Moreover, rising sea levels and temperatures may present insurmountable challenges to tourism, food security, and health (ECLAC, 2009).

Caribbean governments have responded by endorsing a regional framework that aims to make the region more resilient to climate change (CCCCC, 2009). The framework provides a roadmap for action over the period 2009-2015, and builds on the groundwork laid by the CCCCC. Some of the objectives are to establish direction for the building of resilience to the impacts of climate change and to implement a strategy with multi-sectoral roles.

This regional framework is meant to encourage island states to adapt through a variety of initiatives, including regulating land use, conserving energy, investing in resilient infrastructure, and expanding forest resources. Plans for the region to reduce greenhouse gas emissions by developing renewable energy, improving energy efficiency, and conserving forest reserves will be key to mitigating the effects of climate change.

Other regional programmes include the Global Climate Change Alliance (GCCA) Project that was launched in 2007 involving CARICOM, Cuba, and the Dominican Republic. The project is funded by the European Union and will run to December 2014. Objectives of the project include facilitating data collection, data management, and enhancing capacities in ways that link sustainable development, risk management, and adaptation (GCCA, 2012).

The CARICOM regional implementation plan being targeted through GCCA includes the following challenges and actions: building a low climate resilient economy that is integrated within a wider sustainable development agenda; risk assessment and management becoming a standard in decision-making and resource allocation processes; building resistance to existing climate variability through disaster risk reduction programmes in the Caribbean. Hence the work of the Caribbean Disaster and Emergency Management Agency (CDEMA) must remain a priority (CCCCC, 2012).

As developed countries continue to debate the best way forward through deliberations at climate change summits, the reality for Caribbean developing states is that they are low emitters of carbon (a greenhouse gas thought to contribute to climate change), but highly dependent on the environment for their future prosperity. Therefore they may be most at risk from the impacts of climate change (see Table 1.3).

“While the Caribbean has made only a minor contribution to global climatic change, the region will be on the front line of risk and damage. Its environment and economy will suffer the combined impact of increased incidence of hurricanes, global warming, more erratic rainfall patterns and sea level rise. Caribbean vulnerabilities manifest themselves both in geography and socio-economic conditions”(Leslie, 2011).

Table 1.3. An examination of how climate change affects key economic sectors in the region through the natural resource base.

Issue or Resource Vulnerable to Climate Change	Potential Effect of Climate Change	Sectors at Greatest Risk	Economic Relevance
Freshwater availability	Reduced precipitation; increased evaporation and saline intrusion from sea level rise	Water resources, agriculture, and forestry	Water supply is expected to be a bottleneck for economic activity and serious health concern. All water-using sectors would be affected
Degradation of marine and coastal ecosystems	Sea level rise and changes in sea temperatures can affect important ecosystems such as mangroves, fishing grounds, and coral reefs	Fisheries and tourism	Fisheries sector is an important employer; tourism accounts for a high share of the GDP and greatly depends on the health of marine ecosystems
Coastal flooding		Tourism, agriculture, and forestry	Most tourism activities are located in the coastal zone. Significant capital investment assets and infrastructure could be affected
Climate		Multi-sectoral	The cost of hurricanes and other natural disasters in the Caribbean region, estimated at several 100 million dollars during the last decade, may increase

Source: World Bank/OAS, 2002.

In this context, Caribbean states, including Barbados, may face challenges that include the following:

- Warmer temperatures in temperate countries could make the appeal of a Caribbean destination less attractive
- Increased intensity and frequency of storm related events
- Increased coral bleaching which impacts on marine flora/fauna and the integrity of the whole coastal zone, a significant aspect of the tourism product
- Water supply impacts
- Increased beach and coastal erosion

In response, adaptive measures to the impacts of climate change have been recommended for the Caribbean Region by the CCCCC (Trotz, 2008), and include:

- Planning coastal development that does not contribute to beach erosion
- Integrating vulnerability assessments when planning for new developments, targeting areas less likely to be affected by the impacts of climate change and sea level rise, and building infrastructure that will protect and/or be protected from these impacts
- Using vulnerability assessments on coral reefs and other natural ecosystems to plan for low-impact tourism activities on highly sensitive areas
- Improving the dissemination of information regarding high impact weather events, and using this information to help the tourism industry plan accordingly
- Adopting economic and regulatory measures that allow for immediate implementation of adaptation strategies.

Implementation of measures to adapt to climate change contributes to sustainable development initiatives in all economic sectors. Instituting measures specific to the reduction of non-renewable energy costs and the use of more renewable energy in the tourism sector contributes to a greener economy. The Regional Framework (CCCCC, 2009) encourages member states to mainstream adaptation into existing sustainable development policies in order to reduce vulnerability, and to promote reduced greenhouse gas emissions via renewable sources, energy efficiency, and conservation of standing forests. Barbados has opportunities to draw from these resources as it moves forward with its adaptation initiatives within the context of sustaining and improving the tourism sector.

A major impact on the tourism industry attributed to climate change was identified as carbon emissions and, although regional nations are not viewed as major direct producers of local emissions, the link with transportation to and from the region via air travel is of primary concern (Jackson (2002). While the technology associated with aircraft engine design has been evolving, in the interim several airlines have implemented carbon offset programmes. In many countries, especially in Europe, legislation is either in existence or planned which will impact the airline industry. Passengers are being asked to contribute to carbon-offset programmes that hope to balance the impact of their travel on the environment. This “carbon tax” could potentially escalate the cost of travel to destinations such as Barbados. In this regard, the proposed Airport Master Plan for Barbados being considered by Government recommends the production of a greenhouse gas inventory so the emissions baseline is understood and improvements can be reported to boost public awareness of applied environmental measures (Jacobs Consultancy, 2011).

Aside from the effects of climate variability, the Caribbean region faces appreciable risk from natural disasters. These include hurricanes, floods, earthquakes, landslides, volcanic eruptions and tsunamis. Such risks can be expected to remain part of the regional experience even if climate change impacts turn out to be less severe than predicted. However, some of these risks may be linked to climate change. The region’s proneness to natural disasters can be influenced by land use policies and socio-economic and cultural practices that increase a country’s vulnerability.

Vulnerability implies risk relative to damage by a natural hazard. This makes tourism infrastructure, most of which is concentrated on or near coastal areas, and the tourism

industry highly vulnerable to hurricanes, storm surges and tsunamis. In Barbados, of 6,100 hotel rooms surveyed, over 90% are built on the coast less than 1/2 mile from the high water mark and less than 20m above mean sea level. Storm surge models indicate that over 50% of these rooms may be vulnerable to a Category 3 hurricane (Jackson, 2002).

Sea level rise is expected to pose one of the greatest threats to tourism in the region. It will exacerbate wave and storm surge effects occurring with hurricanes. Islands will remain vulnerable whether or not the trend in the frequency and intensity of hurricanes is linked to climate variability or climate change.

Property owners will need to cope with sea level rise impacts on two fronts. One is associated with wave, storm surge and wind related damage and their direct and indirect damages/costs. The other is from erosion, land loss, and inundation. A major concern will be how this affects property value and income over time. Beach resorts and other facilities will be faced with challenges affecting property, the viability of businesses, and earnings. According to Jackson (2002) these include:

- Loss of recreational value of beaches
- Loss of property value resulting from declining amenity value
- Loss of land value
- Deterioration of landscape and visual appreciation
- Cost for beach and property protection

It will be important for government agencies to compile databases, manage climate related information, and build public support for change in those practices that weaken social resistance to natural disasters. The emphasis on mitigation being placed by the Caribbean Disaster Emergency Management Agency (CDEMA) in response to natural disasters must become widespread in application within both the private and public sectors.

Given the importance of the tourism sector in the Caribbean, the region's vulnerability to natural disasters, and the impacts from climate change, CDEMA was mandated to develop a Disaster Risk Management Strategy and Plan of Action for the Tourism Sector in the Caribbean which forms part of the Regional Disaster Risk Management for Sustainable Tourism in the Caribbean Project 2007 – 2010 (CDEMA, 2009). This project aims to build a culture of natural hazard risk reduction within the Caribbean tourism sector to minimize potential loss of life, property, livelihoods, economic activity, and damage to the environment caused by natural hazards through strengthening capacity for mitigation, preparedness, response and recovery. A Model Institutional Framework for the tourism sector, based on a 2006 framework established by the Ministry of Tourism in Barbados, is suggested in the Multi-Hazard Contingency Planning Manual for the Caribbean Tourism Sector. Disaster Risk Management efforts are required by tourism stakeholders at the local, national, and regional levels in order to reduce vulnerability and assure continued sustainable development following hazard events.

When the tourism industry is negatively impacted by natural hazards, the expected domino effect is a decline in agriculture, manufacturing, transportation, financial services and a host of services in the economy that are vital linkages to the tourism industry. The sustainability of

the tourism sector therefore equates to the sustainability of economic, social, cultural and environmental assets.

The Green Economy Synthesis Report (UWI, 2012) highlights the most significant considerations for investment toward achieving sustainability solutions for the local tourist industry. Climate Change was presented as a key area requiring greater investment in order to reduce the disparity in performance (see Table 1.4).

Table 1.4. Investment gap analysis of the Barbados tourism sector (UWI, 2012).

Challenge	Importance Score (1)	Performance Score (2)	Performance/ Investment Gap (3)=(1)-(2)
Cost of achieving green certification	7	3	4
Heavy dependence on imports	6	1	5
Climate change	9	5	4
External environment	8	5	3
Measurement	8	5	3
Low occupancy rates	9	2	7
Domestic transportation system	5	1	4
Crime and safety issues	7	5	2
Inconsistent supply of local inputs	5	4	1
Cost of inputs	8	7	1

(Source: UWI, 2012)

1.5.3 Local Studies

The White Paper noted that Government is committed to the preservation and management of the Barbados coastline from damages caused by natural disasters and risks associated with climate change (Strategic Solutions Inc., 2012, p. 102). Given that the island's natural ecosystems, particularly in the coastal zone, feature prime assets for a vibrant tourism industry (e.g. sandy beaches, coral reefs, and calm coastal waters), it is imperative that these assets are safeguarded from negative impacts due to development and non-sustainable use. Improper planning of development projects, including tourism infrastructure, can also be exacerbated by climate change and natural disasters. Tourism stakeholders will therefore need to have a greater understanding of the role of the environment as it relates to the viability of the island's economy in order for sustainable development to be achievable.

In 2009, an assessment of risk perception and adaptation capacities of the tourism sector in Speightstown was conducted by CERMES (CERMES, 2009). The main findings included:

- Stakeholders have limited knowledge and awareness of global climate change and more of an appreciation for events that directly impact on their businesses and livelihoods

-
- Stakeholders are knowledgeable and aware of significant, visible events such as hurricanes despite the fact that Barbados has not experienced a major hurricane event since 1955. This is a result of the catastrophic impacts of hurricanes on other islands and on the USA in more recent.
 - Stakeholders assess threats according to individual values and experiences, e.g. persons whose businesses depended on the beach or on the coral reefs identified beach erosion and coral bleaching as threats, and had less problems with water shortages.
 - The most common preventative measure as a result of having been impacted by flooding or bad weather events is addressing building design and structural reinforcement much of which is focused on drainage, or putting in shutters or generators.
 - The adaptive capacity of the respondents within each stakeholder group, especially the small operators, was poor. The majority of stakeholders had not focused on putting adaptive strategies in place partly because of the low perception of risk, since they have not really experienced any major events, and also because of feelings of incapacity, characterized by statements such as “there is nothing I can do.” There is also the passing off of the responsibility to the government, landlord, or property manager.
 - The only incident of real concern to the stakeholders is flooding and as far as they are concerned poor drainage design; inadequate drainage management; runoff from land based activities; changes in rainfall patterns; and insufficient government planning are the causes.
 - Speightstown stakeholders were concerned about things that have directly impacted on them in the past and therefore have a limited perception of the risks associated with broad-based climate change impacts. This reinforces their lack of attention to the need for adaptive strategies, and coupled with a willingness to pass the responsibility onto government or another party, they are not likely to respond with any degree of urgency to climate change adaptation policy and legislation.
 - The challenge that remains is to update and harmonize the existing policies and legislation where climate change is not adequately considered and incorporate climate change considerations into day-to-day decision making. Consideration should be given to the perceptions, attitudes, practices, values, livelihood strategies, and awareness of tourism stakeholders.
 - One mechanism that may serve to facilitate the participation of tourism stakeholders in the climate change adaptation planning process is the Enhanced Comprehensive Disaster Management (CDM) Framework and Strategy (CDEMA, 2007).

Following the Speightstown study, there was the preparation of a National Adaptation Strategy in 2009 to address climate change in the tourism sector in Barbados (CERMES, 2009). The recommendations from the technical reports are summarized as follows:

- Tourism developers should comply with existing planning regulations and policies to reduce vulnerability to hydro-meteorological extremes
- The public sector should strengthen the enabling environment to serve as the platform for climate change adaptation
- The public sector needs to initiate the collection of data for climate change modeling. With the exception of the 2007 study (Smith Warner, 2007) which was limited to a small area of the Barbados coastline, coastal vulnerability data for Barbados is more than a decade old. There is a pressing need to augment existing data that was used in studies such as the Delcan and CPACC projects (Delcan, 1994; CPACC, 2002) with data from new and improved models, projections and surveys. Technology for collecting survey data and modeling future climate scenarios is advancing rapidly, providing more accurate data for planning and decision-making
- Mainstream new information and technologies in support of climate change adaptation planning into the national and sectoral planning and policy processes. The new data and information must be formally incorporated into the national and sectoral planning and decision making processes
- The public sector to coordinate the National Adaptation Strategy for the Tourism Sector and industry specific adaptation plans with the Regional Comprehensive Disaster Management (CDM) Strategy (CDEMA, 2007).

The Caribsave Climate Change Risk Atlas included Barbados in their first phase. Among their findings were that 73% of the beach at Hometown would be lost under a 0.5 m sea level rise, and almost half of the beach at Sandy Lane would be lost under a 1.0 m sea level rise. The study also indicated that with respect to vulnerable coastlines, 1 m of sea level rise places 8% of the major tourism properties at risk, with 32% at risk with 2 m of sea level rise. Further it is estimated that critical beach assets will be affected much earlier than the sea level rise induced erosion damages to tourism infrastructure. Turtle nesting sites would also be destroyed by erosion in minor storm surge events (Caribsave, 2012).

A recent study conducted by a CERMES student in 2012 (Francis, 2012) focused on the west coast of Barbados, and assessed issues relative to tourism stakeholders in that area as it related to global climate change risks. The area studied extended from Cobbler's Cove Hotel in St. Peter to Portobello Villa in Prospect, St. James. Managers or owners of 82 tourism-based businesses were interviewed in this study. The following adaptation to climate change actions were being undertaken by these stakeholders:

- Clearing drains to address flooding
- Installing coastal structures
- Developing hurricane/emergency plans
- Installing shutters to prevent damage from high winds
- Installing water tanks in response to water shortages

The main reasons given for not taking adaptation actions by 50% of the respondents were lack of expertise, 30% cited financial difficulties, 25% said there was unavailability of assistance, and 10% claimed a lack of technology.

Recommendations from a study on the effects of climate change on tourism in small island states that used Barbados as a case study (Moore et. al., 2012) included the need for a cross-ministerial climate change committee to assist with policy development and coordination. There is also a need to establish an environmental trust fund to support research and development to collect data to drive adaptation in the tourism industry.

The CHENACT project (Duffy-Mayers and Bhattacharjee, 2012) gave priority to the preparation and implementation of a climate change act and the establishment of a body to coordinate the implementation of the act.

1.5.4 Local Initiatives

Given the nation's participation in regional frameworks relative to climate change and disaster management, the Government of Barbados has prepared a *National Policy for Climate Change* that will be reviewed by Cabinet in the near term. Programmes that have either been implemented or are in progress to mitigate against impacts to coastal environments in Barbados include the following:

2002 - 2009: Coastal Infrastructure Programme includes 6 projects, of which 3 have already been completed, i.e. Holetown Beach Improvements Project, Rockley to Coconut Court Waterfront Improvements Project, and Welches Beach Improvement Project

2012 - 2018: Coastal Risk Assessment and Management Programme (CRMP) aims at improving Barbados' ability to withstand coastal hazards. The programme will involve collection of updated data on risks in the coastal zone and improved quantitative assessment, monitoring, and management of tools

2012: Holetown Improvement Project encompasses coastal improvement structures, offshore breakwaters from Holetown to Heron Bay, and restoration of the Holetown Lagoon to improve water quality and reduce flooding. A design and feasibility study of new infrastructure projects will also be conducted. This is aimed at providing long-term shoreline protection and enhancing the recreational value of beach areas. Demonstration projects will also be implemented as an ecosystem-based approach to climate change adaptation.

2012: Regular Process for Global Reporting and Assessment of the State of the Marine Environment involves Barbados participating in a global integrated marine assessment. The programme will allow informed decision making and coordination planning and policy-making actions, involving the following areas:

- Assessment of the influence of land-based activities on the marine environment
- Identifying the linkages between human well-being and marine environmental changes, including those resulting from human impacts, such as the effects of climate change foreseen by the Intergovernmental Panel on Climate Change (IPCC)
- Organizing, analyzing, and communicating this information
- Creation of a framework to assist regional and specialized assessment processes to improve data collection and analysis
- Strengthened networking and capacity-building within and between regions

- Promotion of capacity-building and transfer of technology, including marine technology for developing and other States in accordance with accepted international rules

Barbados was found to be one of the two countries most vulnerable to declines in air arrivals and economic returns owing to climate change (ECLAC, 2011). Environmental impacts from climate change are expected to include the following:

- sea level rise and sea temperature rise leading to coral reef destruction and resultant needs for increased engineered coastal protection to avoid erosion along coasts
- less rain and declining fresh water levels which allows for saline intrusion into groundwater
- increased hydro-meteorological events where major hurricanes may occur more regularly along with increasing regularity of storms

Possible climate change impacts on tourism may include:

- (a) Direct damage to tourism plant and natural resources:
 - Coral reef bleaching owing to increase water temperatures
 - Beaches – Coastal erosion
- (b) Loss of attractiveness of the region as a destination:
 - Impacts on health – emergence of dengue, malaria, etc.
 - Impacts to agricultural production – crop cycles, and pest and plant disease changes
 - Reduced dive tourism if coral reefs are damaged
- (c) Loss of employment in the industry:
 - Increased insurance costs for properties in vulnerable areas
 - Increased costs for carbon offset programmes and imposed duties such as the Air Passenger Duty (APD)

Key tourism zones such as Bridgetown, Holetown and Speightstown may experience periodic flooding and disruption to businesses owing to the position of commercial developments relative to sea levels. Coastal effects are receiving significant attention from the Coastal Zone Management Unit (CZMU) which has instituted shoreline protection programmes using boulder walls, revetments, and headlands particularly along the western and southern coasts of the island.

One of the climate change predictions for the Caribbean is that we are going to have more flash floods...We are seeing some of that occurring already...We also have the sea level rise issues. We have a loss of vegetation, our beaches are getting narrower, and then there is flooding in the watershed in Holetown” (L. Inniss, CZMU, In: Rawlins-Bentham, 2012).

Based on the research conducted by the various entities, including CERMES, CPACC, CCCCC, CDEMA, a logical recommendation is for focused attention on developing the adaptation capacity of tourism managers in Barbados. Therefore, the proposed strategy

presented in Section 3.0 is to conduct training for tourism managers to develop and implement adaptation plans for their respective enterprises (refer Action 11.1-11 in Section 3.0).

2.0 Stewardship and Sustainable Tourism

2.1 Overview

The White Paper highlighted 8 pillars of tourism development for Barbados, the first being “Sustainable and Responsible Tourism Development” (Strategic Solutions Inc., 2012, p. 95). It went further to note that tourism is not just for tourists, but also for the benefit of all Barbadians (Strategic Solutions Inc., 2012, p. 97), a philosophy that is at the forefront of the Barbados Tourism Master Plan 2014 – 2023. The White Paper (Strategic Solutions Inc., 2012, p. 97) stated that for this reason:

“Government will seek to (1) achieve the development of tourism in a manner that is in harmony with its surroundings and the dreams and aspirations of all Barbadians and (2) maintain a delicate balance between the benefits to be achieved from the industry and preservation policies mitigating against the overconsumption of national resources necessary to sustain an optimal level of social development”.

This section of the environment report focuses on the opportunity for Barbados to transition to a greener economy, and position itself to develop the country as a whole, including its leading tourism industry, in a sustainable manner. As a small island state that acts as a hub for the Eastern Caribbean, Barbados has the potential to become a model of, and a leader in, sustainable living. With an annual abundance of sun, wave, and wind power, a solid history of good governance, a slate of highly skilled professionals and artisans, and the notable reputation of a desirable warm weather destination with generally good services and infrastructure, there is little to stand in the way of Barbados moving forward towards the development of a sustainable tourism industry for the benefit of all.

