Antigua and Barbuda

SIDS 2014 Prepatory Progress Report (July 2013)

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1 Introduction

The historic Rio Earth Conference brought sustainable development to the global political agenda. As part of this process and in recognition of the peculiar vulnerabilities and challenges faced by Small Island Developing States (SIDS) a separate program, the Barbados Program of Action (BPOA) and its subsequent successor, the Mauritius Strategy of Implementation (MSI), was developed. This approach was envisaged as a separate commitment strategy specifically for Small Island Developing States to effectively address sustainable development issues. Essentially, the overall objective of the BPOA and the MSI is to secure renewed political commitment for sustainable development, and assessing the progress of SIDS in their capacity to address new and emerging challenges. It is important to note that the Barbados Program of Action represents the first commitment, collectively and comprehensively addressing the sustainable development issues faced by SIDS. In conjunction with the MSI it also provides a strategic framework that aims to mitigate the underlying vulnerabilities of SIDS.

The BOPA was adopted with fourteen priority areas and the necessary actions to be undertaken to meet these objectives. The priority areas included climate change and sea level rise, natural and environmental disasters, management of waste, coastal and marine resources, freshwater resources, land resources, energy resources, tourism resources, biodiversity resources, national institutions and administrative capacity, regional institutions and technical cooperation, transport and communication, science and technology and human resource development. The other cross sectoral areas identified as requiring attention included capacity building, institutional development at the national, regional and international levels, cooperation in the transfer of environmentally sound technologies, trade and economic diversification as well as finance. In culmination of the ten-year review of the BPOA there was the adoption of the MSI for the further implementation f the BPOA. In recognition of the fact that SIDS were still having constraints in implementing the BPOA the MSI set out nineteen priority areas building on the original fourteen from the BPOA. The additional areas included graduation from least developed country status, trade, sustainable production and consumption, health, knowledge management and culture. These were aimed at helping each SIDS to meet the international targets and goals established.

As part of the reporting requirements under these two strategies as well as to asses their progress, countries are expected to conduct internal and regional assessments prior to the 2014 SIDS Conference to determine how the first conference and other subsequent processes have influenced their development agenda. In preparation for this important meeting SIDS member states have held several regional meetings including at the levels of the Caribbean Community (CARICOM) and the Group of Latin America and the Caribbean States (GRULAC). Subregional meeting led to a series of recommendations at the regional and global levels, which included calls for the strengthening of the CARICOM and the Alliance of Small Island States (AOSIS), establishing a new model of ocean governance and improving the coordination with the United Nations system in relation to defining sustainable development indicators. In line with the country priorities identified by Antigua and Barbuda, the following emerging issues were acknowledged at the meeting: non-communicable diseases, ecosystem services, the challenges associated with the opening of new shipping routes in the Arctic region and higher sea levels, climate change and energy, food and livelihood security. Priority was also placed on the weather-related disasters that have put the countries of the Caribbean to the test over the last decade. These have had serious implications for the economies of the region in addition to the global economic recession.

At the level of the GRULAC, a meeting held in Santiago Chile on the 7-8th September 2012, identified the following priorities for the countries in the region. Antigua and Barbuda supports these priorities and aligns itself at the national level with a commitment to ensure their implementation. The priorities include:

- The eradication of extreme poverty,
- A change in patterns of production and consumption, in which the developed countries should play a leading global role,
- Effective access to and transfer of safe and appropriate technologies, without conditionality and on preferential terms for developing countries,
- The promotion of a global intellectual property rights regime that facilitates the transfer of such technologies, in keeping with the commitments undertaken by each country,
- Full implementation of the right to access to environmental information, participation and justice enshrined in Principle 10 of the Rio Declaration,
- A global institutional framework for sustainable development which is efficient and flexible and ensures the effective integration of its three pillars,
- New, additional, stable and predictable financing for supporting implementation activities in developing countries,
- The fulfilment of mitigation and adaptation commitments in relation to climate change and the building of resilience to its impacts,
- Greater South-South cooperation and exchange of successful experiences,
- The restoration of harmony with nature,
- Better ways of measuring countries' wealth that adequately reflect the three pillars of sustainable development.