The following sub-sections assess the issue of transitioning to a green economy, present the need to elevate environmental awareness at the local level in order to generate greater stewardship of the island’s natural resources, and provide visitor management issues relevant to the tourism sector.

2.2 Green Economy

According to the White Paper on the Development of Tourism in Barbados (Strategic Solutions Inc., 2012, p. 101):

“Government is committed to operating sustainably and to limiting any negative impact on the environment. It will therefore lead the national agenda to work tirelessly today, to protect tomorrow and will continue to strive to improve the way it

operates by reducing its carbon footprint through the adherence to internationally recognized standards and best practices...Due to the paradoxical relationship tourism has with nature, it is not uncanny that Barbados' lead sector must champion the cause of Greening Barbados to reduce energy costs particularly in the hospitality sector, increase Barbados' marketability and reduce the island's carbon footprint".

The positive impacts of tourism can be summarized as cultural revitalization and conservation, employment creation, and community development, all within a social framework. However, the negative influences can be seen as increases in crime and other social problems, commoditization of cultural elements, and overburdening of public spaces. Within the environment, degradation or reduction of natural resources through overuse is also a challenge. Accelerated climate change and a growing carbon footprint are two significant detractors from expanding tourism development. Mitigation efforts such as recycling and establishment of protected areas and systems can offset this negative trend.

In 1992, the World Tourism Organization (WTO) launched the concept of identifying indicators to assess the sustainable development of tourism. In addition, the Caribbean Tourism Organization (CTO) has developed a regional policy geared toward improving sustainable tourism development on a regional basis. This policy framework encompasses 6 themes: tourism management capacity, marketing, transportation, environment, linkages with other economic sectors, and health, safety and security.

The transition to a green economy is seen as a primary method for reducing the vulnerability of the nation in the process of charting a more sustainable path. In this regard, some key messages from the Green Economy Scoping Study for Barbados (UWI, *forthcoming*) are:

- For the Caribbean, the most tourism dependent region in the world, sustainability or greening is no longer an option but an imperative
- The stakeholders' vision for greening the tourism industry reflects a desire to build a sustainable product that has forward and backward linkages with other sectors in the economy and embedded within the community
- There is need for a business model that speaks to sustainable agro-tourism as well as internationally recognised standards for agricultural products. Having these two initiatives will provide farmers and other producers with access to local and international markets
- There are opportunities for savings through energy and resource efficiency in the hotel sector (average potential electricity savings near 40% of total hotel consumption)
- Focused policy and financial interventions are required to create sustainable agro-based and cultural-heritage tourism models

The White Paper also highlighted the development of a green economy as a Governmental imperative, stating that:

"Barbados must seek to promote and build a reputation for itself as a green destination. This will be achieved through the implementation of sustainable and responsible tourism practices..." (Strategic Solutions Inc., 2012, p. 106).

The White Paper went further by stating that:

“All Barbadians need to be educated and sensitized about the benefits of sustainable development...in order to achieve their buy-in. At present, only 40% of the houses in Barbados have solar water heating. This number needs to be improved. All Barbadians, tourism and other businesses need to be acquainted with the incentives and concessions available to encourage the transition to a more energy efficient nation” (Strategic Solutions Inc., 2012, p. 107).

This Green Economy Scoping Study for Barbados (UWI, *forthcoming*) established a set of enabling conditions that are required to help transition the Barbados economy, and which are reflected in the strategies and actions recommended in the Tourism Master Plan 2014 - 2023. These enabling conditions include:

- Training and Capacity Enhancement
- Financing and Investment
- Development, Access and Transfer of Clean Technology
- Taxation, Incentives and Fiscal Reforms
- Standards and Regulations
- Governance and Institutions
- Data, Information and Communication

The Green Economy Scoping Study - Synthesis Report (UWI, 2012) highlighted the most significant considerations for investment toward achieving sustainability solutions for the local tourist industry. The study suggested that specific investment gaps to be addressed include the following (refer Table 1.4 in Section 1.5.2):

- Domestic transportation
- Low occupancy rates
- Climate change
- Heavy dependence on imports
- Cost of achieving green certification

Relatively low occupancy rates since 2008 (see also Report V, Section 2.5) characterize the industry, reduce profitability, and therefore limit the ability of the industry to finance green initiatives. Moreover, the dynamism in the external tourism market with which the local industry competes, and the cost of inputs also present a challenge to the tourism industry in Barbados and to its efforts to contribute to a Green Economy on a consistent basis.

Also of importance is the need to decrease the dependency on imports; indeed the Caribbean hotel industry has always been criticized on its failure to utilize locally produced products. The White Paper noted that a lot more can be done to showcase local art and craft within the accommodation sector (Strategic Solutions Inc., 2012). *There is therefore a need for a business model to address sustainable agro-tourism as well as internationally recognized standards for agricultural products.*

2.2.1 Standards and Certification of Tourism Businesses

The Synthesis Report (UWI, 2012) on the greening of the Barbados economy also examined the requisite mechanisms for greening the tourism sector. These included establishing environmental codes of conduct, certification schemes, triple bottom line reporting (i.e. incorporating economic, social, and environmental data), use of indicators of sustainable tourism, and performance enhancement and support programmes such as the Travelife Sustainability System (Travelife, 2012) currently utilized by Bougainvillea Beach Hotel. Table 2.1 presents the tools, issues and institutional examples to green the tourism industry.

Table 2.1. Potential greening tools for tourism.

Tools	Issues	Institutional Examples
Environmental Codes of Conduct – provides guidelines for businesses to operate in a more sustainable fashion	<ul style="list-style-type: none"> • Focuses primarily on the physical environment (not comprehensive enough) • Voluntary in nature • Ineffective sanctions 	<ul style="list-style-type: none"> • World Travel and Tourism Council • International Hotel Initiative (Charter for environmental action) • Pacific Area Tourism Association – Code of environmentally sustainable tourism
Certification Schemes - Verification of a company's performance against a set of standards	<ul style="list-style-type: none"> • Tend to focus on environmental issues • Can be disadvantageous to poorer countries – lack of skills, monitoring and recording systems • Environmental standards may be insensitive to local realities 	<ul style="list-style-type: none"> • Green Globe 21 • Smart Voyager (Galapagos Islands) • Certification for Sustainable Tourism (Costa Rica) • Green Deal (Guatemalan coalition of NGOs) • Fair Trade Tourism (South Africa) • Hospitality Assured (Caribbean Tourism Organization) • Tour Operators Initiative (2000) • Blue Flag
Triple Bottom Line Reporting- goes beyond narrow reporting on economic performance measures and reports on the social and economic value that organization's add	<ul style="list-style-type: none"> • Recognizes that financial success itself is reliant upon all pillars of sustainability • Efficiencies in cost savings • Implementation costs may be too high for many businesses • Measurement focuses on quantitative variables; limits to quantification 	Global Reporting Index (2002)
Indicators of sustainable tourism – measures, assesses, monitors progress using primarily quantifiable data	<ul style="list-style-type: none"> • Requires data sets that may not be always available • Recognizes the interconnectivity in the tourism system • Methodology not always transparent or explicit; comparative methodologies become difficult • Tension between local and global indicators 	<ul style="list-style-type: none"> • UNWTO (1999) – developed for destinations • Association of Caribbean States (2001) – developed for the ACS member countries • Caribbean Tourism Organization- developed for member countries (2003)
Travelife Sustainability System	<ul style="list-style-type: none"> • Provides support, advice and tools to help supply improve their environmental and social performance 	<ul style="list-style-type: none"> • Bougainvillea Beach Resort • Barbados Beach Club • Mango Bay • Fairmont Royal Pavilion

Source: UNEP, 2012.

In addition, the Synthesis Report (UWI, 2012) highlighted the fact that for tourism businesses, adherence to environmental codes of conduct such as those advocated by international organizations (e.g. WTTC) is voluntary, and hence sanctions for infractions are an ineffective measure.

Certification schemes such as Green Globe and Blue Flag, however, allow for a deeper focus on environmental issues. Successful implementation requires expertise related to evaluation and monitoring of any changes within the system in order to institute mitigation measures. Similarly, the assessment of social and economic value necessary to implement triple bottom line reporting requires an awareness of the metrics associated with quantifying social and environmental issues. In addition, the role of tourism stakeholders and authorities in providing environmental information and raising consciousness among visitors regarding the impacts of their actions must be underscored. Since visitors and tourism-related businesses utilize large quantities of products and services, improved knowledge of environmentally responsible practices will aid notably in the outputs generated.

There are also issues relative to maintaining certification status in green programmes for the hotel sector. In a survey of water use efficiency in the Barbados hotel sector, Charara et al (2011) found that of 21 hotels, 3 reported abandoning their green certification because the process was considered to be overly time-consuming along with having complex administrative procedures. Five additional properties were considering or actively applying for certification.

Initiatives involving the greening of the tourism accommodation sector have already been initiated through programmes such as the Caribbean Hotel Energy Efficiency Action (CHENACT) project. The goal of the recently completed first phase of the project was to improve the competitiveness of small and medium sized hotels (less than 400 rooms) in the Caribbean by achieving more affordable and predictable energy costs. This will aid Caribbean governments in meeting their international obligations in emissions of greenhouse gases (GHG) and phase-out of ozone depleting substances (ODS). Detailed energy audits were conducted in 31 hotels in Barbados, among other initiatives implemented by the project that will help the sector identify how to operate more sustainably (Duffy-Mayers, L., 2012). Phase 2 is currently being implemented.

2.2.2 Scope for Business and Employment Opportunities

Within the tourism and hospitality industry, there are emerging opportunities relative to greening the economy. Some jobs may be redefined and others will be created. For example, companies such as “New Barbados” have already seized the opportunity to market supplies of environmentally friendly cleaning products in response to growing demands. Furthermore, there are a number of areas that will emerge in response to the needs arising from a greener society, including organic farming, maintenance of energy and water efficient systems, manufacturing of biodegradable products, mobile applications for monitoring and sourcing, disposal of biodegradable and other refuse, expansion of recycling companies (adding to hazardous waste and other non bio-degradable materials from restaurants, hotels etc.), agro-tourism attractions, heritage attractions, eco-lodges, gastronomic and culinary experiences, education and training for greening the economy. All these areas will help to stimulate job creation and employment in Barbados.

2.2.3 Promoting a Green Economy

Promoting sustainable resource management will require a range of responses necessary to develop a holistic approach to the management of the island's natural resources that fosters a healthy environment in which the tourism industry, and indeed society as a whole, can thrive. These responses include local support, land stewardship practices, financial support, and political will, all contributing to the creation of fair decisions and sustainable practices, and ultimately the nurturing of resilient landscapes (see Figure 2.1). All strategies and actions proposed in this report contribute to the objective of a Green Economy (see Section 3.0).

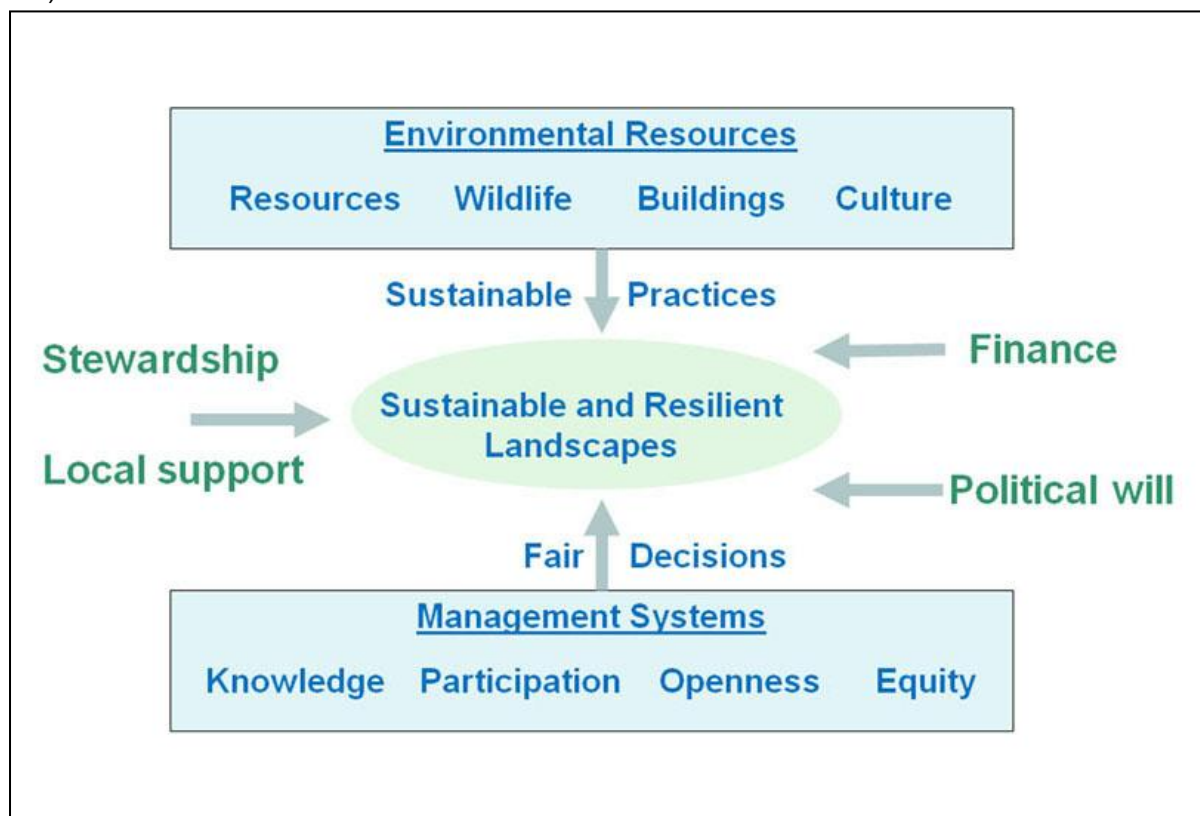


Figure 2.1. Responses (in green text) required to promote sustainable, integrated resource management based on the Wales model (Ogden, 2009).

Ogden (2009) outlined a number of challenges to achieving sustainable development, which are applicable to Barbados, including:

- Public apathy, lack of understanding and environmental awareness, and resistance to investment in national environmental programmes
- Lack of coordination between the various public sector departments whose mandate is to address environmental issues
- The need to implement initiatives required by any environmental conventions to which Barbados is a signatory
- The need to link private sector / NGO initiatives in environmental management with associated public sector ones

- Ongoing natural habitat fragmentation and associated loss of connectivity, within and between land and marine-based resources, driven by development pressures
- The competition for physical space, including terrestrial or marine, for the development of goods and services (e.g. tourism infrastructure, residential developments, commercial and agricultural industries, coupled with the need to adhere to strict zoning laws to minimize same)
- The lack of mature woodlands and the need for sustainable forest regeneration programmes, especially on abandoned agricultural lands
- Maintaining important areas of biodiversity through appropriate protection and management schemes
- The need to promote integrated and sustainable economies that reflect high environmental standards, and provide local food and energy security

Achieving a green economy, inclusive of a sustainable tourism product for Barbados, will be dependent on requisite regulations that are established to support development that is not harmful to the environment on which it depends. In this regard, passing the draft EMA Act with supporting regulations, along with strict enforcement regimes, is critical to achieving this objective. In the absence of such a regulatory framework for Barbados, the desire to establish a green economy can only be discussed, debated, and imagined, but impractical to put into practice.

Under a legislated EMA, public sector departments that are responsible for environmental matters, including the EPD, NHD, NCC, SSA, BWA, CZMU, Ministry of Energy, Ministry of Health, and Ministry of Environment, will have the basis upon which to operate more effectively, and be capable of driving environmental policy, programmes, and strategies that have been compiled to date, and which will be developed moving forward, in order to transition to a green economy for Barbados. Efforts to convert to renewable energy from our current fossil fuel driven economy are well underway, and can be further promoted island-wide through ongoing and future initiatives and incentives, promoting greater buy-in from the private sector, and stimulating developers and investors to embrace the goal of national sustainable development.

Barbadians collectively will require a paradigm shift in mindset that is geared towards greater land stewardship to foster a Barbados that visitors will seek, admire, and enjoy. Since residents of Barbados are also potential domestic tourists, this will entail a scenario similar to the concept of 'cleaning up your own backyard', for the benefit of all. The younger generation will be best able to embrace this concept, but greater environmental awareness and training will be necessary for all levels of society. This concept is embraced through one of the White Paper's sustainable tourism development policy statements (Strategic Solutions Inc., 2012, p. 217) that states that Government will:

“develop programmes to educate and sensitize all Barbadians, tourism and other businesses about the benefits of sustainable development and the Government's alternate energy programmes, and acquaint them with the incentives and concessions available to encourage the transition to a more energy efficient nation”.

Developers will have to become greater land stewards and avoid the traditional practice of total site clearance before commencement of construction projects; planners will have to design sites that incorporate natural elements, maintain the integrity of the natural environment and promote the reduction of carbon footprints prior to seeking planning approvals.

Tree replanting schemes on existing properties that lack vegetation cover and those planned for all new developments, along with the promotion of reforestation projects will help to create an environment for users, both local and international, that is more comfortable, appealing and satisfying for the benefit of all.

Organic and sustainable farming practices that can feed the local population will help to reduce the heavy reliance on food importation, prevent the addition of toxins into the environment, and promote greater health and well-being for all. With an ideal year-round climate, and the incorporation of renewable energies that drive sustainable agriculture, Barbados can act as a model for sustainable living. Starting in the rural communities of St. Andrew, St. Joseph and St. John, these communities can become well established and foster other similar initiatives throughout the island. With the implementation of reliable Farm to Table programmes (see also Report V, Part 2, Section 3.6.1.3) that link with food outlets, restaurants, and visitor accommodation establishments, locals and visitors will be able to enjoy farm fresh, healthy Barbadian foods on a consistent basis, and be confident of where the food originated and how it was grown. The production of sustainable foods and promotion of local small businesses, while enhancing the tourism product offering, will drive the national economy towards a thriving tourism industry.

2.3 Tourism Capacity

Like any industry, tourism brings both positive and negative impacts. If not recognized, the positive impacts may be missed and the negative ones may become entrenched. So it is important to continually check on the health of tourism. This means comparing the amount and type of tourism activities with the nature and scale of the impacts caused by tourism.

2.3.1 The Current Situation

In Barbados, tourism capacity relates especially more to what visitors do and how they are managed than it does to numbers of visitors. As a result, if the resources that visitors enjoy and the activities that they engage in are well managed, there should be no foreseeable major concerns about the numbers of visitors that Barbados can accommodate. Given how the Barbados tourism economy has shrunk since 2006, it may be a challenge to get back to that level, or even grow beyond it, within the next ten years.

In looking at numbers of visitors in peak years, it is also important to note the value of total visitor exports, i.e. spending within the country by international tourists for both business and leisure trips, including spending on transport (WTTC, 2012). A high value of visitor exports indicates more varied visitor activities, thus more varied utilization of the resources that cater to visitor needs and preferences. Table 2.2 presents visitor data to Barbados for select years.

TABLE 2.2. Barbados visitor data for select years.

	2006	2012	2022*	2022**
Visitor exports (real 2011 BDS \$ millions) ***	3,315.3	2,254.1	3,315.3	4,000
Total number of visitors ****	1,101,650	1,053,739	1,211,799	1,264,486
Total stay-over visitors	562,558	536,303	616,748	643,564
Total cruise ship visitors	539,092	517,436	595,051	620,922
Average expenditure per visitors (all visitors) BDS\$	3,009	2,139	2,736	3,163
Percentage change in visitor exports		-32%	47%	77%
Percentage change in average expenditure per visitor		-29%	28%	48%
Percentage change in total numbers of visitors		4.4%	15%	20%
Percentage change in total visitors 2006 to 2022			10%	15%
*The first 2022 column represents consulting team targets with moderate implementation of the Tourism Master Plan				
**The second 2022 column represents consulting team targets with extensive implementation of the tourism Master Plan				
***Values for the years 2006 and 2012 are taken from WTTC data. The data value for 2012 was estimated in mid-2011				
****Values for number of visitors (stay-over & cruise) for 2006 and 2012 come from Barbados Statistical Services				

The year 2006 was the peak year for value of visitor exports (over BDS\$3.3 billion). The over \$1.1 million visitors to Barbados were very active with an average expenditure of over \$3,000 per visitor (this combines cruise and stay-over visitors). Other than a few areas of concern, discussed below, in 2006 there were no major issues with the capacity of Barbados to handle this number of active visitors.

Last year (2012) the total number of visitors was down by approximately 50,000 from the year 2006. More significantly, the total value of visitor exports was down during the same period by a full 32% and the average expenditure per visitor was down by 29%; a drop of BDS \$870 per visitor. This drop in expenditure per visitor indicates they are less active and/or active in doing things which cost less. The likely result is less use of the resources which serve visitors, and a lessening of potential capacity issues.

In examining stay-over tourist arrivals by month, the months of December-April are the busiest, with another peak in July. But there is a good distribution of visitors throughout the year, suggesting there are not many capacity issues related to time other than the July Crop Over event.

Cruise ships may introduce more capacity issues because the majority of cruise ship calls occur November-April. There are capacity issues with the port which largely relate to its design, the fact many calls are on the same 2 days of the week, and the combination of the cruise port with the cargo port. However, these issues are largely being addressed through

a proposal that will see a separation of the port functions, new berths and an expanded commercial area.

Another potential area having capacity issues is that of accommodation. However, if we look at occupancy rates that average around 60%-65% this is not indicative of capacity problems. Also, the monthly visitor data does not point to capacity issues, nor do the more recent resort closures due to financial problems. However, there may well be capacity issues with certain types of accommodation (e.g. conference hotel, family oriented, niche market specific needs). These are addressed more fully in a section of this Master Plan that specifically deals with accommodation (refer Report V, Section 2.0).

There is a need to consider the future; what will happen with Barbados visitor capacity as the objectives of growing the Visitor Economy are realized through implementation of the Tourism Master Plan? We have set targets for 10 years hence (2022). These targets, representing two scenarios, would be realized with implementation of the Tourism Master Plan. They target an increase in visitor spend and an increase in numbers of visitors of 10% and 15% beyond 2006 levels. However, the only way the targets can be realized will be through considerable investment in the Barbados tourism product. This investment will serve to make Barbados a more attractive place, thus encouraging more visitors.

Of great relevance to the potential issues of capacity is that these investments provide visitors with a wider choice of things they will choose to do. The result is that the visitors become more dispersed and there is less usage pressure on "potential "bottleneck" areas.

The conclusion is that Barbados needs to be more concerned with growing its economy through attracting a few more visitors, and especially giving them more choices so they wish to spend more money, than limiting numbers based on capacity concerns. To assure good visitor and resident experiences, it will be essential to continue managing visitor activities and behaviours and their impacts on the environment and society.

2.3.2 Capacity Issues at Select Sites and their Potential Mitigation

Barbados should be able to receive 1 million stayover visitors per year, plus another 1 million cruise visitors without negatively impacting the social and ecological environments, as long as there are proper practices addressing both visitor management and resource management as well as plans to address the existing 'bottleneck areas'. These numbers were projected by the Barbados Tourism Master Plan consulting team based on several years of intense study of the Barbados tourism markets and products.

The following analysis examines site capacity implications of 1 million stayover visitors, plus another million cruise visitors per year in Barbados. This is done only for select sites and events which are considered to currently have, or potentially have, capacity issues. The analysis is based on current utilization patterns while projecting ahead to the impacts of the projected increase in visitation in the future.

As presented in this section, it is wiser and to the greater benefit of all users, suppliers, residents, and the country to recognize that under current utilization there are substantial

issues and concerns, and that these will only increase as utilization increases due to increasing numbers of tourists. In this context, 'carrying capacity' should focus on the adaptive management of resources and visitors to ensure the sustainability of the site. Adaptive management requires the integration of design, management and monitoring to systematically test assumptions in order to adapt and learn.

One factor which encumbered the analysis was the fact that there is limited and in some cases nonexistent, utilization data for the specific attractions / venues of concern. Therefore, the first step in the analyses of capacity was an estimation of utilization. These estimations were based on assumptions designed to reflect actual occurrences as best possible.

2.3.2.1 Oistins

Based on the best data currently available for numbers of visitors to Oistins and the timing of their visits, the following two tables model what current visitation approximates on the busy Friday evenings during high tourist season and July, as well as what visitation patterns might be when the total number of stayover visitors to Barbados reaches 1 million annually.

The analysis in Table 2.3 demonstrates, for the high season tourist months of November to April and the month of July, total visitors to Oistins on the Friday evenings of between 2,997 per evening in November and 3,782 in March. While all may not be there at the same time, since some will have arrived earlier and left before others arrive, the data nevertheless demonstrate considerable current Friday evening utilization pressures at Oistins.

Under the presented assumptions, Table 2.4 demonstrates the magnitude of potential increase in Friday night visitation to Oistins as the number of stayover visitors increases from 536,000 experienced in 2012 to 1,000,000 annually. The total number of Friday night visitors would range from 4,951 in November to 6,241 in March. This represents an increase of between 2,000 for November to 2,500 for March per Friday during high tourist months.

Table 2.3. Oistins estimated utilization (2012).

	Stayover Visitors to Barbados (2012)	Stayover Visitors to Oistins (26.5%/2006)	Local Visitors @ ratio of 1 to 3	Total/mo. Stayover and Local	Total per week @ 4/mo.	Friday Total Visitors @ 70%
Visitors annual (2012)	536,000	142,040				
November	42,925	11,375	3,754	15,129	3,782	2,648
December	52,174	13,826	4,563	18,389	4,597	3,218
January	52,619	13,944	4,602	18,546	4,636	3,245
February	54,056	14,325	4,727	19,052	4,763	3,334
March	54,164	14,353	4,737	19,090	4,773	3,341
April	47,979	12,714	4,196	16,910	4,228	2,959
July	51,253	13,582	4,482	18,064	4,516	3,161

- Notes:
1. Based on BSS visitor data
 2. 2006 CTO survey indicates 26.5% of stayover visitors go to Oistins
 3. Assumes a local resident to visitor ratio of 1 to 3 on busy evenings (based on TMP consultants observations over the course of 18 months)
 4. Assumes the monthly visitation is distributed equally per week
 5. Assumes 70% of total weekly tourist visitation is concentrated on Fridays

Table 2.4. Oistins estimated utilization at 1 million long-stay visitors.

	Stayover Visitors to Barbados	Stayover Visitors to Oistins (26.5%)	Local Visitors (same numbers above)	Total/mo. Stayover and Local	Total per week @ 4/mo.	Friday Total Visitors @70%
Visitors annual	1,000,000	265,000				
November	80,132	21,235	3,754	24,989	6,247	4,373
December	97,285	25,780	4,563	30,343	7,586	5,310
January	98,114	26,000	4,602	30,602	7,651	5,355
February	100,794	26,710	4,727	31,437	7,859	5,502
March	100,995	26,764	4,737	31,501	7,875	5,513
April	89,462	23,708	4,196	27,904	6,976	4,883
July	95,567	25,325	4,482	29,807	7,452	5,216

- Notes:
1. 2006 CTO survey indicates 26.5% of stayover visitors go to Oistins; assumes this will remain constant with the increase in numbers of visitors
 2. Assumes the number of local visitors will remain constant since their numbers are not increased as do long stay visitors
 3. Assumes the monthly visitation is distributed equally per week
 4. Assumes 70% of total weekly visitation is concentrated on the busy Fridays

Table 2 is a 'snapshot' of the potential numbers of visitors if the current utilization assumptions continued to hold. It shows that with current utilization patterns, the demand for

Oistins Friday night visits could reach in excess of 5,200 when 1 million long-stay visitors come to Barbados. Unfortunately, it would be expected that under the current set of utilization assumptions, the resources at Oistins would be so substantially downgraded that visitors would cease to attend in such large numbers.

Thus, it could be concluded that the maximum capacity at Oistins has already been reached since there are already capacity issues on the busy Friday evenings. Challenges relate to traffic congestion, visitor crowding in sections of the food court, and sanitation and sewage management issues, among others. However, if proper visitor management and resource management strategies as presented in Table 3 are implemented, the Oistins capacity would be greater than the current utilization.

Consistent with the philosophy of adaptive management, it is prudent to examine options for visitor and resource management. Table 3 presents an overview of key elements required for resource and visitor management in Oistins. These elements are further developed in Report VI on Cultural Heritage and Attractions which provides detailed strategies and actions for further development of Oistins as a heritage centre; and also in Report V Part 1 which addresses traffic management issues in Oistins. Additional elements are addressed in other TMP reports, and the references are contained in Table 2.5.

Table 2.5. Oistins Capacity: Issues and Mitigation.

Issue	Mitigation
Crowding/Congestion	<ul style="list-style-type: none"> • Extend the area by adding more vendors to the east side of the current area. Popularize an additional day(s) to Friday through promotion and staging of events • Develop and popularize the ‘fish fry’ event at other locations • Develop and popularize other attractions to spread visitors’ demand to a greater extent (Report V Part 1)
Poor Drainage	<ul style="list-style-type: none"> • Implement a drainage plan in order that wastewater and rainwater does not accumulate or stagnate
Poor Sanitation	<ul style="list-style-type: none"> • Increase the number of washrooms and improve their cleanliness • Remove garbage and litter more frequently • Do a general regular cleanup of the surrounding area, especially with respect to long-standing garbage and decaying materials (Report II)
Harassment	<ul style="list-style-type: none"> • Educate locals and visitors on acceptable and not so acceptable behaviours and their consequences • Given the importance of this resource to the country put more resources in enforcement (Report III)

Traffic Congestion	<ul style="list-style-type: none"> • Implement a traffic flow plan which utilizes alternate routes • Develop more park & ride, • Develop more pedestrian footpaths (Report V Part 1)
Lack of Guest Facilities	<ul style="list-style-type: none"> • Increased number of seating areas, and general rest areas • Increase numbers of washrooms, their lighting and cleanliness (Report VI)
Food Preparation Safety	<ul style="list-style-type: none"> • Develop implement and monitor health and safety standards associated with food preparation
Inebriated Individuals/Poor behaviour	<ul style="list-style-type: none"> • Patrol the site and enforce so individuals with inappropriate behaviours are removed (Report III) • Pay special attention to enforcement in the washroom and more poorly lit areas
Poor People Circulation	<ul style="list-style-type: none"> • Provide more spaces for people walking through and circulating
General Presentation and Aesthetics	<ul style="list-style-type: none"> • Improve lighting • Paint frequently • Build a well-lit well-designed Boardwalk along the waterfront (Report VI)

2.3.2.2 Harrison's Cave

In comparison to Oistins, Harrison's Cave is the next most popular attraction in Barbados. Based on 2006 CTO survey data, 16.8% of all stayover visitors to Barbados visited Harrison's Cave in comparison to 26.5% for Oistins. In 2000, Harrison's Cave underwent extensive development planning and redevelopment. It was estimated at that time that its visitation capacity was substantially in excess of the visitors it was receiving.

In 2000, a total of 179,570 visitors attended Harrison's Cave. Visitation has declined to 103,451 in 2013. In one year alone, Harrison's Cave visitation decreased from 25.0% (2005) to 16.8% (2006). (*Source: Caves of Barbados Ltd., Visitor Arrivals 2000 – 2013*).

Given this substantial decline in visitor arrivals to Harrison's Cave, including August peak month declines of 18,938 in 2000 to 12,453 in 2013, it is important to address the decline while ensuring the responsible management of the resource and its visitors. This is addressed in Strategy 2.4 and Action 2.4.1 that focuses on measures needed to conserve the natural heritage and promote their sustainable use.

2.3.2.3 Bridgetown

The main capacity issues in Bridgetown are centred around vehicular and pedestrian traffic congestion, both of which increase on cruise ship days and during the Christmas season

when there is both an increase in locals and visitors in Bridgetown. Report V Part 1 comprehensively addresses issues related to vehicular traffic congestion.

Congestion in Bridgetown is particularly obvious on the days when there are peak cruise ship arrivals. Currently, these are Wednesdays and Fridays, and especially in the high tourist season during the winter months. When Barbados reaches 1 million each stayover and cruise visitors, if the *'status quo'* were to prevail, the Bridgetown area of Barbados would receive approximately double the number of pedestrian visitors that it does now, i.e. the demand by tourists would be approximately double its current utilization. Without better visitor management and management of the city as a resource, it is likely that the demand would decrease because the experience would become unpleasant.

Table 2.6 identifies the issues and potential mitigation measures that would ease the negative conditions that could be exacerbated as the number of tourist arrivals in both cruise and stayover increases. References are made to the TMP Reports that contain detailed analysis and recommendations to address the issues identified.

Table 2.6. Bridgetown Capacity: Issues and Mitigation.

Issue	Mitigation
Crowding/Congestion	<ul style="list-style-type: none"> • Designate certain streets to be traffic-free during certain times (some tourist destinations, e.g. St. Maarten for popular tour centers designate the main streets as traffic-free between the hours of 6 pm and 9pm each evening). Merchants and visitors would benefit greatly from this • Encourage merchants to extend their opening hours into the evening and weekends to accommodate longer shopping periods for visitors • Increase the number of shaded rest areas • Improve signage directing visitors (Report V Part 1)
Poor Sanitation	<ul style="list-style-type: none"> • Increase the number of washrooms and improve their cleanliness • Remove garbage and litter more frequently • Increase attractive signage with respect to litter and cleanliness
Harassment/Safety	<ul style="list-style-type: none"> • Educate locals and visitors on acceptable and not so acceptable behaviours and their consequences (Report III on Education) • Given the importance of this resource to the country, put more resources into enforcement. Increase police presence (Report III Safety and Security)
Traffic / Pedestrian Conflict	<ul style="list-style-type: none"> • Implement a traffic flow plan which utilizes alternate routes (Report V Part 1) • Develop more park and ride (Report V Part 1) • Develop more pedestrian footpaths • Improve public transportation for visitors in and out of the city (Report V Part 1)

Lack of Guest Facilities	<ul style="list-style-type: none"> • Increase number of seating areas, and general rest areas • Increase numbers of washrooms, their lighting and cleanliness
Static/Boring	<ul style="list-style-type: none"> • Animate the city through special venues, entertainment, art, performances, exciting interpretation to bring Bridgetown to life • Focus on Bridgetown as a tremendous asset to both tourists and residents and not just as an incidental place • Restore, interpret and animate historical sites and buildings such as the Empire Theatre, The Dry Dock, and others (Report VI)
Inebriated Individuals /Poor Behaviour	<ul style="list-style-type: none"> • Patrol the site and pay special attention to enforcement (Report III on Safety and Security)

2.3.2.4 The Garrison

The designation of Historic Bridgetown and its Garrison as a World Heritage Property should lead to increased visitation of Barbados by international visitors as well as local residents (see Report VI). This, in large part, will be due to the many initiatives currently underway, including those under the auspices of the Barbados Garrison Historical Consortium Inc. (BGHC), an organization representing the Garrison stakeholders. There are potentially 80 sites of interest within an area of 150 acres. These include the completed restoration and interpretation of George Washington House, the weekly Changing of the Sentry at the Clock Tower, introduction of a restaurant at George Washington House, and significantly, the opening to the public of the existing tunnels under the Garrison as an attraction.

Current utilization of the Garrison area occurs primarily for events such as parades on Independence Day, and during Barbados Turf Club horse racing days. In general, year round utilization of the Garrison is largely by residents of Barbados, with limited tourist utilization. However, the main exception is the annual Sandy Lane Gold Cup horse racing event. On that occasion, 3,000 attendees are accommodated in the Grand Stand and 50% of these are visitors (Barbados Turf Club, 2014).

In contrast, the grounds hold 5,000 - 6,000 persons of which approximately 25% are visitors. Currently, capacity issues occur only at the time of special events and peak race days. During the winter months from November to March annually, there is 90% patronage from overseas visitors in the Grand Stand section that accommodates 430 seats. This arises due to the fact that overseas repeat guests purchase their tickets for the Grand Stand well in advance of the next year's events.

It is anticipated that utilization by visitors to Barbados and residents acting as domestic tourists will increase substantially for the following reasons:

- The number of visitors is anticipated to increase and could potentially double if and when the stated tourist capacity of Barbados is achieved at 1 million visitors each for long-stay and cruise

- Increased awareness of the events and venues, existing and proposed, will result in an increased number of foreign and resident visitors
- The UNESCO designation, as people become more aware of it, will in itself serve to attract a considerable number of visitors, including many cruise visitors who are now finding a paucity of things to do in Barbados

Each of the current venues / sites at the Garrison can accommodate more visitors, but functional capacity is a concern. For example, at the Barbados Museum (BMHS) there is no facility to provide refreshments. George Washington House (GWH) has a café, but lacks sufficient patronage. During the 'Changing of the Sentry', whereas the Stables Café can accommodate 600 people, current attendance is approximately 100 visitors, which represents 17% of the above figure. To maximise attendance at this event with increased numbers, it would be necessary to install barricades, limit traffic movement, and reconfigure the site layout. Improved washroom facilities at various Garrison locations will also be necessary apart from GWH and BMHS. In terms of visitor capacity, the Garrison can handle 150,000 per annum for events, with improved facilities (BGHC, 2014).

Some of the issues identified in Table 2.7 currently exist to a limited extent. However, these issues will certainly become very prevalent if no appropriate mitigation measures are taken.

Table 2.7. The Garrison: Issues and Mitigation.

Issue	Mitigation
Traffic Congestion	<ul style="list-style-type: none"> • Implement a traffic flow plan which utilizes alternate routes • Develop more park & ride opportunities • Develop more pedestrian footpaths • Do not provide on-site parking because: (a) there is a lack of space and would therefore compete with pedestrians; (b) it is not consistent with the heritage values of the Garrison (Report VI) • Provide off-site parking • Strictly enforce parking and traffic restrictions(Report V Part 1) • Develop tram transportation as proposed by The Garrison Historic Consortium • Provide adequate public transportation to and from The Garrison (Report VI)
Deterioration of the Heritage Values from Overuse	<ul style="list-style-type: none"> • With increased utilization, a visitor management plan will be required (Report VI) • Provide adequate enforcement • Educate visitors about the importance of their appropriate behaviours in contributing to the preservation of heritage values and the heritage itself (Report III)
Deteriorating Heritage Buildings	<ul style="list-style-type: none"> • Develop and implement, based on individual asset evaluations, a comprehensive restoration plan • Ensure maintenance of the Garrison theme (Report VI)
Educational and Entertaining	<ul style="list-style-type: none"> • Animate the experiences to make them educational and entertaining as per the many recommendations in this TMP, and many of the Garrison Historic Consortium proposed projects • Develop signage and materials which are informative and

	<p>positively grab the visitors' attention and interest (Report VI)</p> <ul style="list-style-type: none"> • Provide many interactive, hands-on and participatory experiences (Report III and VI)
Crowding/Congestion	<ul style="list-style-type: none"> • Designate many pedestrian areas to be free of motor vehicles, except public transportation vehicles • Popularize activities and events throughout all days of the week • Link the Garrison to related experiences and attractions throughout the island (Report VI) • Ensure all stakeholders become active participants in meeting, greeting and hosting the visitors (Report III) • Avoid duplication of major events, such as on racetrack days
Sanitation	<ul style="list-style-type: none"> • Increase the number of washrooms and ensure cleanliness • Remove garbage and litter frequently • Keep the area fresh, clean and green
Harassment	<ul style="list-style-type: none"> • Educate locals and visitors on acceptable and unacceptable behaviours, and their consequences • Given the importance of this resource to the country put more resources in enforcement (Report III)
Lack of Guest Facilities	<ul style="list-style-type: none"> • Increase number of seating areas, and general cool rest areas • Increase numbers of washrooms, their lighting and cleanliness
Inebriated Individuals/Poor Behaviour	<ul style="list-style-type: none"> • Patrol the site and enforce so individuals with inappropriate behaviours are removed (Report V Part 1) • Pay special attention to enforcement in the washrooms and any poorly lit areas
General Presentation and Aesthetics	<ul style="list-style-type: none"> • Improve lighting where specified by BGHC • Ensure maintenance programme is sustained

2.3.2.5 St. Lawrence Gap

As a consequence of the large and small resorts and restaurants located in St. Lawrence Gap, as well as along the south coast, many tourists frequent The Gap during daytime hours, and even more so during evening hours. While it can be said that during the high tourist season The Gap is quite busy, it is never especially congested. Due to its substantial length and the fact that most of The Gap has controlled one way traffic and limited parking areas, the street is used as a spacious promenade. Therefore, there is no congestion and crowding. The 'bottlenecks' that occur are primarily at entry points to restaurants.

The Gap is one of the more animated areas that attracts people who desire a pedestrian environment and a light snack or drink along the way. While there are the regular scheduled transit buses that operate just outside The Gap, there is limited or no public transportation directly through The Gap itself. This, along with the very limited parking for private vehicles, is a deterrent for many people from more distant locations to visit The Gap.