Despite these challenges progress has been made at the national level as Antigua and Barbuda has undertaken a number of national and regional initiatives to attain sustainable development. These initiatives have been outlined in the sections below based on the priorities considered in the BPOA and the MSI.

The preparation process for SIDS 2014 is being led by the Permanent Mission of Antigua and Barbuda to the UN in New York and at the national level by the Environment Division and the Ministry of Foreign Affairs.

1.1 Country Profile

Antigua is located at 17o 10' N and 61o 55'W with a total land area of 270Km^2. Approximately 40Km to the north is the island of Barbuda which is located at 17o 35'N and 61o 48'W with a land area of 155 Km^2. The islands are part of the Leeward Islands which are in the north-eastern section of the Caribbean archipelago. The twin islands of Antigua and Barbuda sit on an extensive underwater platform known as the Barbuda Bank which has a total area of 3,500 Km^2 and is within the EEZ estimated at 110,071 Km^2.

In 2007, Antigua and Barbuda was ranked 57th on UNDP's Human Development Index making it the

second highest ranked in the OECS after Saint Kitts and Nevis which was ranked 54th. This high human development rank is based on a life expectancy at birth of 73.9 years, a literacy rate of 85.8%, and GDP per capita of US$12,500 in 20045. Such a high standard of living makes the twin island one of the three most attractive places for intra-regional migrants within the GEF SGP's subregional programme area, with the others being Barbados and Saint Lucia.

According to the Caribbean Development Bank, Antigua and Barbuda's economy recorded the best economic performance in the 25 years since independence when GDP grew by 12% in 2006 compared with 5% in the previous year. In 2005, the GDP at market prices was estimated at US$459.487 million and the GDP per capita was US$10,513. This relatively high GDP per capita was made up of contributions from various sectors as follows: Transportation and Communications (20.8%); Government Services (16.8%); Construction (16.2%); Financial and Business Services (16.1%); and Hotels and Restaurants (9.9%). Comparatively, the Agriculture sector contributed only 3.6% to the value of GDP in 2005 and has continued its steady decline for a number of years. The main direct and indirect contributor to GDP is tourism which is the most significant economic driver for the economy. In 2005, CDB estimates gross tourism revenue amounted to almost 50% of GDP. Like many other SIDS in the Caribbean, the economy of Antigua and Barbuda has transitioned from an agrarian to a more service oriented economy within the last 25 years, but the economy lacks diversity and therefore resilience.

Crime, poverty and environmental degradation are considered major issues affecting the future development of Antigua and Barbuda. The CDB in its recent economic review noted that violent crime involving firearms had the potential to undermine the "... social and economic fabric of the country, but also because of its potential impact on tourism". Poverty is also a major concern with estimates as high as 18% being quoted, up from an estimated 12% in 1994. This increase is of concern and the Government is well aware of this situation. That same report also noted that there was an increase in evidence of coastal degradation which could have adverse impacts on the quality of the environment and the tourism industry. Antigua and Barbuda enjoys a high standard of living but the economy like many SIDS, is fragile and vulnerable to social and environmental issues, which includes the impacts of disasters, in particular hurricanes.

1.2 Report Overview

The Government of Antigua and Barbuda has taken many strides in its effort to implement the Barbados Program of Action to achieve the agenda 21. This report provides an overview of the advancements, gaps and emerging challenges of the country.

The report first summarizes the progress made in the thematic areas of the BPOA and MSI with specific mentions of the significantly improved policy and legislative framework that guides national considerations for sustainable development. Pivotal to the policy and legislative framework for sustainable development, the reports highlights the National Physical Development Plan (NPDP) and National Environmental Management Strategy which cumulatively creates an overarching framework for land use developments. The upcoming enactment of the Environment Protection and Management Bill signifies the country's progress towards environmental sustainability and economic development.

The report will demonstrate that although the Government of Antigua and Barbuda has demonstrated much political will through the development and adoption of national policies addressing the various facets of sustainable development, climate change adaptation and mitigation presents a great challenge, in addition to invasive species and global economic trends and policies. The growing impacts of climate change and responsibility to meet international mitigation standards have enlisted a significant amount of financial investment to address this undue pressure. Not only within the context of the national economy, but greater financial assistance is required to support the implementation of national policies aimed at adapting the environment and natural resources as well as social liveability.

Overall, the Government of Antigua and Barbuda has made significant effort to enact the legislation and establish an enabling environment necessary to address the management of its natural resources. However, the process for creating a legislative environment suitable to promote the basic tenants of sustainable development has not followed a coordinated path.

2 National Assessment: Where we are

The following chapter provides a brief summary of the national actions undertaken to implement the BPOA and MSI. The chapter first summarizes the progress made within the key focal areas of the BPOA and MSI as well as major challenges experienced therein. Conclusion of this chapter highlights the national policy and legislative framework developed to support the advancements made in environmental management and development planning to attain sustainable development despite constraints within the thematic areas of trade liberalization and globalization.

2.1 Climate Change and Sea Level Rise

Antigua and Barbuda ratified the United Nations Framework Convention on Climate Change (UNFCCC) on February 2nd 1993 while the Kyoto Protocol, a subset of UNFCCC, was ratified on October 28th 1998. As a country, Antigua and Barbuda is in the process of preparing its Third National Communication however, the Second National Communication for Antigua and Barbuda, submitted in late 2011 highlights the current climate change situation including present and futuristic impacts. It also details the impact climate change will have on the weather and climate sensitive economic sectors. This subsection also details the implementation of Antigua and Barbuda's obligations under the UNFCCC, including the development of a climate change database, implementation of monitoring programs, research programs and economic instruments and policies as well as development of an inventory of GHG.

Like many SIDS, Antigua and Barbuda's contribution to global CO_2 emissions is insignificant, but the impacts of global warming will be severe because of its high vulnerability. Antigua and Barbuda's survival depends on its natural resources and climatic condition. Without appropriate adaptation, climate change may have an extremely harmful impact on the sustainability of the development process with the coastal zone being most vulnerable. Table 1 highlights the following as the projected changes to Antigua and Barbuda's climate due to global warming:

Climate Parameter	Predicted change for the Insular Caribbean[F1]	Predicted change for Antigua and Barbuda[F2]	Notes
Air temperature	Increase of 1.8 - 4.0°C by 2099	**Increase of 1.3°C by the 2050s** **Increase of 1 - 3.5°C by the end of the century**	There is evidence to suggest that the climate of Antigua and Barbuda is changing. Both maximum and minimum temperatures have increased in the recent past. The warming trend is expected to continue. The country is projected to be 1 to 3.5 degrees warmer by the end of the century. Winter months will see marginally larger increases in temperature than summer months. The frequency of very hot days will increase, while very cool nights will decrease.
Sea surface temperature	~1.7°C by the end of the century	**Up to 2°C by the end of the century**	
Sea level rise	Rise of 0.18 – 0.59 m by 2099	**Rise of 0.24 m by 2050**[F3]	Caribbean Sea levels are projected to rise by up to 0.5 m by the end of the century.
Carbon dioxide	Reduction in pH of the oceans by 0.14 - 0.35 units by 2099	**An increase in carbon dioxide emissions through 2050.**	