The Gap is of appeal primarily to stayover visitors as opposed to cruise ship visitors because the area appeals primarily as an evening location. Therefore, an increase in future visitation will occur primarily as a result of an increase in numbers of long-stay visitors, and it can be expected that the demand for The Gap will increase at least proportionately to the increase

in numbers of visitors to the island. If ongoing and proposed upgrades along The Gap continue and the existing negative issues are mitigated, then market demand will increase in greater proportion than visitor increases. With an increase of stayover visitors to 1 million per year, the demand for The Gap experiences will more than double. Table 2.8 presents the issues and mitigation measures that need to be addressed to make The Gap experiences pleasant for both visitors and residents, and thereby realize its full potential.

Table 2.8. St. Lawrence Gap: Issues and Mitigation.

Issue	Mitigation
Traffic Congestion	<ul style="list-style-type: none"> • Dedicate the main western portion of The Gap as a promenade area only • Every evening of the week between the hours of 6 and 10 pm limit vehicular traffic along the main one-way portion, to taxis and private buses only • Have the remaining eastern portion of The Gap operate with only one-way traffic during the same hours • Develop more 'park and ride' areas • Provide more parking near the entrances to the Gap • Strictly enforce parking & traffic restrictions • Provide adequate public transportation to and from The Gap (Report V Part 1)
Ad hoc Development	<ul style="list-style-type: none"> • Prepare a Gap development plan with a focus on themed development as opposed to the <i>ad hoc</i> variety which has emerged over the last few years
Deteriorating Buildings	<ul style="list-style-type: none"> • Develop and implement, based on individual asset evaluations, a comprehensive restoration and/or replacement plan
Animated and Entertaining	<ul style="list-style-type: none"> • Animate The Gap with performers to make it more appealing and entertaining • Develop signage and materials which are informative and positively grab the visitors' attention • Popularize activities and events throughout all days of the week
Sanitation	<ul style="list-style-type: none"> • Increase the number of washrooms and ensure cleanliness • Remove garbage and litter frequently • Keep the area fresh, clean and green (Report III)
Harassment	<ul style="list-style-type: none"> • Strictly enforce removal of the obvious illegal and harassment activities now there (Report III) • Educate locals and visitors on acceptable and

	<ul style="list-style-type: none"> unacceptable behaviours and consequences Given the importance of this resource to the country put substantial resources in enforcement
Lack of Guest Facilities	<ul style="list-style-type: none"> Increased number of seating areas, and general cool rest areas Increase numbers of washrooms, their lighting and cleanliness
Inebriated individuals /poor behaviour	<ul style="list-style-type: none"> Patrol the site and enforce so individuals with inappropriate behaviours are removed Pay special attention to enforcement in the washrooms and more poorly lit areas
General Presentation and Aesthetics, Safety	<ul style="list-style-type: none"> Improve lighting which is badly needed Clean and paint frequently

2.3.2.6 Gun Hill Signal Station

The Gun Hill Signal Station attraction is attended by both visitors and residents. Notwithstanding that January to March visitation is 80% tourists, in other months it comprises more residents. While it is a site of much historical interest and exhibiting attractive panoramic views, there are relatively limited opportunities for visitors to participate in any activities. Moreover at times it can be somewhat crowded.

In reviewing CTO visitor exit survey data, it is noted that in 2006, 9.4% of long-stay visitors indicated they attended Gun Hill; this was down from 10.3% who indicated attendance in 2005. Comparatively in 2012, 8.5% of cruise tourists surveyed indicated they had visited Gun Hill.

The majority of visits occur during the day. However, from mid-January to April, the Barbados National Trust hosts a monthly event 'Gun Hill by Moonlight'. On average, between 150 and 200 people attend. Visitation in 2013 was especially low; however that figure has already been surpassed by the January - April 2014 period (Barbados National Trust, 2014).

An increase could be anticipated as the number of visitors to the island increases as a consequence of (i) issues with the site being resolved; (ii) the product being enhanced and animated; and (iii) marketing improved and targeted. Current capacity issues with the site are not a substantial problem, but could become a challenge with increased visitation due to the factors listed above. Table 2.9 lists current and potential issues and their mitigation.

Table 2.9. Gun Hill Signal Station: Issues and Mitigation.

Issue	Mitigation
Informative, Animated and Entertaining	<ul style="list-style-type: none"> Develop signage and promotional materials which are informative and positively grab the visitors' attention Reprint the small booklet about Gun Hill and

	other signal stations, to be sold on-site
Signage	<ul style="list-style-type: none"> Replace directional signs at the top of the hill coming off the main highway to indicate how to find Gun Hill
Parking	<ul style="list-style-type: none"> Improve the adequacy of the parking area
Maintenance	<ul style="list-style-type: none"> Ensure implementation of planned upgrade and maintenance programme, and ongoing initiatives in this area

2.3.2.7 Beaches

Cumberbatch and Moses published a study in 2011 that investigated Social Carrying Capacity (SCC) in the context of beach management in Barbados. Data was gathered from locals and tourists visiting several beaches over a four year period from 2005 to 2009. The study provided the following insights about visitor use and capacity issues on Barbados beaches:

- Browne's Beach, overall, had the highest number of users compared to all other beaches in other studies. This is not surprising since Carlisle Bay, where this beach is located, is in close proximity to Bridgetown, the most densely populated area of the island; it is also at the junction of the major resort areas of the South and West coasts of Barbados; and it is the nearest beach to the cruise terminal
- Local beach users outnumbered the tourists by as much as 11:1 at Browne's Beach. However, at Coach House/Blue Monkey beach where there were more tourists than locals the ratio was only 2:1
- Use increased on weekends and public holidays
- Children visited beaches mostly on weekends
- Local adults were seen at all of the beaches all of the time
- In contrast to the locals who revisited the beach at all hours including in the early morning and in the evening, tourists visited the beach most frequently in the middle of the day (9:00 am - 3:00pm)
- Swimming emerged as the activity of choice among all users; other activities included ballgames, relaxation, walking, exercising, diving and snorkelling
- Browne's Beach was a hive of activity from as early as 4:30 am where retired persons from all over the island met to bathe in the water and to socialize
- Nationals on return to the island were drawn to Browne's Beach
- At the survey beaches there were numerous vendors selling a range of food products, crafts and jewellery
- There were water craft including catamarans, dive boats, glass bottom boats, kayaks and fishing boats
- Stable hands and jockeys brought horses from the nearby racetrack and stables for bathing and swimming in the morning at Pebbles Beach; this also brought complaints from beach users
- The Carlisle Bay beaches also receive complaints about stray dogs
- 70% of tourists walked to the beach, indicating that proximity to their accommodation is a major reason for selecting the beach

- 33% of survey respondents informed that "too many people" were the reason for feeling crowded; lack of personal space and noise were also reasons for feeling crowded
- The survey showed that quiet, uncrowded beaches are preferred, with positive aesthetics and calm water for swimming
- Also, the surveys showed that maintaining the areas in a clean condition, having changing rooms and bathroom facilities, as well as snack bars were the main things beach users indicated they would like to have

There have also been issues regarding discharge and runoff of contaminated water from the land areas that drain into Carlisle Bay. Proposals have been made to mitigate the situation.

Beaches, especially those in Carlisle Bay and at Blue Monkey Beach, enjoy especially strong utilization during the months of the high tourist season and, in particular, on the most popular days for cruise ship arrivals. As the numbers of visitors to Barbados increases and potentially reaches 1 million annually each for long-stay visitors and cruise visitors, the demand for the beaches will increase proportionately. Since the number of residents will not increase proportionately to the increase in visitors to the island, and since the current utilization ratio is approximately 2 to 1 tourists to locals, we can expect the demand for Carlisle Bay Beach experiences to increase by approximately 67%. However as capacity issues also increase, visitors will turn away from those beaches in favour of more distant beaches, or in favour of other experiences in Barbados. Mitigation of issues regarding capacity will become especially important.

Table 2.10 presents capacity issues and their mitigation tactics at these three Carlisle Bay beaches.

Table 2.10. Pebbles, Browne's and Boatyard Beaches at Carlisle Bay: Issues & Mitigation.

Issue	Mitigation
Water Contamination	<ul style="list-style-type: none"> • Implement recommendations which have been made to alleviate polluted water runoff from the land areas adjacent to the beaches (Report III)
Stray Dogs	<ul style="list-style-type: none"> • Remove stray dogs from the beaches • Develop and implement controls for pets on the beach
Water Safety	<ul style="list-style-type: none"> • Review safety issues regarding use of watercraft in the near beach areas • Strictly enforce regulations respecting water safety (Report V Part 1)
Watercraft Noise	<ul style="list-style-type: none"> • Develop and strictly enforce noise regulations regarding watercraft
Washrooms, Changing Rooms, Showers and General Sanitation	<ul style="list-style-type: none"> • Increase number of washrooms, change rooms and showers, and ensure cleanliness • Remove garbage and litter frequently, • Keep the area fresh and clean (Report II)
Harassment and Poor Behaviours	<ul style="list-style-type: none"> • Strictly enforce prevention of the current obvious illegal and harassment activities

	<ul style="list-style-type: none"> • Educate locals and visitors on acceptable and unacceptable behaviours, and consequences • Given the importance of this resource to the country, put substantial resources toward enforcement (Report III)
General Safety and Security	<ul style="list-style-type: none"> • Have numerous and visible police patrols along the beach to ensure the safety and security of users (Report III) • Provide adequate lighting in the access areas

2.3.2.8 Farley Hill

Farley Hill is a spectacular heritage site that is used primarily by locals for picnics and other social gatherings; although for special events, e.g. “Reggae on the Hill”, “Gospelfest”, and “Soca on the Hill”, tourists to Barbados also attend, but in much smaller numbers than locals. Attendance data provided by the National Conservation Commission (NCC) identifies the following utilization for 2013/2014:

- Reggae on the Hill 17,000
- Gospel fest 3,000
- Soca on the Hill 6,000

The principal assets of Farley Hill are its spectacular ruins and grounds. The site experiences a number of capacity issues currently, which are listed in Table 10. While an increase in tourism will have limited impact on total attendance due to the small numbers of tourists who now attend Farley Hill events, as events become more popular, there will be an increase in demand from visitors to Barbados as well as locals. With the current substantial capacity issues at the site, any increase in demand will more than exponentially increase the severity of the issues. As a last resort, it would be possible to ‘issue tickets for the venue’ on a first-come first serve basis, thereby limiting attendance to a maximum number. Table 2.11 presents capacity issues and their mitigation tactics with respect to Farley Hill.

Table 2.11. Farley Hill: Issues and Mitigation.

Issue	Mitigation
Access and Parking	<ul style="list-style-type: none"> • Currently very limited and problematic; requires an access and parking plan • Implement more ‘park-and-ride’ for large, special events
Deteriorating Ruins	<ul style="list-style-type: none"> • Stabilize the ruins to maintain its spectacular character; do not restore
Visitor Behaviours	<ul style="list-style-type: none"> • Conduct a site assessment to determine best visitor behaviours in terms of characteristics of use during special events • Ensure use characteristics that maintain the integrity of the area
Need for Washrooms	<ul style="list-style-type: none"> • Increase the number of washrooms, and ensure cleanliness

General Safety and Security	<ul style="list-style-type: none"> • Have police patrols • Provide adequate lighting
General Aesthetics	<ul style="list-style-type: none"> • Remove garbage and litter frequently, • Keep the area fresh and clean
Amenities	<ul style="list-style-type: none"> • Provide adequate picnic and rest areas

2.3.2.9 Agrofest

Agrofest, the annual weekend event held at Queens Park that brings vendors and agricultural specialties from throughout Barbados, is very well attended by locals and, to a more limited extent, tourists. The event has been increasing in popularity such that the attendance in 2013 and 2014 was estimated at 60,000 visitors (BAS, 2014).

With increasing awareness and popularity of the event, it is anticipated that attendance will continue to increase, and the proportion of island visitors attending will also increase. This increase will be further encouraged by an increase in the total number of visitors to the island. While there are not currently many capacity issues, their severity will increase, and new issues will emerge as utilization increases. Table 2.12 presents the issues and their mitigation.

Table 2.12. Agrofest: Issues and Mitigation.

Issue	Mitigation
Access and Parking	<ul style="list-style-type: none"> • Currently limited and problematic; requires an access management and parking plan • Implement more 'park-and-ride' to reduce impact on adjacent sports field
Visitor Behaviours	<ul style="list-style-type: none"> • Ensure use which maintains the integrity of the area
Need for Washrooms	<ul style="list-style-type: none"> • Increase the number of washrooms, and ensure cleanliness
General Safety & Security	<ul style="list-style-type: none"> • Maintain good police patrols • Provide adequate lighting
General Aesthetics	<ul style="list-style-type: none"> • Remove garbage and litter frequently, • Keep the area fresh, clean
Amenities	<ul style="list-style-type: none"> • Provide adequate picnic and rest areas

2.3.2.10 Holetown Festival

The Holetown Festival is an annual weekend event held along the West Coast road in popular Holetown that attracts many visitors to Barbados as well as local residents. It features local produce, arts and crafts from throughout the island, and special events and performances.

The Festival can become quite crowded at times. As awareness of the Festival and its popularity increases and the number of visitors to Barbados also increases, one can anticipate a commensurate increase in attendance at the Hometown Festival. The existing capacity issues will increase as its popularity increases, and the number of visitors to the island also rises. Table 2.13 addresses the capacity issues and their mitigation.

Table 2.13.Hometown Festival: Issues and Mitigation.

Issue	Mitigation
Parking	<ul style="list-style-type: none"> • A major issue surrounds the need for parking, which is currently very limited and problematic; requires an access management and parking plan • Implement more 'park-and-ride' to minimise impact on neighbouring residential community
Visitor Management	<ul style="list-style-type: none"> • Ensure use that maintains the integrity of the area
Need for Washrooms	<ul style="list-style-type: none"> • Increase the number of washrooms, and ensure cleanliness
General Safety and Security	<ul style="list-style-type: none"> • Maintain good police patrols • Provide adequate lighting
General Aesthetics	<ul style="list-style-type: none"> • Remove garbage and litter frequently • Keep the area fresh and clean
Amenities	<ul style="list-style-type: none"> • Provide adequate picnic and rest areas

2.3.2.11 Cherry Tree Hill

Cherry Tree Hill is becoming an attraction in its own right because of the spectacular view it commands over the East Coast. It is one of the most photographed sites on the island. It is accessed by a narrow winding road, with St. Nicholas Abbey at one end and Morgan Lewis Sugar Mill near the other. Its popularity is evidenced by the increase in numbers of craft vendors, and more recently a vendor who provides fresh coconut water and rum to visitors. Virtually all vehicles along this route stop to enjoy and photograph the spectacular view.

While a very small parking lay-by has been built in recent years, it can only accommodate three or four vehicles. However, the many tour buses, private cars, and rental buses that stop, as well as visitors that disembark, means that parking space can be limited and the area can become hazardous. As the number of visitors to Barbados increases, the issues related to Cherry Tree Hill will also increase. Table 2.14 identifies some of the major issues and their mitigation.

Table 2.14.Cherry Tree Hill: Issues and Mitigation.

Issue	Mitigation
Parking	<ul style="list-style-type: none"> A major issue, since parking is currently limited to 3 or 4 parallel spaces; can be readily extended to provide more angled parking spaces (approximately 10 would likely suffice to accommodate both buses and passenger vehicles)
Visitor Management	<ul style="list-style-type: none"> Ensure usage that maintains the integrity of the area
Need for Washrooms	<ul style="list-style-type: none"> Provide a male/female washroom, and ensure cleanliness
General aesthetics	<ul style="list-style-type: none"> Remove garbage and litter frequently Keep the area fresh and clean

2.3.3 Management by Numbers Does not Work Effectively

One of the main issues facing the management of tourism is how to check on the health of the industry and the resources it depends upon. Health has often been considered in terms of identifying positive and negative impacts. The most commonly promoted positive impacts have been economic (such as earnings and jobs created) while the most commonly promoted negative impacts have been environmental (such as damage of various types) and social (such as the loss of lifestyle).

Health has most often been measured by comparing the amount of tourism activity (number of visitors) with the scale of the impacts generated by tourism. Comparing numbers of visitors with scale of impacts is relatively simple, so it is common. The tourism industry often uses the relationship to promote the positives, while those responsible for managing negative impacts use the relationship to justify limiting visitor numbers, or limiting use.

Within the marine environment, health is often measured by the degree of degradation of the surrounding environs after use, either by locals or visitors. The time frame over which this degradation takes place should be taken into account. Whilst the passing of laws and regulations may be one of the approaches adopted, policing and enforcement of such laws and regulations is necessary to combat the variable human behavioural patterns. For example, the health of reefs depends on the quality of the water surrounding them and the physical damage inflicted on them due to anchor drag, just to mention two areas of concern. These two issues are caused by human use, and need a suite of management approaches, from standards, to best practices supported by regulatory or management measures. Therefore, in a perfect world, the numbers visiting the site may well be extremely elastic.

In any case, while simple to do, the *relationship* of numbers of visitors with the scale of impact is impossible to prove, because there are just too many variables. And not every tourist is the same, and each has different expectations, choices, behaviour and levels of satisfaction. Extensive research into environmental and social impacts has failed to

establish predictable links between different levels of use and their impacts (Washburne, 1982; Graefe et al., 1984; Wight, 1996; Ceballos-Lascurain, 1996; IUCN, 2002). And where a capacity approach has been used, typically the development of these capacities lacks accountability, and therefore lacks the ability to be defended in the face of criticism and conflict between stakeholders.

In addition, although it is a relatively easy approach, it may well be inappropriate, considering usage is critical to tourism as well as to local people, and it may also be inappropriate in terms of the best solution to problems and issues.

2.3.4 Managing for Sustainability

Other approaches and frameworks have been developed for managers, and are briefly encapsulated in Figure 2.2. Essentially, most management techniques can be viewed as taking one of four different approaches:

1. **Managing the supply** (of tourism or visitor opportunities, e.g. by increasing the space available or the time available to accommodate more use)
2. **Managing the demand** (e.g. through restrictions of length of stay, or total numbers, or type of use)
3. **Managing the resource** (e.g. through hardening the site or specific locations, or developing facilities)
4. **Managing the impact** (reducing the impact of use, e.g. modifying the type of use, or dispersing or concentrating use)

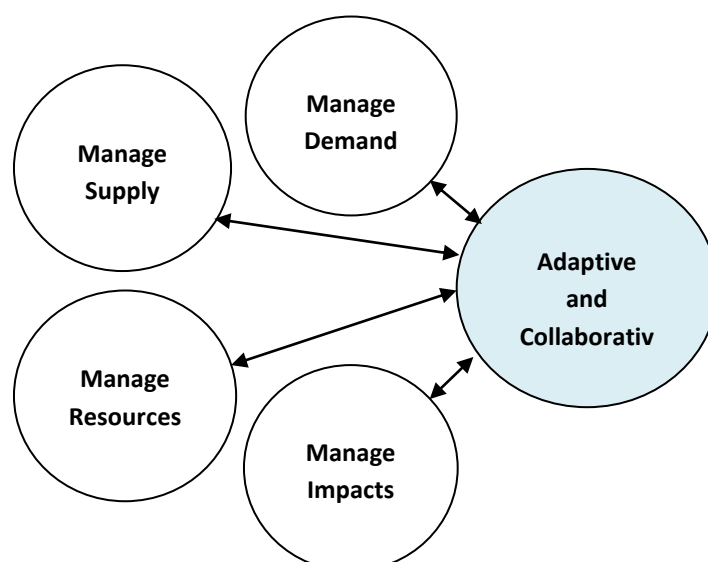


Figure 2.2. Managing for sustainability.

Figure 2.2 illustrates not only the various approaches to managing for sustainability, but also how managers need to adapt their management tools as they learn what the responses are to various management techniques. In essence, with multiple variables at play, the management mix will likely need to change over time.

Figure 2.3 provides a helpful illustration of these various approaches to management in the form of a decisions/choice map. It shows a range of strategies and specific types of management techniques available, which correspond to the approaches above. It gives a good visual idea of the fact that there may be a selection of techniques from which to select the optimum approach for a particular situation in a specific area.