[1]Based on global predictions from IPCC WGI, 2007

[2]Climate Studies Group, Mona. University of the West Indies

[3]Estimate for the Caribbean

Table 1: Predicted Impacts of Climate Change

Hurricanes	More intense with larger peak wind speeds and heavier precipitation.	**More intense with larger peak wind speeds and heavier precipitation.**	Hurricane intensity is likely to increase but not necessarily hurricane frequency.
Precipitation	**Unclear**	**Drier (in the mean) by the end of the century**	Climate change will likely make the dry periods occur earlier in the year and rainy periods (in June/July) drier. The seasonality of Antigua and Barbuda will be largely unchanged. The cooler (with respect to late season temperatures) dry early months and wet hotter late months will still prevail. Winter months will see marginally larger increases in temperature than summer months. The frequency of very hot days will increase, while very cool nights will decrease. There is a likelihood that the country will be drier (in the mean) by the end of the century

The island's vulnerability to the impacts of climate change is effectively documented, particularly as it relates to droughts and hurricanes. The country experiences droughts of at least one severe drought per decade and hurricanes which pose annual threats. In September 1995, Hurricane Luis devastated the country resulting in a 17% decrease in tourist arrivals; 7000 unemployed; damages amounting to US$128.35 million or 30.49% of GDP. These impacts are common after hurricanes and with the projected increase in the frequency, size and intensity of hurricanes, climate change adaptation strategies have become an imperative part of national development planning.

To show its commitment to the international process of reducing greenhouse gas emissions to reduce the rate of climate change impacts, Antigua and Barbuda pledged to implement the Copenhagen Accord in 2010 and pledged a target of 25% reduction of its emissions by 2020.

According to the First National Communications to the UNFCCC the total CO2 emissions for 1990 and 1994 were 288.3 Gg and 334.40Gg respectively. The greatest proportions came from Residual Fuel Oil (46.9% in 1994) used for thermal electricity production; Gas/Diesel Oil (27.6% in 1994) used for electricity and road vehicular transport; Gasoline (22.1% in 1994) used in vehicular transport mainly, and also in agriculture and fishing. Comparatively smaller emissions were also documented from LPG (3.4% in 1994) used primarily in the residential sector. These figures have not changed much since the last report in 2009.

This commitment is crucial as it will also help in meeting the anticipated requirements of the new emissions agreement to be negotiated by 2015 under the Durban Platform. The Government is yet to put in place the necessary institutional and other arrangements to set the meeting of this target in motion. However, it is expected that with the assistance from the GEF, and access to other finical support as indicated in section three and eight of the Copenhagen accord, this will be completed and approved for implementation in 2013.

In the interim, the government has undertaken activities also aimed at meeting the Cancun agreements with its undertaking of inventories to determine its human-generated greenhouse gas emissions, as well as through accessing mobilized funds internationally so as to undertake effective actions based on the requirements of the agreement and meeting the climate change challenges.

It is worth nothing that the establishment of effective institutions and systems to ensure the achievement of the objectives in the country has still not been completely implemented. Additionally, though work on the protection of the forest reserves in the country has begun, this has not yet been completed. As an objective of the agreement, this goal remains on the agenda and is currently being addressed through the implementation of the physical development plan and the protected areas system plan.

2.2 Natural and Environmental Disasters

As in the case of many SIDS, a major obstacle for Antigua and Barbuda in its pursuit of sustainable development is that of natural disasters. Extreme weather events, such as droughts, floods, wildfire, and heat waves can cause significant damage whenever they occur and are responsible for a large part of the climate related impacts[4]. The type, frequency and intensity of extreme events are expected to change as

[4]ESAL 2009 Environmental Variability and Extreme Event Forecasting

the Earth's climate changes. Tropical Waves, Depressions, Storms and Hurricanes are relatively common in this region.[5,6] These storms form just off the coast of Africa during the Hurricane season (June – November) and usually pass somewhere through the Leeward Island chain (of which Antigua and Barbuda is part) on a north westerly course depending, of course, on the atmospheric conditions. Even if the islands do not receive direct hits from storms, the storm surge is usually enough to create significant damage to the coastal regions. Antigua and Barbuda had a forty- five year reprieve of direct hits by dangerous storms. In 1950, two severe hurricanes stuck these islands in the space of twelve days causing great damage. In 1995, Category 4 Hurricane Luis devastated Antigua on the 4th - 5th Sept. to be followed ten days later by Category 1 Hurricane Marilyn. The damage was in the millions of dollars. The forty-five year reprieve lead to little attention being paid to design standards and the development of known hazardous areas. There was closure and loss of revenue in all major tourism facilities along the coast, 17% decrease in tourist stay over arrivals (Graph 8) and 7000 persons were left unemployed. The total cost of damages was EC$ 346.54 million or 30.49% of the GDP at factor cost in 1994.

In 1998, Category 2 Hurricane Georges struck Antigua and Barbuda causing damage estimated at EC$200 million. In 1999, Category 2 Jose hit Antigua in October and Hurricane / Tropical Storm Lenny hit in November, the combined estimated damage was EC$ 247.43 million. Since 1999[7]Antigua and Barbuda has gone 12 straight years without a hurricane making land-fall on our shores. This, however, does not mean that Antigua and Barbuda has been without its challenges. In 2011, Antigua and Barbuda encountered 3 tropical storms, namely Irene, Maria and Ophelia. Although tropical storms do not bring substantial winds, the rainfall and coastal erosion associated with them can at times wreak significant damage. In recent years, tropical storm Omar (2008) cost US$18 million in damage[8]. Direct impact on the tourism arrival however was minimal.

As part of a large scale GEF funded project, an Environmental Sensitivity Index Map was developed in partnership with the National Office of Disaster Services. The map created as part of an Environmental Information Management and Advisory System (EIMAS) uses a Geographical Information Systems (GIS) based platform to digitally highlight the locations and types of ecological resources within the country. Through the use of the EIMAS, flood hazard maps have been developed to plan and coordinate emergency responses. Additionally, the 2012 National Physical Development Plan makes strong recommendations and prohibits development within certain areas. The National Disaster Risk Management Plan has been recently updated as part of a regional initiative in partnership with Caribbean Disaster Emergency Management Agency.

Disaster management on the island is spearheaded by the National Office of Disaster Services and its management and administrative board is the National Disaster Council. During disasters, the National Emergency Operations Centre (NEOC) is activated and consists of many key stakeholders across

[5]National Office of Disaster Services, Govt. of Antigua & Barbuda
6 Cordell Weston, Hurricane the Greatest Storm on Earth, (Antigua Archives Committee) pp 4-8

[7]Destin D (2012)The Atlantic Hurricane Season Summary – 2011 Special Focus on Antigua and Barbuda, Antigua and Barbuda Meteorological Servicehttp://www.antiguamet.com/Climate/HURRICANE_SEASONS/HurricaneSeason2011.pdf

[8]Antigua and Barbuda Meteorological Services (2008) The Atlantic Hurricane Season Summary – 2008Special Focus on Antigua and Barbudahttp://www.antiguamet.com/Climate/HURRICANE_SEASONS/2008/Hurricane_Season2008.pdf

government ministries and civil society. Guided by the National Disaster Risk Management Plan, the NEOC plans and coordinates the appropriate risk management measures based on the type and location of disasters.

2.3 Waste Management

Significant measures have been undertaken to implement the national actions proposed for waste management. However, the environment continues to be degraded by the improper disposal of wastes, particularly liquid waste as there is no central sewer system. Waste is officially deposited at one site, namely the Cooks Sanitary Landfill and Civic Amenities Site, located on the western part of Antigua. The Cooks Landfill is properly constructed, efficient and fully operational. However, sewage collected is disposed of via land pits that are later buried. These pits are located near a wetland preceding Hanson's Bay. With the assistance of the GEF Small Grants Program and the Rotary Club of Antigua Sundown, the Antigua Barbuda Waste Recycling Cooperation (ABWRC) was established as a national recycling facility that caters to plastics, glass, and scrap metal.