2.3.5 Managing Bottlenecks

In Barbados, there are a number of concerns relating to:

- Maintaining or increasing the contribution of tourists and tourism to the overall economy
- Ensuring that the visitor/user experience is maintained, so user satisfaction remains high
- Conserving Barbados destinations, with particular attention to sensitive or high-visitation sites

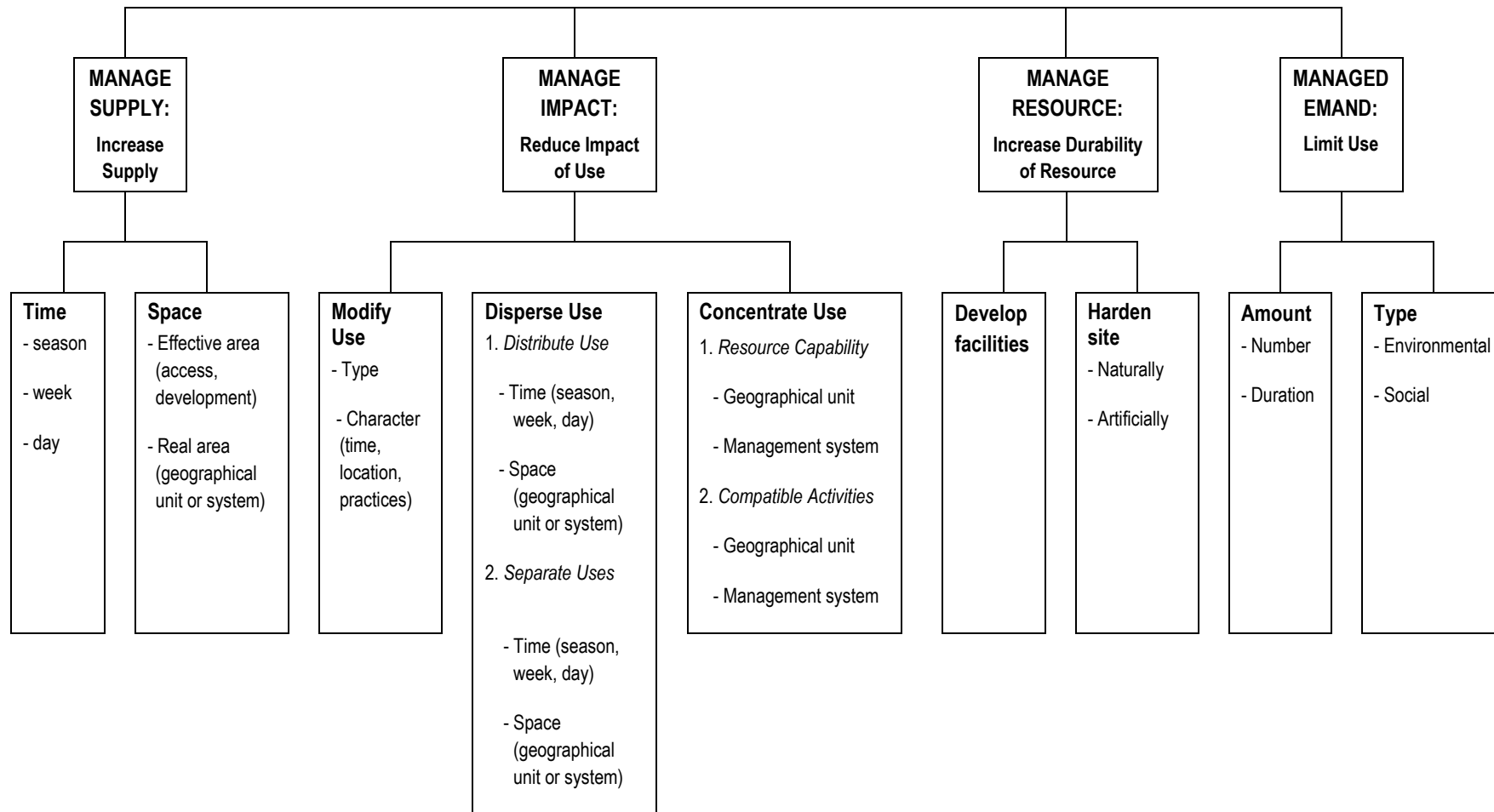


Figure 2.3. Strategies for managing destinations (modified from Wight, 2002, adapted from Manning, 1979).

During the study, numerous stakeholders expressed a desire to increase revenues from tourism, but at the same time they pointed out that there are specific locations in which the user experience is decreasing, or where the location itself may be experiencing degradation. Locations of concern, with key issues include:

- **High-use beaches:** Carlisle Bay was of key concern, but other beaches were also mentioned. Issues included crowding, proliferation of beach furniture, litter, peddling, access and parking, lack of facilities, random mooring and watercraft use, non-existent salvage laws, contaminated drainage, sensitivity of marine resources
- **St. Lawrence Gap:** Issues included periodic crowding, litter, parking, noise, aesthetics/lack of sea views
- **Oistins:** Issues included periodic crowding and congestion, litter, health and safety

The essence of the issues is:

- High visitation may be experienced in short time periods, thus exceeding the capability of human resource, infrastructure and management systems to maintain a high quality of experience
- Visitor experiences and expectations are diminished as a result of various issues related to congestion at peak periods
- Visitors have problems parking during congested periods
- There are relatively small areas for car parking, which can cause traffic congestion and visitor frustration
- There is no overall management responsibility for these attractions

There is a clear need to balance the quality of visitor experience with the impact on the environment, the local community, and the protection of natural and developed tourist sites.

In fact it became evident as the issues were examined, that many of them were evidenced periodically, rather than permanently. It also is clear that a variety of management techniques may be employed to manage the users, the sites, the demand for the destinations, or the impact.

As illustrated previously, there is a diversity of management strategies and approaches that are appropriate for managing visitation and congestion issues, with a range of tactics available for each strategy. Table 2.15, which has been adapted from Cole et al.(1987), presents optional management techniques that may be employed for key locations. It should also be possible for individual site managers throughout the island to check what approaches are suitable for their destinations (private or public) and to create their own list of management tools.

Table 2.15. Strategies for managing sensitive sites or high use areas (selected examples are ticked; adapted from Cole et al. 1987; IUCN, 2002).

Strategy	Optional Management Tactics and Techniques	Beaches	Oistins	St. L. Gap
1. Reduce use of the entire area	<ul style="list-style-type: none"> Limit number of visitors in the entire area Encourage use of other areas (through advertisement, signs, etc.) Require certain skills &/or equipment Charge a visitor fee Make access more difficult in all the area 			
2. Reduce use of specific problem areas	<ul style="list-style-type: none"> Inform about problem areas & alternative areas Discourage or prohibit use of problem area Limit number of visitors in problem areas Encourage/require a stay limit in problem areas Make access harder/easier, to select areas Eliminate facilities/attractions in problem areas Improve facilities/attractions in alternative areas. Establish different skill/equipment requirements (e.g. for use of sea craft) Charge differential visitor fees 	✓ ✓ ✓		
3. Modify the location of use within the problem areas	<ul style="list-style-type: none"> Locate facilities on durable sites Segregate different types of visitor activities Concentrate use by facility or site design, or through information 	✓	✓	
4. Modify the timing of use	<ul style="list-style-type: none"> Encourage use outside the peak use periods Discourage/ban use when impact potential is high Fees in periods of high use/high impact potential 	✓ ✓	✓	✓
5. Modify the type of use and visitor behaviour	<ul style="list-style-type: none"> Discourage/ban damaging practices &/or equipment Encourage/require behaviour, skills, or equipment Encourage/require a party size or limit Teach a user ethic Use interpretation as a multi-purpose tool 	✓ ✓ ✓ ✓	✓ ✓	
6. Modify visitor expectations	<ul style="list-style-type: none"> Inform visitors about appropriate uses and behaviours Inform about potential conditions in area 	✓	✓	✓
7. Increase the resistance of the resource	<ul style="list-style-type: none"> Shield the site/resources from impact Strengthen the site/resources 	✓ ✓		
8. Maintain/rehabilitate/increase durability of resource	<ul style="list-style-type: none"> Maintain/rehabilitate impacted locations Harden the resource Expand the site or develop amenities and facilities 	✓	✓	

One of the approaches illustrated in Figure 2.3 is *Manage the Resource* through paving the site or developing facilities, seen as Strategy 8 in Table 2.3. Increasing the size of the amenity is one tactic, together with hardening sites, which is relevant to many beach capacity issues. For example, an overcrowded beach can be increased in size by the introduction of varying types of marine structures to encourage beach accretion. With respect to Carlisle Bay, the entire stretch of beach is long and wide enough to accommodate many users. At present, users congregate in the area where the main car park is located, adjacent to the Coastal Zone Management Unit's office. This leads to congestion in one location. Some management options could include:

- Providing more access points to the stretch of beach with adequate car parking, so that the additional parking areas help to spread the users. For example:
 - Remove the structure which formerly housed the fish market at Browne’s Beach and increase the size of the existing car park
 - Improve the parking facilities at the open area opposite Jemmott’s Lane and clean the site
 - Improve access to the site opposite London Bourne Towers and develop the car park
- Developing additional parking facilities for beach access required along the west coast. The only one available is at Folkestone, St. James. This will require compulsory acquisition of land for such purposes.

2.3.6 Interpretation

Interpretation is an underutilized management tool. Interpretation involves education but should achieve much more than simply informing users.

In the past, information transmission objectives (information and learning) have been given most emphasis in education. But in the context of managing resources and visitors, *behavioural* objectives are most important, because they can help shape visitors’ behaviour and thus lessen resource impact, whether physical or social. However, emotional objectives are also critical, because they motivate visitors to change their behaviour, through impacting their values.

As a visitor management tool, interpretation should affect users’ behaviour. In order to achieve this, appealing to visitors’ emotions can assist in motivating them, and thus be very effective. This is relevant to the education of residents as well as visitors to the island.

The types of features that should be built into educational (interpretive) materials for residents and visitors should ideally impact all of their learning, behaviour and emotions (see Figure 2.4).

Learning	<ul style="list-style-type: none"> • What visitors learn and remember This is the commonest application of interpretation
Behavioural	<ul style="list-style-type: none"> • What visitors do and how they act Helps focus on what you want visitors to do, and how to use the information provided
Emotional	<ul style="list-style-type: none"> • Must occur first, to alter visitor behaviour or attitudes Helps visitors remember the topic because of strong feelings created – such as feelings of surprise, anger, guilt, pride or other emotions

Figure 2.4. Interpretation objectives (Wight, 2002).

Interpretation (verbal or non-verbal) may be *during* the visit (e.g. in interpretive displays or literature), or even *before* the visit (e.g. in tourism literature, on Internet web sites, or in school or other resident programmes).

Not only does interpretation have a strong role in the management of visitors and their behaviour, but it also provides high added value to the visitor experience. At the same time, it helps maintain high resource values, which are the very qualities that visitors wish to experience, and are prepared to pay for.

2.3.7 Managing for Desirable Conditions

A number of approaches have been formulated as management approaches for the natural environment and recreational or tourism settings. These include Limits of Acceptable Change – LAC, Visitor Experience and Resource Protection – VERP, Visitor Impact Management – VIM, and the Tourism Optimization Management Model – TOMM (Manidis Roberts, 1997; McVetty and Wight, 1999).

The thinking for some time has moved away from only asking questions about *numbers* of people, towards determining the social, environmental and experiential conditions which should prevail.

It is a logical alternative to shift the focus from a relationship between levels of use and impact to identifying desirable conditions for sustainable tourism activity to occur at the outset. These desirable conditions (which may be regarded as optimal conditions or objectives) are typically focused on both the state of the environment and the quality of the visitor experience.

3.0 Recommended Actions to Support Environmental Management

The following Actions are recommended to support Strategic Imperative 11 on **'Mainstreaming Environmental Management'** and corresponding Strategy 11.1 which states: *"Bring environmental management into the mainstream through improved protected area management and enhanced physical environs, implementation of conservation initiatives, and expanded capacity to provide environmental education and public awareness"*. Some of these recommended Actions relate to Strategic Imperative 12 on **'Update and Enforce Policy and Legislation to Support the BVE'**, and corresponding Strategy 12.1 which states: *"Review local legislation to update existing and enact new laws to facilitate functioning of the BVE"* (refer Report I, Sections 4.4 and 5.0).

11.1-1 Develop a Beach Accreditation Programme

Description:

The beaches of Barbados are popular sites for both locals and visitors and form a major part of the island's tourism product. However, there is a lack of international environmental standards relative to these beaches. To enhance Barbados' reputation regarding its renowned beaches, a local programme of beach accreditation should be instituted. The programme would include the upgrading of existing shoreline conditions where feasible to *international standards* through the minimization of drainage outfalls and discharges from developed areas into the near-shore zones, and the maintenance of beaches in a clean and pristine condition. These improvements would further strengthen promotional opportunities to enhance the island's competitiveness in the region through one of its prime tourism resources: beaches.

Two of the island's most notable beaches, Crane Beach and Bottom Bay, were judged to be amongst the world's 100 best beaches in the world (CNN Travel, 2013). The island can take advantage of such international recognition and the existence of excellent coastal sites for appreciation and use by both locals and visitors (see Figure 3.1).



Figure 3.1. Browne's Beach, a popular destination for sea bathing, snorkeling, and diving.

Expected Outcomes:

- Enhanced beach conditions in Barbados and improved environmental standards in the coastal zone
- Increased competitiveness in the regional market
- Increased levels of public health standards in the near-shore zone
- Greater opportunities for marketing and promotion of a significant natural asset

Guidelines for Implementation:

Develop a programme of local accreditation for beaches to promote the island's major asset and increase competitiveness amongst its Caribbean neighbours. The goals would include:

- Maximizing opportunities to market beaches as a premier attraction
- Mapping of all Barbados' beaches and amenities
- Improving amenities where required to include infrastructural changes to drainage outfalls
- Marketing of beaches along with recognition of appropriate standards

Implementation would also include the following steps:

- Working in association with the BHTA to define the primary assets of local beaches and sharing such information with beachfront accommodation providers and industry stakeholders
- Promoting a set of standards which can be marketed internationally
- Implementing and monitoring the standards at all beaches managed by public agencies
- Highlighting the most excellent beaches using an accreditation label of recognition

Challenges With Implementation:

- Defining a set of internationally comparable standards
- Participation by beachfront hotels and locals in maintaining high standards
- Maintaining facilities and beach amenities at a high standard
- Minimizing vandalism of beach facilities and amenities

Recommended Implementation Agency:

CZMU in association with the National Conservation Commission

Priority / Implementation Timeframe:

High/Short Term: This is viewed as an **urgent** priority action in the TMP Implementation Plan (refer Report I, Section 5.0)

Target Users:

Locals and visitors

Who Benefits:

Barbados as a whole and visitors through improved standards of excellence

Risks:

Beach accreditation programme is not implemented, as has been done in other Caribbean islands, e.g. Blue Flag programme

Estimated Costs:

Start up budget of BDS\$50,000

Source of Funds:

- Budget allotment for “water quality testing” by Environmental Protection Department and reef assessment by Coastal Zone Management Unit may fall under current mandate of each Department
- National Conservation Commission to continue beach maintenance programme

Revenue Generation Potential:

Indirect through improved use of beaches by visitors and locals

Further Development Work Required:

Identification of potentially eligible beach locations and prerequisite amenities or standards for improvement

Other Considerations: Linkages with Beach Management Plan for Barbados (CEES Inc., 2007); Health & Wellness Tourism; sensitivity of Barbadians to beach-related issues;

One existing standard, Blue Flag, is a voluntary eco-label awarded to 3,650 beaches and marinas in 46 countries across Europe, South Africa, Morocco, Tunisia, New Zealand, Brazil, Canada and the Caribbean. The Blue Flag accredits beaches and marinas for sustainable practices regarding water quality, and environmental education, management and safety, etc. Currently the Bahamas, Jamaica, Dominican Republic and the US Virgin Islands are the only Caribbean

destinations with accredited beaches (refer www.blueflag.org)

12.1-1 Ratify the Draft Environmental Management Act

Description:

Overlapping environmental management responsibilities are currently spread across different public sector ministries/departments, creating challenges for effective management of the natural environment. There is a need for broad-based environmental protection through comprehensive regulations, as set out in the Draft Environmental Management Act, and enforcement procedures.

The Barbados National Biodiversity Strategy and Action Plan (NBSAP; Government of Barbados, 2002, p. 156) described the challenges relative to the protection of the island's natural resources, including effects from any ongoing tourism activities, as follows:

“The conservation of biodiversity in Barbados relies heavily on the effectiveness of the GOB to streamline the operations of the various Ministries and agencies which are involved in environmental management. The formulation and delegation of clear biodiversity protection mandates among these institutions, enhanced levels of communication and documentation of biodiversity related information, in addition to the optimal utilization of resources at hand is essential if they are to effectively carry out their functions.

The NBSAP identified the following areas that would enhance Government's capacity to undertake effective conservation and management of the island's biodiversity (Government of Barbados, 2002, p. 149):

- Improved protected area management and conservation
- Revising / updating legislation and regulations for the protection of habitats and species
- On-going research and compilation of biodiversity information into a central repository, including the collation and maintenance of a comprehensive GIS database
- Expanding the capacity to provide biodiversity and related environmental education and public awareness to locals
- Enhancing the capacity to effectively prosecute violators of existing regulations put in place to ensure the protection of biodiversity

Currently, there are a number of departments in the public sector outside the jurisdiction of the Ministry of Environment that have responsibility for environmental issues. For instance, the Ministry of Agriculture has responsibility for Climate Change and Meteorology, while the Ministry of Environment is the focal point and communications hub for Climate Change relative to the international community. *The streamlining of departments responsible for environmental management, and the adoption of the Environmental Management Act, would be a catalyst in furthering the objective of developing a Green Economy for Barbados.*

Expected Outcomes:

- Greater implementation of sustainable tourism practices
- Streamlined effort that addresses environmental management issues
- Greater coordination between offices responsible for environmental issues, practices, and

<p>standards, all within one entity</p> <ul style="list-style-type: none"> • Greater efficiency in addressing environmental issues in Barbados, through action programmes • Enhanced environmental stewardship • Promotion of sustainable development objectives • Greater coordination and focus on environmental management issues will be pivotal in transitioning to a Green Economy
<p>Guidelines for Implementation:</p> <ul style="list-style-type: none"> • Ratify the Draft Environmental Management Act with the Chief Parliamentary Counsel as a basis for moving forward • Establish requisite Regulations and enforcement guidelines for the EMA
<p>Challenges With Implementation: Moving various departments / agencies responsible for environmental issues into one overarching umbrella entity</p>
<p>Recommended Implementation Agency: Ministry of Environment and Drainage</p>
<p>Priority / Implementation Timeframe: High/Short Term: This is viewed as an urgent priority action in the TMP Implementation Plan (refer Report I, Section 5.0)</p>
<p>Target Users: Public sector departments responsible for environmental management</p>
<p>Who Benefits: All locals and visitors</p>
<p>Risks:</p> <ul style="list-style-type: none"> • Constraints relative to merging and coordinating various departments • Territoriality relative to responsibilities
<p>Estimated Costs: Government budgetary allocations and fiscal arrangements to be determined.</p>
<p>Source of Funds: Government of Barbados</p>
<p>Revenue Generation Potential: Opportunity for cost reductions in the public sector through consolidation of functions, roles and responsibilities</p>
<p>Further Development Work Required: Analysis of current institutional framework relative to environmental management, and the development of a plan to restructure and streamline same.</p>
<p>Other Considerations: Linkages with Institutional Strengthening; Policy and Legislation</p>

11.1-2 Implement an Energy Saving Programme for Tourism Sector

Description:

Given the island's heavy dependence on fossil fuels as its primary energy source, energy expenditures are significantly high, especially in the tourism sector.

The provision of electricity through Direct Current (DC) operation is more efficient than through Alternating Current (AC). A programme is therefore recommended that would assist the tourism sector in reducing its operating costs through greater energy efficiency. This can be achieved by encouraging the replacement of existing air conditioning units from alternating to direct current operation in both Government offices and tourism-related establishments, and the conversion of existing swimming pool pumps in the tourism sector from alternating to direct current operation. In addition, the use of more energy efficient lighting, such as compact fluorescent lamps and LED lights is also recommended.

This would also support some of the objectives of the CHENACT project in Barbados.

Expected Outcomes:

- Reduced energy costs in the public sector and tourism sector
- Greater energy efficiency
- Reduction in operating costs through lower utility bills

Guidelines for Implementation:

- Institute a pilot project in a Government building, to be followed by implementation throughout the public sector
- Develop an awareness programme, in association with the CHENACT project, for tourism managers to promote the adoption of this programme in accommodation establishments and other properties that support the tourism sector
- Replacement of existing air conditioning units from AC to DC operation in the tourism sector
- Conversion of swimming pool pumps in the tourism sector from AC to DC operation
- Promote the use of compact fluorescent lamps and LED lights in the tourism sector

Challenges With Implementation:

- Convincing users about the benefits of the programme
- Time constraints relative to pay-back periods

Recommended Implementation Agency:

Ministry of Energy in association with the BHTA

Priority / Implementation Timeframe:

High/Short Term: This is viewed as an **enabling** priority action in the TMP Implementation Plan (refer Report I, Section 5.0)

Target Users:

- Government buildings
- Managers of tourism establishments (e.g. hotels, apartments, villas)

Who Benefits:

- Government departments
- Tourism sector

Risks:

Lack of participation in the programme

Estimated Costs:

- Dependent on number and size of electrical units to be replaced, e.g. DC Air conditioners from approximately BDS\$3,000 per unit; DC swimming pool pumps from approximately BDS\$1,800 per unit
- Government should provide incentives through tax concessions on these imported items

Source of Funds:

Government and Private Sector

Revenue Generation Potential:

Reduction in utility costs can help to reallocate funds for other infrastructural improvements at tourism establishments

Further Development Work Required:

- Identification and sourcing of energy efficient air conditioners, swimming pool pumps and lighting fixtures
- Developing awareness programmes for tourism managers

Other Considerations: Linkages with Accommodation; investigating renewable sources of energy that result in savings, e.g. solar grid tie systems, wind energy systems, biodiesel fuels and natural gas

11.1-3 Conduct a Sand Fluidization Programme for Beaches

Description:

Sand deposits on beaches can regularly block surface water flows into the sea, which can cause stagnant bodies of water to form and contribute to potential public health risks. Installation of mechanical fluidizing devices at the mouths of drainage channels that discharge across beaches will ensure that these sand deposits are removed in order to maintain regular flows into the sea. Installation of a pumping system and construction of catchment pools, overflow weirs and drainage channels will be necessary, and should be implemented on the south and west coasts.