The development of fiscal policy to encourage environmentally sustainable imports and local products with low waste or degradable waste content was achieved through the Environmental Levy Act (Bottling and Can levy). The Levy was initially established to see large scale imports benefitting by exporting bottles and cans, however in reality, it became a revenue measure that redounds to the benefit of the National Solid Waste Management Authority (NSWMA). Revenue generation is further constrained as more and more businesses have been granted exemption by the Government which is a grave cause for concern to NSWMA. Moreover, the existing business plan has since been outdated.

Some progress has been made with regards to the development and implementation of appropriate regulatory measures, including emission discharge and pollution standards for the reduction, prevention, and control and monitoring of pollution from all sources. Regulations exist as per the Solid Waste Management Act 1995 and the Litter Act, while pesticides are regulated under the implementation of the Stockholm convention. Some monitoring is done through breast milk testing. As it relates to effluent emissions, hospital effluent emissions are not monitored. The enforcement of the aforementioned regulations still presents a challenge despite ongoing public awareness campaigns.

The NSMA engages schools through its Environmental Services Division and Schools Program as part of a public awareness and education campaign. However, this is not fully functional as more campaign efforts are needed to realize separation of wastes at the source, and illegal dumping. Moreover, garnering support and buy in at the policy level has not yet been fully realized.

In accordance with Annex V of the International Convention Prevention of Pollution from Ships (MARPOL 73/78), the mechanism exists for the collection of solid waste by barge however, the system is not ideal. The system has departed from what was set out under the OECS ship and solid waste project and requires further improvements.

Waste Data is collected at Cooks Sanitary Landfill based on the category and quantities of wastes received. The NSMA continues to measure all categories of waste for waste management through waste

receipts and a waste type attracter tipping fee. However, although the quantity of wastewater is measured, proper disposal continues to be an issue as sewage is just buried in pits at the landfill.

Wastewater generated on the island is predominantly disposed either to on-site sub-surface disposal systems (soak-aways and drain fields) and/or to roadside gutters, culverts and watercourses[9] as there is no central sewage collection and transfer treatment system in place. During heavy rainfall, this poses a significant threat to freshwater resources and the potential spreading of diseases. By contrast, the Development Control Authority (DCA) in corporation with the Central Board Of Health has consistently required the construction of mechanical type on-site wastewater treatment plants as a prerequisite to the approval of all major new tourism and commercial projects around the island. As a result, almost 75% of the hotels in the north-west tourism zone and 48% of the larger commercial buildings in the St. John's, the capital, have wastewater treatment plants. These plants are typically extended aeration, activated sludge treatment plants, operating as continuous or sequencing batch reactor (SBR) plants. They are designed to treat to secondary level effluent standards (i.e. <30 ppm BOD, < 30 ppm TSS) and often have no provisions for nutrient removal.

Through partnership with the regional Integrated Watershed and Coastal Areas Management (IWCAM) project and the GEF funded Sustainable Island Resource Management Mechanism (SIRMM) project a national wastewater management strategy was developed and is in the process of adoption. Moreover, a sewage treatment plant was installed within the North West coast to cater to residential as well as commercial entities in the nearby area as a demonstration project. The treated grey-water produced will be sold to farmers and some hoteliers to assist with irrigation and landscaping.

Additionally, through the SIRMM project, which is a large scale GEF project, an environmental management system inclusive of an online wastewater management database has been established. The database enables a varied selection of large, medium and small scale hotels within the North West coast to upload data on their respective wastewater management systems and also generate analysis report. This initiative has been successfully achieved through public private partnership in that the Central Board of Health, and Environment Division have unlimited access to the uploaded data. Analysis reports generated will alert the respective government agencies to discrepancies or to breaches within the system and initiate a full onsite investigation. Although established as a pilot demonstration project with only 5 hotels currently using this database, it is envisaged that this tool will be expanded to other hotels and eventually commercial buildings.