Expected Outcomes:

- Reduction in the lifespan of stagnant pools of water which will minimize the breeding of mosquitoes
- Minimizing the entry of debris into the sea bathing environment and ensuring that relatively clean water is discharged into the sea
- Reduction of infection risks to sea bathers

Guidelines for Implementation:

- Sensitize Government environmental agencies, environmental groups, schools and the general public
- Identify suitable locations for catchment pools and weirs
- Identify suitable fluidizing equipment
- Install and maintain mechanical fluidizing devices at the mouths of drainage channels across primary visitor beaches
- Construct drainage channels and catchment weirs where required

Challenges With Implementation:

- Acquisition of lands to construct the catchment pools and weirs
- Regular checking from Government personnel to ensure that the system and equipment continue to function satisfactorily
- Regular cleaning of debris from the catchment pools
- General maintenance of the system
- Inertia from Government

Recommended Implementation Agency:

CZMU in collaboration with the EPD and Ministry of Health

Priority / Implementation Timeframe:

High/Short Term: This is viewed as an **enabling** priority action in the TMP Implementation Plan (refer Report I, Section 5.0)

To be implemented in phases as follows:

Phase 1 – Immediate installation of fluidizers on beaches

Phase 2 - Construction of drainage channels where required

Phase 3 – Construction of catchment pools and weirs

With an ongoing equipment maintenance programme

Target Users:

Locals and visitors

Who Benefits:

Locals and visitors

Risks:

Destruction of underground pipes during adverse sea conditions

Estimated Costs:

- Fluidizers - BDS\$500,000.00
- Channelling of drains - BDS\$500,000.00
- Catchment ponds and weirs - BDS\$1,000,000.00
- Total - BDS \$ 2,000,000.00

Source of Funds:

Government of Barbados

Revenue Generation Potential:

None anticipated

Further Development Work Required:

- Consideration of the use of inland retention ponds to reduce the quantity of water entering the sea
- Use of these retention ponds for irrigation purposes

Other Considerations: Linkages with public health programmes and vector control initiatives

12.1-4 Create an Environmental Hotline

Description:

Barbados requires greater enforcement of environmental regulations. The public could assist in this regard if there was a communication network set up that would allow individuals that witness environmental infractions to report them. The hotline would be equivalent to the 'Crime Stoppers' initiative currently in operation.

The White Paper (Strategic Solutions Inc., 2012, p. 123) states that *"Barbados, is a generally clean country, however, this core brand element is currently under threat due to air pollution from increased traffic congestion, contamination of the underground water supply and increases in the undesirable practice of indiscriminate littering around the island"*. Practices such as willful littering and refuse dumping continue to mar the local landscape in Barbados. Litter piles that are not cleared for long periods of time also compound the problem (see Figure 3.2). Other practices affecting the environmental integrity of Barbados include the illegal cutting of mature trees above a specified girth, and capturing wildlife protected by local environmental laws.

The Environmental Hotline could be maintained by the Environmental Protection Department which is authorized to communicate with key agencies that would act on the reported infractions. The hotline would provide witnesses with an avenue to report environmental infractions, generate awareness regarding current regulations, inform enforcement agencies of areas in which regulations are contravened, and allow relevant authorities to initiate responses in a timely manner.



Figure 3.2. Unsightly litter along an access road to Cheapside Market in Bridgetown, part of the UNESCO World Heritage Property (left); litter and overflowing garbage skip at Barclays Park on the east coast, a popular recreational site for both locals and visitors along a major scenic route in the Barbados National Park area (right).

Expected Outcomes:

- Reduction in environmental infractions
- Greater enforcement of environmental regulations
- Expansion of existing anti-litter campaign
- Improvement of the overall standard of cleanliness and health of the Barbadian environment
- Increased local and visitor satisfaction regarding environmental health on the island
- Strengthening of the Barbados Brand regarding cleanliness
- Establishment of a proactive attitude to environmental preservation amongst Barbadians

Guidelines for Implementation:

- Collaboration between stakeholder agencies to include the MOE, EPD, SSA, MTW, NHD, NCC, Future Centre Trust, RBPF
- Examination of current hotline models, e.g. Crime Stoppers hotline
- Formulation of a unit or expansion of the roles of existing personnel within EPD or the relevant agency for monitoring and enforcement of regulations that would manage the hotline
- Development and promotion of a telephone and web-based hotline

Challenges with Implementation:

Coordination of response from the time of reporting to the appropriate action required depending on the nature of the report

Recommended Implementation Agency:

EPD in collaboration with the Ministry of Health

Priority / Implementation Timeframe:

High/ Short Term: This is viewed as an **enabling** priority action in the TMP Implementation Plan (refer Report I, Section 5.0)

Target Users:

- All visitors and locals
- Environmental stakeholders

Who Benefits:

- All users of the hotline
- Residents and visitors

Risks:

Lagging response times and inability to respond to the report from the public

Estimated Costs:

Staffing and training of hotline unit – utilize existing budgets

Source of Funds:

Ministry of Environment

Revenue Generation Potential:

Indirect through increased visitor satisfaction

Further Development Work Required:

- Determination of the roles of each agency in executing enforcement actions
- Development of telephone hotline and content for the web hotline
- Construction of the website with integral links to stakeholder agencies where applicable
- Training and engagement of requisite staff

Other Considerations: Linkages with Policy and Legislation

11.1-4 Support the Waste Reduction Programme

Description:

Reducing the amount of solid waste that ends up in the national landfill represents a best practice that supports environmental stewardship. One way to achieve this is through the reduction in the use of plastic bags at points of sale.

The White Paper (Strategic Solutions Inc., 2012, p. 217) states that Government will support *“national environmental awareness programmes targeting schools, businesses and the general public to promote sustainable practices and eliminate littering and other undesirable behaviours”*. The UNEP Caribbean Environment Programme advocates the reduction of plastic bag use through reuse or replacement with alternative materials such as cloth bags as one mechanism to minimize solid waste outputs and marine litter which is seen as an *“ environmental, economic, health and aesthetic problem affecting all regions around the world”*(UNEP, 2013).

In order to support the objectives of transitioning to a Green Economy, it is proposed that a national programme be initiated across local retail outlets that would significantly reduce the volume of plastic bags entering the landfill and littering the landscape (see Figure 3.3). Some outlets are already instituting this type of programme, which needs to be expanded island wide. This type of initiative also raises the level of environmental awareness and promotes best practices in waste reduction, as is carried out in other destinations around the world.



Figure 3.3. Street-side waste disposal area in Oistins, a prime tourism venue. Plastic bags comprise a large proportion of the waste in these garbage piles.

Expected Outcomes:

- Reduction in the amount of plastic ending up in the landfill
- Reduction in the amount of plastic bags littering the landscape
- Enhancement of the general standard of cleanliness of the Barbadian environment
- Increased visitor and local satisfaction regarding environmental health on the island
- Reduction in the volume of plastic bags entering natural drainage courses that lead to the sea, also polluting the marine environment and endangering marine life such as sea turtles
- Reinforcement of the Barbados Brand regarding cleanliness
- Promoting a Green Barbados via recycling initiatives and supporting local recycling programmes

Guidelines for Implementation:

- Promote collaboration between stakeholder agencies to include the Ministry of Environment and commercial retailers who provide plastic bags to consumer
- Develop a programme that reduces the amount of plastic bags distributed at points of sale
- Supply, at reasonable cost, reusable cloth or equivalent bags at points of sale. Retail outlets can standardize their own bags for marketing purposes
- Establish principles for developing an effective programme that includes incentives and disincentives, as used internationally. These may include: (1) a nominal monetary credit (e.g. 5 cents per bag) available at the retail outlet for personal bags provided by the consumer (for a fixed period of time, e.g. the first 6 - 12 months of the programme; (2) elimination of value added tax on the cost of reusable bags sold by retail outlets; and (3) application of a nominal charge (e.g. 5 cents per bag) for every plastic bag requested by a consumer for the packaging of goods purchased

Challenges with Implementation:

Attaining the cooperation of commercial vendors and consumers

Recommended Implementation Agency:

BCCI in collaboration with the Ministry of Environment

Priority / Implementation Timeframe:

High/ Short Term: This is viewed as a **sustaining** priority action in the TMP Implementation Plan (refer Report I, Section 5.0)

Target Users:

- Commercial vendors
- All visitors and locals
- Environmental stakeholders

Who Benefits:

All residents and visitors

Risks:

Limited public cooperation

Estimated Costs:

- Promotion of the programme, including through school awareness and media programmes, is estimated at BDS\$20,000
- Reusable bags can be offered for sale at each retail outlet – estimated at BDS\$5.00 per bag

Source of Funds:

Ministry of Environment

Revenue Generation Potential:

Indirect through reduction in expenditure on:

- Litter clean-ups
- Plastic bag production

Further Development Work Required:

- Review of the success of similar initiatives already being executed by commercial stakeholders
- Discussion to be held with local commercial stakeholders regarding effective mechanisms for implementation and appropriate phasing of the programme

Other Considerations: Linkages with Education, Shopping

11.1-5 Develop a Programme for a Greener Bridgetown

Description:

The objective is to improve the environmental quality and integrity of Historic Bridgetown through (1) the development of an urban rehabilitation initiative to facilitate the creation of high quality urban streetscapes, converting existing disused properties that attract indiscriminate dumping of garbage into pleasant environs, and (2) increased use of alternative energy systems by commercial property owners. It is proposed that Bridgetown be marketed as a cultural heritage centre in which key cultural assets would be promoted, encompassing UNESCO World Heritage Sites.

The programme would also involve the promotion of a pollution-free, 'car-less' city by 2022. A regular shuttle service by heritage trams within Bridgetown is recommended for public transit. Electric or solar powered vehicles would be permitted entry to the city centre and also delivery service vehicles, the latter scheduled only within certain timeframes. All other vehicles would be provided parking at the periphery in existing multi-story parking lots or other designated park-n-ride zones.

Expected Outcomes:

- Improved environment within Barbados' capital city and support for the Green Economy objectives
- Reduction in air and noise pollution
- Greening of the harsh, hot cityscape
- Creation of additional public recreational spaces
- Conversion of city spaces which compromise health or safety
- Upholding of Barbados Brand elements – Cleanliness, Safety and Security

Guidelines for Implementation:

- Liaise with stakeholders and property owners to discuss 'A Greener Bridgetown' Initiative
- Promote the initiative within the urban community and enlist volunteers as well as participants from city-wide businesses, in addition to NGO's and governmental organizations, to execute the improvements
- Identify the locations of disused or abandoned lots along primary arteries within the city of Bridgetown in addition to those located adjacent to UNESCO World Heritage Sites
- Identify potential park-n-ride locations for city-bound vehicles and conceptualise use of heritage trams with Garrison Committee
- Source sponsors from the resident and business communities, particularly in Bridgetown, who would donate funds or materials, all aimed at environmental improvements and clean-up efforts
- Assess the extent of upgrade required, e.g. sidewalks, vegetation clearance, tree planting, painting or repair of damaged boundary walls or fencing adjacent to primary roadways, public washrooms
- Obtain permission from owners willing to enter into public/private sector partnerships upgrade their lots or frontages. Select city lots may be planted with trees to create small

- urban parks particularly if situated on Crown lands
- Where properties are a health hazard, utilize the services of the Environmental Protection Department and Sanitation Service Authority
- Promote a greener Bridgetown through 'in-ground' shade tree planting where appropriate
- If necessary, the initiative can be coordinated with a repeat of the Careenage clean-up, orchestrated by the Urban Development Commission in July 2012 under the theme: 'Green Environments, Urban Economics'
- The Initiative should be managed through a new Town Centre Management office, and ongoing over the long term to maintain high standards of environmental quality in Bridgetown
- Interpretive signage may be placed in areas which have been upgraded to become mini-parks or gathering places for heritage tours and community residents to highlight the linkage between community inputs and the overall tourism product

Challenges With Implementation:

Recruitment and organization of volunteers and public service personnel

Recommended Implementation Agency:

Barbados Tourism Investment Inc in association with MTW /Barbados Chamber of Commerce

Priority / Implementation Timeframe:

High/Short Term: This is viewed as a **sustaining** priority action in the TMP Implementation Plan (refer Report I, Section 5.0)

Target Users:

- Urban communities and businesses
- Businesses within the urban development area
- All locals and visitors

Who Benefits:

- Visitors and locals traversing Bridgetown
- Persons engaging in commercial activity in the urban development zone

Risks:

Lack of participation or delayed permission by property owners may hamper the initiative

Estimated Costs:

Costs would be determined based on the number of properties to be upgraded; approximately BDS\$10,000 - \$15,000 per property

Source of Funds:

BTII, TDC and private sector

Revenue Generation Potential:

Indirect revenues will be gained through increased visits to the City by locals and visitors

Further Development Work Required:

Promotion of the initiative amongst the wider stakeholder community to encourage participation, identification of sites for upgrade

Other Considerations: Linkages with Cultural Heritage and Attractions, Community Tourism, Tourism Awareness

12.1-5 Enforce Marine Pollution Legislation

Description:

Marine pollution needs controlling through enforcement of existing environmental legislation. Carlisle Bay in particular has been polluted due to lack of regulatory enforcement. The general clearing of debris from the seabed in Carlisle Bay is recommended, along with strategic placement of objects on the seabed to support the growth of fish colonies and other marine life. This action should be supported by enforcement of marine pollution legislation to render it a crime to deposit debris in Carlisle Bay and other boat berthing areas, along with the drafting of legislation to collect rental fees from boats using these areas.

Expected Outcomes:

- Increase in marine plant and animal life
- Return of pelicans to Carlisle Bay
- Increase in diving activity by locals and visitors
- Reduced pollution to the waters which can be sustained through policing by Bay wardens

Guidelines for Implementation:

- Sensitize Government environmental agencies, environmental groups, schools and the general public
- Identify suitable candidates for the role of Bay Wardens who will help to enforce existing marine pollution legislation
- Identify suitable equipment for use by the Wardens
- Organize and galvanize corporate Barbados to put the necessary equipment and personnel in place to assist with the cleaning of Carlisle Bay and other boat berthing areas
- Draft legislation to collect rental fees from berthing boats

Challenges With Implementation:

- Local boat owners and users of Carlisle Bay opposed to paying fees
- Inertia from the politicians to pass the necessary legislation
- Organizing the necessary floating equipment for the cleaning process

Recommended Implementation Agency:

Coastal Zone Management Unit in collaboration with the EPD

Priority / Implementation Timeframe:

High/Short Term: This is viewed as a **sustaining** priority action in the TMP Implementation Plan (refer Report I, Section 5.0)

Target Users:

- Local boat owners
- Itinerant yacht owners
- Scuba diving locals and tourists
- Snorkeling locals and tourists

Who Benefits:

- The Government of Barbados through increased revenue
- The people of Barbados through employment opportunities
- The beach users through less polluted waters and a healthier environment

Risks:

Not receiving the necessary support from Corporate Barbados for the equipment for the clean-up process

Estimated Costs:

- Cleaning Carlisle Bay - BDS\$150,000
 - Equipment - BDS\$1,000,000
 - Miscellaneous - BDS\$200,000
- Total estimate - BDS\$1,350,000

Source of Funds:

Government of Barbados

Revenue Generation Potential:

Every vessel anchored in Carlisle Bay will be charged a fee. Locals will be charged on a monthly basis. Itinerant yachts will be charged on a daily basis. Consideration can be given to applying a charge to scuba divers to view the various wrecks in Carlisle Bay and other diving areas

Further Development Work Required:

- To define the seaward limits of the Bay
- Development of a “Carlisle Bay Management” programme for above and below water activities
- A budget to cover the above programme

Other Considerations: Linkages with Tourism Awareness; Sports Tourism

11.1-6 Improve the Garrison to Oistins Corridor

Description:

The physical environment of the South Coast route from the Garrison to Oistins is degraded. This zone has declined generally due to land use issues, including lack of shade trees, dilapidated buildings, and abandoned properties, leading to harsh environmental conditions for all users. The objective is therefore to improve the public amenity and existing infrastructure of the coastal route from the Garrison to Oistins regional centre. Existing legislation, including PDP policies and the UNESCO designation, will create the enabling environment.

Expected Outcomes:

- A higher standard of user experience in one of the highest density commercial and residential strips in Barbados
- Improved environmental conditions
- Enhanced visual appeal

Guidelines for Implementation:

- Retain all existing ‘open windows to the sea’
- Identify and signpost key beach access points, e.g. Hastings Rocks boardwalk
- Discourage major developments that obliterate coastal views along the urban corridor

- Promote redevelopment and enhancement of existing tourism properties along the South Coast, e.g. Caribbee Hotel
- Improve the public amenity and interpretive signage on all beaches in the area
- Create tax incentives for property owners to improve the value of their properties
- Conduct a comprehensive assessment of existing public sidewalks, pedestrian crossings and location of speed humps in the corridor
- Promote the upgrading of existing vernacular architecture through a proposed 'Paint the Town' programme of refurbishment activities, including chattel houses and rum shops
- Identify all coastal parks and address the Barbados System of Parks and Open Spaces
- Develop health and fitness centered areas, e.g. Dover Playing Field
- Commence street tree planting programme where appropriate in the urban corridor
- Enhance the efficiency of solid waste management in the area
- Upgrade all bus stops, seating and related directional signage
- Install new litter bins through sponsorship
- Engage all relevant agencies including the SSA, NCC and FCT, and encourage neighbourhood recycling programmes for the respective areas

Challenges With Implementation:

- Achieving 'buy-in' from the various stakeholders
- Obtaining the necessary permits could be time consuming with the slow approval process through several government agencies

Recommended Implementation Agency:

Barbados Tourism Investment Inc.

[All stakeholders and the Barbados Chamber of Commerce to be included in this South Coast initiative]

Priority / Implementation Timeframe:

High/ Short Term: This is viewed as a **sustaining** priority action in the TMP Implementation Plan (refer Report I, Section 5.0)

Target Users:

- All stay-over tourists
- All cruise ship visitors
- Residents of the area
- This significant linkage between Bridgetown, its Garrison and Oistins can elevate the area to become a destination attraction for all Barbadians and visitors in all categories

Who Benefits:

The beneficiaries will be all residents of Barbados, including school education, businesses in all sectors, residents and government through increased revenues

Risks:

- The major risk is proceeding with the development planning and design stage, without access to funds for implementation
- Not being able to obtain timely permits from Government agencies
- Lack of inter-agency cooperation

Estimated Costs:

- Excluding any land acquisition, an approximate cost estimate could be BDS\$1.5 million for design and development
- Signage, education materials, and associated costs could be an additional BDS\$250,000

Source of Funds:

- Could be eligible for funds under Government and agency programmes, including Barbados Tourism Investment Inc. and Tourism Development Corporation
- May qualify as part of a specially developed fund for TMP implementation

Revenue Generation Potential:

- Would enhance the wider area as an improved ‘tourism zone’, attracting greater interest and more retail business opportunities
- Private tour operators can facilitate promotional activities to generate revenue

Further Development Work Required:

- Design and costing
- Identifying any need for land acquisition
- Conducting an environmental review/ scoping exercise
- Source of financing
- Identifying an implementation and operations entity

Other Considerations: Linkages with Cultural Heritage and Attractions

11.1-7 Implement a National Reforestation Programme

Description:

Due to extensive deforestation and the dominance of agriculture since colonization, large forests are essentially non-existent in Barbados. Currently, only 2% of the island is covered in forest, with the largest located at Turner’s Hall. According to the Barbados National Assessment Report (Government of Barbados, 2010, p. 20):

“Open green spaces, once established and properly managed, present an opportunity for both social and economic development in that they can be used for recreational, educational and cultural events, as well as being marketed as a natural ecotourism destination”.

Trees are a valuable natural commodity (see Figure 3.4). Among other attributes, they produce oxygen, help to stabilize soils and prevent erosion, contribute to soil production and enrichment, provide food and other materials useful to humans, provide shade and help to reduce ambient temperatures which is significant in the tropics, and provide habitat for wildlife.



Figure 3.4. Mature forest on the approach to Cherry Tree Hill, St. Peter: an oasis in an otherwise hot, exposed environment.

With specific reference to Barbados, the White Paper (Strategic Solutions Inc., 2012, p. 64) noted that:

“...over the years, lack of controlled management and development has resulted in serious impacts on the environment...The negative impact of tourism on the natural environment and other ecosystems is ultimately hurting the tourism industry itself and compromising its viability”.

Since land development practices, including those that support the tourism and agricultural industries, have impacted on the forest reserves of Barbados, it is important to consider a programme of sustainable reforestation, especially in former agricultural lands that now lie idle. The development and maintenance of green spaces, including wooded areas, can help to sustain healthy environmental processes, promote environmental education for land stewardship, and enhance tourism awareness regarding the importance of preserving the natural environment. The Scotland District and the Barbados National Park are prime areas that can foster nature-based attractions and land stewardship programme, including in reforested areas.

Developing and instituting a systematic reforestation programme in Barbados would be in keeping with the objective of developing a Green Economy for Barbados.

Expected Outcomes:

- Increasing forested areas in Barbados
- Providing more woodland ecosystems
- Providing more wildlife habitat, thereby enhancing the potential for increased biodiversity reserves
- Enhanced appeal for nature-based tourism
- Implementation of an important sustainable development practice
- Greater efficiency in addressing environmental issues in Barbados through action programmes
- Enhanced environmental stewardship of the land
- Assisting with the transition to a Green Economy
- Creating jobs in forestry
- Sustaining livelihoods in rural communities

Guidelines for Implementation:

- Planting of indigenous tree species in appropriate areas of the island, especially on Crown lands that are idle
- Planting of stands of trees, including fruit varieties, across the Scotland District
- Developing a maintenance programme to support forest growth
- Instituting a sustainable reforestation plan

Challenges With Implementation:

- Vandalism
- Praedial larceny
- Supporting early growth stages of wooded areas to be planted

Recommended Implementation Agency:

Ministry of Environment in collaboration with the Ministry of Agriculture

Priority / Implementation Timeframe:

Medium/Long Term: Reforestation is a long-term process with long-term benefits

Target Users:

- Communities
- Farmers
- Locals and visitors through nature-based activities

Who Benefits:

Locals and visitors

Risks:

- Ensuring proper management of new forest reserves through consistent planning and monitoring
- Inadequate supervision of planted sites to mitigate against negative impacts

Estimated Costs:

BDS\$500,000 for a start-up programme of reforestation

Source of Funds:

Government of Barbados – Soil Conservation Unit

Revenue Generation Potential:

- Increased revenues through nature-based tourism opportunities
- More local fruit production can help to reduce the food import bills

Further Development Work Required:

- Development of a reforestation plan for Barbados
- Identification of areas to be planted with trees

Other Considerations: Linkages with Cultural Heritage and Attractions

11.1-8 Develop an Environmental Stewardship Programme

Description:

Implementing an island-wide environmental stewardship programme for locals and repeat visitors to Barbados (e.g. 5 or more stays) can be implemented to help raise environmental awareness and enhance the integrity and beauty of the island's terrestrial environment. This can be achieved through the planting of ornamental or fruit trees that are suitable for a chosen location, with the name of the sponsor or beneficiary noted in place. Tree planting can be a memorial event, one that celebrates an achievement, or is used in public recognition of service to the nation.

Expected Outcomes:

- Improved land stewardship by both locals and visitors, and environmental quality across the Barbadian landscape
- Enhanced the natural environment through the creation of shaded areas within urban and rural zones
- Recognition and reward of visitor loyalty
- Recognition of Barbadians by their employers or associates

Guidelines for Implementation:

- Advertise the programme in local media and make a request for submissions
- Plan tree planting regimes in association with established interest groups, schools and non-governmental organizations such as the Future Centre Trust, 4-H Clubs, Brownies, Cub Scouts, Key Clubs or community groups. Plant-a-Tree contributions can also be organized at the check-out lines at local supermarkets
- Sponsorship would be catalogued and rationalized with tree planting locations. Sponsors or groups may indicate preferred planting locales. Sponsorship by individuals or businesses is voluntary
- Trees will be planted either at a school, in a participating community area, or in a public location/urban site organized with the National Conservation Commission and the Natural Heritage Department
- Each hotel may nominate guests, or Barbadians interested in implementing a neighborhood tree planting scheme on a group or individual basis may submit a request
- An optional plate marking the tree (e.g. from recycled PVC) could bear the name of the beneficiary and the sponsor
- Trees would be sourced, tagged and planted in association with the National Conservation Commission. The Soil Conservation Unit is another tree source

Challenges With Implementation:

Engaging locals, business partners and hotels in the programme

Recommended Implementation Agency:

Barbados Chamber of Commerce and Industry in association with NCC and Soil Conservation Unit

Priority / Implementation Timeframe:

Medium/Medium term: The active involvement of guests is a dimension which can add value to the tourism product and experience

Target Users:

- All tourists
- Residents of Barbados
- Educational Institutions
- Tourism Stakeholders
- Local businesses

Who Benefits:

- The beneficiaries will be all stakeholders of the tourism industry through encouragement of repeat guests
- All Barbadians through the improvement of the environment and green spaces

Risks:

- Vandalism (e.g. theft or disfigurement) of planted tree specimens
- Tree loss through lack of care
- Ensuring an adequate watering programme until trees are established

Estimated Costs:

- BDS\$50 – planting in existing viable topsoil
- BDS\$300 per tree – planting in augmented/upgraded soil with name plate (optional indicating sponsor)
- BDS\$650 per tree (planting in rocky conditions requiring mechanical preparation) with name plate

Source Of Funds:

Private sponsorship, Tourism Development Corporation

Revenue Generation Potential:

Indirect through enhanced environmental quality

Further Development Work Required:

- Establishment of a roster for nominating guests
- Identification of participant hotels, businesses and neighbourhoods
- Earmarking of locations for tree planting

Other Considerations: Linkages with Community Tourism, Tourism Awareness

11.1-9 Enhance 'Open Windows to the Sea'

Description:

'Open windows to the sea' enhance the public use and enjoyment of coastal areas, and promote connectivity to the natural marine environment. Due to development pressures over the last few decades, further encroachments to these 'open windows' should therefore be discouraged.

Preserving existing open windows, particularly on the more densely developed south and west coasts, is recommended. One such area is located at Freight's Bay in Enterprise, Christ Church, just east of Miami Beach (see Figure 3.5). The enhancement and functional upgrade of this multi-purpose 'open window' would not only support its preservation, but also assist in its use as a popular surfing spot for locals and visitors. Due to its protected location, its waves are

considered ideal for learning the basics of surfing. This Bay is widely used by surfers and instructors from various surfing schools in Barbados.

Due to its elevated and unobstructed views to the southwest, the site provides an impressive panorama of Oistins Bay and beyond. It occupies an area of approximately 15,000 square feet, slopes steeply from the roadside down to the existing beach, and is narrow, preventing the construction of a residential building. The current landowner is reportedly willing to consider a land swap with Government due to the existing development constraints resulting from the steeply sloping terrain (pers. comm., B. Gibbs, Environ Ltd., May, 2013). An option for Government is to consider a long-term lease.



Figure 3.5. View of Oistins from the Freight's Bay 'open window'.

Expected Outcomes:

- Enhancement of an 'open window to the sea'
- Improvement of functionality and access to a prime recreational area for adjacent communities

Guidelines for Implementation:

The site is currently used on a regular basis by instructors and surfing students. Improved access is required through the following measures:

- Create level area with retaining wall at road edge for vehicular parking
- Provide pathway from proposed parking area to a new timber stairway
- Construct stairway with landings
- Install shower for persons visiting beach
- Provide shade trees and seating
- Assess feasibility of preserving other 'open windows' on the south and west coasts

Challenges With Implementation:

- Planning approval process
- Recruitment and organization of volunteers and public sector personnel in completing the exercise in a timely and efficient manner for the duration of the initiative

Recommended Implementation Agency:

National Conservation Commission

<p>Priority / Implementation Timeframe: Medium/Short Term: This surfing site is considered the most suitable for training and instruction of locals and visitors learning to surf</p>
<p>Target Users:</p> <ul style="list-style-type: none"> • Visitors and locals seeking a passive recreational experience • Surfing instructors and students
<p>Who Benefits:</p> <ul style="list-style-type: none"> • Visitors and locals utilizing the Bay • Surf schools training at the Bay • Barbados through opportunities for promotion
<p>Risks: Inability to conclude landowner agreement for use of land</p>
<p>Estimated Costs: BDS\$50,000 – \$60,000</p>
<p>Source of Funds: BTII, Barbados Surfing Association, local community fund raising initiatives</p>
<p>Revenue Generation Potential: Indirect revenues will be gained through the overall improvement of visitor and local satisfaction</p>
<p>Further Development Work Required: Obtain TCPO permission</p>
<p>Other Considerations: Linkages with Community Tourism, Sports Tourism</p>

11.1-10 Develop an Energy Credit Programme

Description:

The objective of this programme is to create an incentive-based mechanism to encourage guests to participate in energy conservation measures at visitor accommodation establishments.

Expected Outcomes:

- Increased guest stewardship and reduced energy consumption by hotel guests
- Lower associated hotel electricity bills and increased profit margins
- Guests playing a part in achieving their own lower room rates

Guidelines for Implementation:

- Further to promotion of the programme amongst accommodation stakeholders, those providers choosing to participate in the programme would have select rooms / villas outfitted with energy meters to evaluate energy use
- Standard usage would be pre-measured / sampled through summer and winter seasons to establish peak and baseline seasonal power usage for given room types at the establishment
- The room / villa rates would then be evaluated against the costs of typical / daily energy usage
- A rate structure based on energy credits would be set to allow guests to be rewarded with a discount at the end of their stay based on their comparative energy use. A minimum daily room

<p>rate would be established</p> <ul style="list-style-type: none"> • The standard rate would apply for guests whose rooms record standard usage or below. • A pre-established rate chart / schedule of rates would indicate pro-rated discounts to be applied to the standard room rate • Also, repeat guests could accumulate credit over a number of trips or when booking several rooms for a larger party which would count towards future stays
<p>Challenges With Implementation:</p> <ul style="list-style-type: none"> • Enrolling hotel partners in an energy programme • Installation of meters and evaluation of typical energy usage over a fixed period
<p>Recommended Implementation Agency: BHTA</p>
<p>Priority / Implementation Timeframe: Medium/Short Term</p>
<p>Target Users:</p> <ul style="list-style-type: none"> • Tourists • Staycation visitors • Accommodation stakeholders
<p>Who Benefits: Accommodation stakeholders and visitors through reduced room rates</p>
<p>Risks:</p> <ul style="list-style-type: none"> • The major risk is not being able to co-ordinate and disseminate the necessary upgrades through the various government departments and agencies, and then not being able to obtain or reallocate funds for implementation • Agencies / departments challenging over jurisdiction • The effort and improvements are not maintained and sustained in the medium to long term and adjusted and improved as required
<p>Estimated Costs: BDS\$2,000 per room for installation of energy meter</p>
<p>Source Of Funds: Sustainable Energy Investment Programme (Energy SMART Fund): Energy Efficiency Retrofit and Renewable Energy Finance Facility (http://www.energy.gov.bb/web/energy-smart-fund)</p>
<p>Revenue Generation Potential: Reduction of energy expenditure by the accommodation sector and associated increase in revenues through repeat visitation through this programme</p>
<p>Further Development Work Required:</p> <ul style="list-style-type: none"> • Identification of participating hotels • Developing a pricing structure
<p>Other Considerations: Linkages with Accommodation</p>

11.1-11 Implement a Climate Change Awareness Programme

Description:

Evidence suggests that adaptive capacity within the tourism sector in Barbados is low. Properties and enterprises are not sufficiently engaged in the implementation of appropriate measures to prepare themselves for the increasing impacts of climate change and impending disasters, which can include:

- Loss of recreational value of beaches
- Loss of property value resulting from declining amenity value
- Loss of land value
- Deterioration of landscape and visual appreciation
- Cost for beach and property protection

While there is some indication that financial constraints play a part in this lack of engagement, the major reason is their lack of technical ability to design and undertake these initiatives. To this end, this recommended action is designed to increase the capacity of tourism business operators to create and implement climate change adaptation activities.

Expected Outcomes:

It is expected through the implementation of this action that tourism managers and other related stakeholders would have:

- Increased awareness and knowledge on the impacts of climate change on properties
- Improved ability to design appropriate adaptation measures
- Implementation of emergency and disaster management plans

Guidelines for Implementation:

- Training activities funded and/or conducted by agencies such as CERMES, Caribsavve, CDEMA, and CCCCC
- Demonstration projects designed to showcase appropriate adaptation measures related to the reduction of the carbon footprint including but not limited to energy conservation
- Tapping in to the Smart Energy Fund support some of the adaptation initiatives

Challenges With Implementation:

- The indebtedness of members within the tourism sector challenges their ability to service loans that may be available for these green initiatives
- Climate change and disaster management are not currently perceived as a priority in the context of financial and other daily and monthly managerial responsibilities

Recommended Implementation Agency:

Private sector driven in collaboration with agencies such as CERMES, Caribsavve, CDEMA and CCCCC

Priority / Implementation Timeframe:

High/Medium Term: There are ways for tourism operators to institute adaptation measures that are not costly but that would help to reduce their carbon footprint and improve their disaster readiness

Target Users:

Local tourism managers and operators

Who Benefits:

- Owners of enterprises that contribute to the tourism industry
- All users of tourism enterprises that are vulnerable to the effects of climate change / disasters

Risks:

- Cooperation by business entrepreneurs in the tourism industry
- Inability to access funding due to indebtedness of tourism managers and operators

Estimated Costs:

BDS\$300,000 over a 3 year period

Source Of Funds:

IDB capitalized Smart Energy Fund, grants from CCCCC and CDB

Revenue Generation Potential:

Savings expected, not revenue

Further Development Work Required:

Sourcing of financing

Other Considerations: Linkages with Tourism Awareness, Green Economy objectives

List of Acronyms

APD	Air Passenger Duty
BAS	Barbados Agricultural Society
BCCI	Barbados Chamber of Commerce and Industry
BEF	Barbados Entrepreneurship Foundation
BHTA	Barbados Hotel and Tourism Association
BIDC	Barbados Investment and Development Corporation
BMA	Barbados Manufacturers Association
BMHS	Barbados Museum and Historical Society
BRIC	Brazil, Russia, India, China
BTA	Barbados Tourism Authority
BTII	Barbados Tourism Investment Inc.
CARICOM	Caribbean Community
CBB	Central Bank of Barbados
CBT	Community-based Tourism
CCCCC	Caribbean Community Climate Change Centre
CCMF	Caribbean Centre for Money and Finance
CDEMA	Caribbean Disaster and Emergency Management Agency
CERMES	Centre for Resource Management and Environmental Studies
CHENACT	Caribbean Hotel Energy Efficiency Action Program
CPACC	Caribbean Planning for Adaptation to Global Climate Change Project
CRMP	Coastal Risk Assessment and Management Programme
CRT	Centre for Responsible Tourism
CSO	Civil Society Organization
CTO	Caribbean Tourism Organization
CZMU	Coastal Zone Management Unit
ECLAC	Economic Commission for Latin America and the Caribbean
GAIA	Grantley Adams International Airport
GCCA	Global Climate Change Alliance
GHG	Greenhouse gases
GOB	Government of Barbados
HCTI	Holetown Chamber of Trade Inc.
IADB	Inter-American Development Bank
IAEG	Inter-Agency Executive Group
ICT	Information and Communications Technology
IFI	International Financial Institutions
IIED	International Institute for Environment and Development
IPCC	Intergovernmental Panel on Climate Change
IT	Information Technology
LESC	Lloyd Erskine Sandiford Centre
LOS	Length of Stay
MOT	Ministry of Tourism
NBSAP	National Biodiversity Strategy and Action Plan
NCC	National Conservation Commission
NCF	National Cultural Foundation

NGO	Non-Governmental Organization
NHCA	National Heritage Conservation Area
NPDP	National Park Development Plan
NRMU	Natural Resources Management Unit
NTHP	National Tourism Host Programme
OAS	Organization of American States
ODI	Overseas Development Institute
ODS	Ozone depleting substances
OECS	Organization of Eastern Caribbean States
OEG	Oxford Economics Group
PDP	Physical Development Plan
POV	Purpose of Visit
ROI	Return on Investment
SBA	Small Business Association
SME	Small and Medium-Sized Enterprises
TCDPO	Town and Country Development Planning Office
TDC	Tourism Development Corporation
TMP	Tourism Master Plan
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNWTO	United Nations World Tourism Organization
UWI	University of the West Indies
VAT	Value Added Tax
WTO	World Tourism Organization
WTTC	World Travel and Tourism Council

References

- Alleyne, R. 2012. Government Enforces Commitment to Greener Economy. *Barbados Advocate*, February 13, 2012.
<<http://www.barbadosadvocate.com/newsitem.asp?more=business&NewsID=22784>>
- Alleyne, R. 2013. The Ten-Point Plan. *Nation News*, Barbados, July 19, 2013.
- Alleyne, B. 2013¹. \$1b to Fix Mains. *Nation News*, April 3, 2013.
<<http://www.nationnews.com/index.php/articles/view/1b-to-fix-mains/>>
- Atwell, C. 2012. Speightstown on its deathbed. *Nation News*, May 25, 2012.
<<http://www.nationnews.com/articles/view/speightstown-on-its-deathbed/>>
- AXYS Environmental Consulting (Barbados) Inc., Environmental Planning Group (EPG), Gillespie & Steel Associates and Bellairs Research Institute. 2000. Feasibility Studies of Harrison's Cave and Associated Sites: Final Report. Prepared for the Environmental Special Projects Unit, Government of Barbados, March, 2000.
- AXYS Environmental Consulting (B'dos) Inc. and Jacques Whitford Inc. 2006. Social Impact Assessment: Relocation of Oistins Civic Centre. Draft Final Report, October 2006.
- AXYS Environmental Consulting (B'dos) Inc. and Jacques Whitford Inc. 2007. Relocation of Oistins Civic Centre: Final Report. Prepared for BTII, Bridgetown.
- Barbados Advocate. 2011. Government, IADB Sign Second Loan Deal for Sustainable Energy Framework. *Barbados Advocate*, November 17, 2011.
- Barbados Advocate. 2013. Treated waste water high on agenda. *Barbados Advocate*, May 12, 2013. <<http://www.barbadosadvocate.com/newsitem.asp?more=local&NewsID=30533>>
- Barbados Chamber of Commerce and Industry (BCCI). 2013. Revitalizing Bridgetown. BCCI, Barbados.
<<http://www.barbadoschamberofcommerce.com/bridgetown>>
- Barbados Marine Trust. 2004. Reef Balls, BMT, Barbados.
<<http://www.reefball.com/map/barbadosmarinetrust/barbados%20marine%20trust%20-%20reef%20balls.htm>>
- Blackbird Design. 2012. Folkestone Marine Park and Reserve: A Look at Redevelopment. Prepared for the NCC, Barbados, February 2012.
- Burnham, L. 2012. No Politics. *Barbados Today*, May 12, 2012.
<<http://news.barbadostoday.bb/barticlenew.php?ptitle=NO%20POLITICS&article=16806>>
- Campaign for the Protection of Rural Wales (CPRW). 2014. Rural Wales. Spring 2014 Edition. Welshpool, Wales, 26 pp.

Caribbean Broadcasting Corporation (CBC) News. 2013. Agricultural Entrepreneurship Centre to be Set Up. CBC News, January 25, 2013.

Caribbean Centre for Money & Finance (CCMF). 2011. Caribbean Tourism 2011 – Trends and Prospects. *Newsletter* 4(5): May 2011.

Caribbean Community Climate Change Centre (CCCCC). 2009. Climate Change and the Caribbean: A Regional Framework for Achieving Development Resilient to Climate Change (2009-2015). CCCCC, 41 pp.
<<http://www.preventionweb.net/english/professional/publications/v.php?id=11465>>

Caribbean Community Climate Change Centre (CCCCC). 2011. Delivering Transformational Change 2011-21: Implementing the CARICOM Regional Framework for Achieving Development Resilient to Climate Change. CCCCC, June 2011.
<<http://www.iadb.org/intal/intalcdi/PE/2011/10128.pdf>>

Caribbean Community Climate Change Centre (CCCCC). 2012. The CARICOM Regional Implementation Plan. Presented by J. McGann, CCCCC at the First GCCA Programme Steering Committee Meeting, July 10-11, 2012.
<http://www.gcca.eu/sites/default/files/ACP/caribbean_component_implementation_plan_1st_scm_caricom_july2012.pdf>

Caribbean Disaster Emergency Management Agency (CDEMA). 2007. Enhanced Comprehensive Disaster Management Programme Framework 2007 – 2012. CDEMA, Barbados.
<<http://www.cdema.org/publications/CDMFrameworkInfoSheet.pdf>>

Caribbean Disaster Emergency Management Agency (CDEMA). 2009. Disaster Risk Management Strategy and Plan of Action for the Tourism Sector in the Caribbean. The Regional Disaster Risk Management for Sustainable Tourism in the Caribbean Project. CDEMA, Barbados.

Caribbean Planning for Adaptation to Global Climate Change Project (CPACC). 2002. Component 6 Coastal Vulnerability and Risk Assessment (Barbados, Grenada and Guyana): Barbados' Coastal Vulnerability and Risk Assessment. CPACC, Barbados, 110 pp.

Caribbean Tourism Organization (CTO). 1999. Sustainable Tourism Development Strategy and Plan of Action for the Caribbean. CTO, March 17, 1999, 7 pp.
<<http://onecaribbean.org/content/files/ctosustainabletourismstrategy.doc/>>

Caribsavé. 2012. Caribsavé Climate Change Risk Profile for Barbados.
<<http://caribsavé.org/assets/files/CCCRA%20Final%20Documents/FINAL%20Summary%20Document%20CCCRA%20-%20Barbados.pdf>>

Ceballos-Lascurain, H. 1996. Tourism, Ecotourism and Protected Areas. IUCN, Gland, Switzerland and Cambridge, UK.

CEES (Coastal & Environmental Engineering Solutions) Inc. 2007. Beach Management Plan for Barbados. Prepared for the National Conservation Commission, 110 pp.

Central Bank of Barbados. 2010. Annual Economic Review 2010. Government of Barbados.

<www.economicaffairs.gov.bb/download.php?id=228>

Centre for Resource Management and Environmental Studies (CERMES). 2009. National Adaptation Strategy to Address Climate Change in the Tourism Sector in Barbados: Synthesis of the Technical Reports. Prepared for the CCCCC, Belize. CERMES, UWI, Cave Hill, 143 pp.

Chandler, L. in: Barbados Advocate. 2013. Treated Wastewater High on Agenda. Barbados Advocate, May 12, 2013.

<<http://www.barbadosadvocate.com/newsitem.asp?more=local&NewsID=30533>>

Charara, N., A. Cashman, R. Bonnell, and R. Gehr. 2011. Water use efficiency in the hotel sector of Barbados. *Journal of Sustainable Tourism*, 19(2): 231- 245.

CNN Travel. 2013. World's 100 Best Beaches. CNN, June 6, 2013.

<<http://www.cnn.com/2013/05/28/travel/100-best-beaches>>

Cole, D.N., M.E. Petersen, and R.C. Lucas. 1997. Managing Wilderness Recreation Use: Common Problems and Potential Solutions. *Gen. Tech. Rep. INT-GTR-230*, USDA Forest Service, Intermountain Research Station, Ogden, UT, USA.

Cooke, V. 2012. Eco-Adventures. *Nation News*, May 7, 2012.

Cumberbatch, J. 2011. Report of the Town Hall Meetings Convened on the White Paper for the Development of Tourism in Barbados. Prepared for the Ministry of Tourism, Barbados (unpublished).

Cumberbatch, J. and J. Moses. 2011. Social Carrying Capacity in Beach Management in Barbados. *Journal of Coastal Research: Special Issue 61 - Management of Recreational Resources*, pp. 14 – 23.

Cumberbatch, L. (2013). Water and Sanitation Systems Upgrade in Barbados: Design and Oversight of the Replacement of Approximately Forty-nine Kilometres (49km) of Water Mains. Barbados Water Authority Project Execution Unit & Inter-American Development Bank – IDB. < <http://bit.ly/1cCDtC7> >

Cummins, K. 2013. Reviving the Gap. *Barbados Today*, April 13, 2013.

Dakers, A., D. Lees, R. Cullen, and G. Meyer-Hubber. 2004. Impact of Tourism on Water and Wastewater Services in Small Towns. Tourism Recreation Research and Education Centre, Lincoln University, New Zealand.

Delcan International Corp. 1993. Nearshore Benthic Marine Communities of the West and South-west Coasts of Barbados: Importance, Impacts, Present Status and Management Recommendations. Prepared for the Coastal Conservation Project Unit, Ministry of Environment, Housing and Lands, 1993.

Delcan International Corp. 1994. Water Levels for Barbados. Feasibility Studies on Coastal Conservation. Prepared for the Coastal Conservation Project Unit, Ministry of Environment, Housing and Lands, August 1994, 101 pp.

Delcan International Corp. 1994¹. Nearshore Marine Water Quality of the West and Southwest Coasts of Barbados: Present Status and Management Recommendations. Prepared for the Coastal Conservation Project Unit, Ministry of Environment, Housing and Lands, August 1994.

Duffy-Mayers, L. and M. Oven. 2010. The Caribbean Hotel Energy Efficiency Action Program (CHENACT). CARILEC 2010 CEO Conference, Antigua, May 24-26, 2010.

Duffy-Mayers, L. and U. Bhattacharjee. 2012. Caribbean Hotel Energy Efficiency Action (CHENACT) – Sustainable Tourism for Caribbean. Seminar held in Georgetown, Guyana, April 18, 2012.

Economic Commission for Latin America and the Caribbean (ECLAC). 2009. Economics of Climate Change in Latin America and the Caribbean: Summary 2009. United Nations, 67 pp.

Economic Commission for Latin America and the Caribbean (ECLAC). 2011. An Assessment of the Economic Impact of Climate Change on the Tourism Sector in Barbados. United Nations, 82 pp.
<http://www.eclac.org/portofspain/noticias/paginas/0/44160/Barbados_LCARL314.pdf>

Energy4Me. 2013. Environmental Impact by Energy Source.
<<http://www.energy4me.org/energy-facts/environmental-protection/environmental-impact-by-source/>>

Environmental Planning Group (EPG), People Dynamics Associates, and Social and Environmental Management Services. 2003. Gully Ecosystem Management Study. Prepared for the Ministry of Housing, Lands and the Environment, November 2003.

Fair Trading Commission. 2012. Renewable Energy: Where are We? Government of Barbados.
<http://www.ftc.gov.bb/index.php?option=com_content&task=view&id=212&Itemid=85>

Francis, K.K. 2012. Climate Change and Tourism in Barbados: An Assessment of the Knowledge, Attitudes and Practices of the Tourism Stakeholders on the West Coast as it Relates to the Risks of Global Climate Change. UWI-CERMES, Cave Hill, Barbados, 73 pp.

Garafano, N. and L. Edghill. 2011. All Things Green: A Budding Green Economy. *Business Barbados*, 13th Edition (2011): 102-103.

Global Climate Change Alliance (GCCA). 2012. GCCA CARIFORUM Support Programme<<http://www.gcca.eu/intra-acp/gcca-cariforum-support-programme>>

Government of Barbados. 1998. The National Park Development Plan: Guidelines for Management and Operation of the Barbados National Park and Other Natural Heritage Conservation Areas. Draft, February 1998.

Government of Barbados. 2002. A National Biodiversity Strategy and Action Plan for Barbados. Ministry of Physical Development and Environment, July 2002, 156 pp.

Government of Barbados. 2003. Physical Development Plan: Amended. Barbados.

Government of Barbados. 2005. Third National Report to the Convention on Biological Diversity. Prepared by D.F.P. Oderson, 178 pp.

Government of Barbados. 2008. Energy Efficiency in Barbados. Ministry of Finance, Economic Affairs & Energy, August 5, 2008. <<http://bit.ly/16ldE6h>>

Government of Barbados. 2008¹. Road Map Towards Integrated Water Resources Management Planning for Barbados. Prepared by Caribbean Environmental Health Institute, St. Lucia and funded by GEF, November 2008, 126 pp.

Government of Barbados. 2009. National Report to United Nations Commission for Sustainable Development (UNCSD) Cycle 18/19 (2009/2010). Environment Division, Ministry of the Environment, October 2009, 52 pp.

Government of Barbados. 2010. Barbados National Assessment Report. Ministry of Environment, Water Resources and Drainage, 123 pp.
<sidsnet.org/msi_5/docs/nars/Caribbean/Barbados-MSI-NAR2010.pdf>

Government of Barbados. 2010¹. Historic Bridgetown and its Garrison: Nomination Document 2010. Ministry of Community Development and Culture, Barbados, 332 pp.

Government of Barbados. 2011. Barbados' Fourth National Report to the Convention on Biological Diversity (CBD). Natural Heritage Department, Ministry of Environment and Drainage, June 24, 2011.

Graefe, A.R., R.R. Kuss, and J.J. Vaske. 1984. Visitor Impact Management: The Planning Framework. National Parks and Conservation Association, Washington. D.C.

Greenidge, K. and N. Greenidge. 2011. Sustainable Tourism Development: The Case of Barbados. *Central Bank of Barbados Economic Review*, 37(1&2): 83-125.

Hotel Energy Solutions. 2011. Key Energy Efficiency Solutions for SME Hotels. Hotel Energy Solutions project publications, First edition 2010, Revised version, July 2011.

Husbands, J. 2010. The Financial Benefits of Solar Hot Water Systems to Barbados. Alternative Energy Pathways to a Sustainable Energy Future Workshop, Government of Barbados, September 2010.

<<http://www.centralbank.org.bb/Publications/Engergy/Programme.html>>

IBM Corporation, 2009. UWI Centre for Food Security & Entrepreneurship – Overview: Framing the Issues and Drafting Solutions. Prepared for the Government of Barbados and UWI, IBM, 2009, 17 pp.

Inniss, V. 2001. Government of Barbados: State of the Environment Report 2000. Ministry of Physical Development and Environment, Barbados, 111 pp. Published by UNEP.

Inter-American Competitiveness Network. 2012. Sustainable Energy Framework for Barbados. June 1, 2012. RIAC Report, Barbados Experience.

<<http://www.riacreport.org/barbados/Sustainable%20Energy.pdf>>

Inter-American Development Bank (IADB). 2008. Barbados Priority: Protecting the Coastline. IDB America, April, 2008.

<<http://www.iadb.org/idbamerica/index.cfm?thisid=4565>>

Inter-American Development Bank (IADB). 2012. IDB Approves \$17 Million for Barbados Smart Energy Programme. Inter-American Development Bank, June, 2012.

<<http://www.iadb.org/en/news/news-releases/2012-06-28/barbados-public-sector-smart-energy-program,10049.html>>

International Institute for Environment and Development (IIED). 2011. International Conference: Responding to Climate Change in the Caribbean. IIED, London.

<<http://www.iied.org/international-conference-responding-climate-change-caribbean>>

International Union for the Conservation of Nature (IUCN). 2002. Sustainable Tourism in Protected Areas Guidelines for Planning and Management.

<<http://data.iucn.org/dbtw-wpd/edocs/PAG-008.pdf>>

Jackson, I. 2002. Potential Impacts of Climate Change on Tourism. OAS, Washington.

<www.oas.org/macc/Docs/TourismReport.doc>

Jacobs Consultancy. 2011. Airport Master Plan. Prepared for the Grantley Adams International Airport, Barbados.

Jönsson, C. 2005. Barbados Casuarina Beach Resort - A Model for the Use of Cleaner Technologies in the Hotel Sector? 2nd Tourism Outlook Conference - Tourism Edge and Beyond, 5-7 December 2005, Hotel UiTM, Selangor.

<http://www.academia.edu/1633069/Barbados_Casuarina_Beach_Resort_-_A_model_for_the_use_of_cleaner_technologies_in_the_hotel_sector>

Jordan, R. 2013. Eye on Energy. *Nation News*, March 7, 2013.

<<http://www.nationnews.com/articles/view/eye-on-energy/>>

- Leslie, J. 2010. Socio-Economic Monitoring in Oistins. Barbados Centre for Resource Management and Environmental Studies (CERMES), UWI Cave Hill.
- Leslie, K. 2011. Responding to Climate Change in the Caribbean. Keynote speech delivered by the Executive Director of the CCCCC at a conference, University of London, June 13 – 14, 2011.
- Manidis Roberts. 1997. Developing a Tourism Optimization Management Model (TOMM). Final Report, South Australian Tourism Commission, Adelaide.
- Manning, R. 1979. Strategies for Managing Recreational Use of National Parks. *Parks*, 4: 13-15.
- Mayers, D. 2012. Our Heritage: Oistins. Caribbean Broadcasting Corporation production that aired December 24, 2012, Barbados.
- McVetty, D. and P. Wight. 1999. Optimizing Tourism Outcomes in Canada's National Parks: Two Case Studies. *Tourism Destination Marketing – Gaining the Competitive Edge*, Travel and Tourism Research Association European Conference, Dublin, September 1999.
- Meade, B. 2011. "Save The Planet, Save Your Money: Cutting Costs Through Responsible Resource Use". Presented at the Caribbean Conference on Sustainable Tourism Development, Bermuda, April 2011.
<<http://www.onecaribbean.org/content/files/BillMeadeSTC12.pdf>>
- Moore, W., A. Cashman, and J. Cumberbatch. 2012. The Effects of Climate Change on Tourism in Small States: Evidence from the Barbados Case. *Tourism Review*, Vol. 67(3).
- Nation News. 2006. Minister to SSA: Well Done! *Nation News*, October 9, 2006.
< <http://barpublish.bits.baseview.com/331527299720364.php>>
- Nation News. 2007. Plans for Botanical Garden in Zone 1. *Nation News* October 9, 2007.
<<http://barpublish.bits.baseview.com/story/292580840086172.php>>
- Nation News. 2012. Needhams Point at Risk. *Nation News*, January 15, 2012.
<<http://www.nationnews.com/articles/view/needhams-point-at-risk/>>
- Nation News. 2013. Pan to Link Cities. *Nation News*, July 7, 2013.
<<http://www.nationnews.com/articles/view/pan-to-link-cities/>>
- OECS. 2006. St. George's Declaration of Principles for Environmental Sustainability in OECS. OECS Secretariat, St. Lucia, 30 pp.
- Ogden, P. 2009. National Ecosystem Assessment: Forces of Change and Responses Needed to Conserve the Quality of Wales' Environment. Excerpt from a presentation by the Director of the Campaign for the Protection of Rural Wales, October 26, Aberystwyth, 2009.

Rawlins-Bentham, J. 2012. Climate Change Issues a Factor in Coastal Zone Management. GIS Barbados, October 5, 2012.

<www.gisbarbados.gov.bb/plugins/p2_news/printarticle.php?p2_articleid=9178>

Rawlins-Bentham, J. 2012¹. Public Urged To Care Richard Haynes Boardwalk. Barbados Integrated Government, January 30, 2012.

<<http://www.gov.bb/bigportal/citz/articles/showArticle.php?file=boardwalk.xml&ag=citz>>

Rawlins-Bentham, J. 2012². Environmental Management Act on the Way. BGIS Media, April 2, 2012. <http://gisbarbados.gov.bb/index.php?categoryid=13&p2_articleid=7833>

Rawlins-Bentham, J. 2012³. Barbados Climate Change Mitigation Efforts Applauded. *BGIS Media*, October 8, 2012.

<http://gisbarbados.gov.bb/index.php?categoryid=9&p2_articleid=9194>

Rawlins-Bentham, J. 2013. Introduction of Environmental Police Under Consideration. BGIS Media, January 14, 2013.

< http://www.gisbarbados.gov.bb/index.php?categoryid=13&p2_articleid=9876>

RWA Architects. 2010. RWA Photo Gallery for Bridgetown. RWA, Barbados.

Schuhmann, P.W. 2012. The Economic Value of Coastal Resources in Barbados: Vacation Tourists' Perceptions, Expenditures and Willingness to Pay. CERMES Technical Report No. 50, University of the West Indies, Cave Hill Campus, Barbados, pp. 36.

Selman Moore, R. 2012. BWA Facing Water Service Challenges. *Barbados Advocate*, May 31, 2012.

< <http://www.barbadosadvocate.com/newsitem.asp?more=3Dlocal&NewsID=25033>>

Silva, M. 2000. Sustainable Tourism Development in the Caribbean: Identifying Measurement Instruments. Workshop on Environment Statistics for CARICOM Member Countries organized by the UN Statistics Division, Belize, August 9, 2000, 29 pp.

Skeete, A. 2012. Barbadians Told to Pay Attention to Water Usage. GIS Barbados. December 18, 2012

<http://www.gisbarbados.gov.bb/index.php?categoryid=13&p2_articleid=9767>

Smith Warner. 2007. Intermediate Risk Assessment Report: St. Peter, Barbados. Prepared for the IADB and CDERA, 118 pp.

Travelife. 2012. <www.travelife.org>

Tourism Development Corporation (TDC). 2012. Project Highlights: Product Development – Ecotourism. TDC, Barbados

<<http://www.tdcbarbados.com/projects>>

Trotz, U. O'D. 2008. Climate Change and Development in the Caribbean Sub-Region.

<<http://www.cyen.org/innovaeditor/assets/Trotz%20overview.pdf>>

- United Nations. 1997. Framework Convention on Climate Change.
<http://unfccc.int/essential_background/convention/background/items/2536.php>
- United Nations. 2002. National Sustainable Development Report: Barbados. UN Commission on Water.
<<http://www.un.org/esa/agenda21/natinfo/wssd/barbados.pdf/>>
- UNEP. 2001. Environmental Impacts of Tourism. United Nations Environment Programme
<<http://www.gdrc.org/uem/eco-tour/envi/>>
- UNEP. 2008. Climate Change in the Caribbean and the Challenge of Adaptation. UNEP Regional Office for Latin America and the Caribbean in collaboration with CARICOM, 82 pp.
- UNEP. 2010. National Environmental Summary: Barbados. Prepared by ecoNatural Resources Management Consultant, Barbados, 47 pp.
- UNEP. 2013. The Caribbean Environment Programme: Solid Waste and Marine Litter.
< <http://www.cep.unep.org/publications-and-resources/marine-and-coastal-issues-links/solid-waste-and-marine-litter>>
- United Nations World Tourism Organization (UNWTO). 2007. UNWTO and Climate Change: Overview September 2007.
< sdt.unwto.org/sites/all/files/docpdf/docuoverview.pdf>
- United Nations World Tourism Organization (UNWTO). 2011. Tourism and Sustainability. UNWTO, December 2011.
<<http://dtxqtq4w60xqpw.cloudfront.net/sites/all/files/docpdf/sustainability.pdf>>
- University of the West Indies (UWI). 2012. Green Economy Scoping Study – Synthesis Report: Barbados. University of the West Indies, Cave Hill Campus, Barbados, 68 pp.
- University of the West Indies (UWI). *Forthcoming*. Green Economy Scoping Study for Barbados. Published by UNEP and prepared for the Government of Barbados, 261 pp.
- U.S. Environmental Protection Agency (USEPA). 2012. Brownfields and Land Revitalization: Brownfields Definiton. <<http://epa.gov/brownfields/overview/glossary.htm>>
- Washburne, R.F. 1982. Wilderness Recreational Carrying Capacity: Are Numbers Necessary? *Journal of Forestry* (80): 726-728.
- Watt, D. 1966. Man's Influence on the Vegetation of Barbados 1627 to 1800. University of Hull Occasional Papers in Geography (4): 96 pp.
- Wight, P. 1996. Planning for Success in Sustainable Tourism. Invited paper presented to *Plan for Success*, Canadian Institute of Planners National Conference, Saskatoon, Saskatchewan, June 2-5, 1996.

Wight, P. 2002. Management Tools and Approaches for Resource Protection and Protected Area Management in Tourism Destinations: A Practical Perspective. Published as "Practical Management Tools and Approaches for Resource Protection and Assessment". In: Diamantis, D. and Geldenhuys, S. (Eds.) 2004, Ecotourism: Management and Assessment. Thomson: London.

Williams, P. 2013. Renewable Energy Developments in Barbados. *Business Barbados*, July 3, 2013.

<<http://businessbarbados.com/industries/energy-and-utilities/renewable-energy-developments-barbados/>>

World Bank/OAS. 2002. 3rd Assessment Report of the Inter-Governmental Panel on Climate Change. Booklet on Mainstreaming Adaptation to Climate Change Programme, published by the World Bank/OAS.

World Travel & Tourism Council. 2012. Travel & Tourism Economic Impact 2012, Barbados. WTTC, London.

**Ministry of Tourism and International Transport
Government of Barbados
2014**