2.4 Coastal and Marine Resources

The islands of Antigua and Barbuda are emergent parts of a 3400 sq. km sub-marine platform. The depth of water between the two islands is 27 -33 m. The coastline of Antigua is indented with numerous islands, creeks, inlets, associated sand bars and wet lands. A large portion of the east, north and south coasts are protected by fringing reefs. On the west coast, there are large areas of sandy bottom in shallow water, with sandy bottom between fringing reefs and the shore. The coastline of Barbuda is less varied

[9]IWCAM Wastewater Management Strategy

but has extensive reef systems especially off the east coast. Sections of Antigua and Barbuda's coastline are in various states of erosion based on recent changes in wave action. As the impacts of climate change increases, and tropical storms and hurricanes become more intense, the impact of these features on the coastline have become even more severe.

Antigua and Barbuda has one of the most extensive networks of mangrove wetlands in the Eastern Caribbean; with an estimated 4,900 ha of mangroves in 1991.There are thirty-six (36) mangrove sites in Antigua and nine (9) sites in Barbuda. In Antigua, the sites range from very small single layer stands of trees to large, complex basin systems with multiple species Four species of mangroves are known to occur in Antigua and Barbuda; *Rhizophora mangle* (red mangrove), *Langucularia racemosa* (white mangrove), *Avicennia germinans* (black mangrove) and *Conocarpus erectus (buttonwood).* In Barbuda, there is the luxuriant 352 ha fringe mangrove of Codrington Lagoon and narrow scrubby borders of mangroves around salt ponds. Mangroves essentially are vital to maintaining healthy beach and reef systems. They act as natural breakers and buffer zones that protect the coastline from erosion during storms. Additionally, the mangroves act as sediment traps, protecting the reefs from being smothered by eroded soil and other geological material from the land. Finally they act as nurseries, breeding and feeding grounds and provide a habitat for both marine and terrestrial wildlife.

Photo 1: Example of a Mangrove habitat in Antigua

Climate Change will significantly disrupt the mangrove ecosystem, especially, since these areas are already under stress from natural (hurricanes, droughts) and anthropogenic sources (pollution & destruction – caused by dredging and filling). Recent work undertaken through a number of projects, including the SIRMM (Sustainable Island Resource Management Mechanism) and GEF IWCAM (Integrating Watershed and Coastal Areas Management) projects have sought to examine effective methods of addressing the impacts of land based sources of pollution on the mangrove systems particularly on the north west coast of the island. In some cases, work that has been completed over the last three to four years has resulted in the reintroduction of mangroves in some critical sites such as the Mckinnons Pond.

Coral reefs are found around both islands of Antigua and Barbuda and the estimate coverage varies from a high of 25.4519 km2 to a low of 15.820 km2. Antigua and Barbuda sits on a shallow rock-floored 'shell' covered by a variety of reefs. The edge of the 'shell' is at depths of 90 – 180 m where it drops to oceanic depths. On the windward east coast there is better reef development due to the high wave energy providing circulation of nutrients and flushing with absence of fine muddy sediment. However, on the leeward west coast the reefs are poorly developed because of lack of circulation and abundance of fine sediment. The optimal temperature for reef growth is 29^{o}C (Brown 1989). The mean sea surface temperatures range between approximately 27.5°C or 81.5°F and rising to around 29.5°C or 85.1°F in September and October and falling to around 26°C or 78.8°F in February and March (1971 – 2000)[10]. It is at temperatures of 30^{o}C and above that bleaching of the corals takes place. Prolonged exposure to high temperatures can result in irreversible bleaching of the corals.

Beaches and sand bars provide a major barrier to the constant force of coastal erosion. Antigua and Barbuda boasts many beaches that are critical to its tourism industry and culture. The beaches provide a habitat for nesting turtles and other animals and plants. Unfortunately, the beaches are illegally used as a source of fine aggregates in construction; therefore, sand mining is a significant concern in addition to the potential impacts of Sea Level Rise and other climate influenced coastal erosion events. Additionally, another major source of coastal erosion is the building of concrete structures too close to the shoreline and the use of poorly designed and unregulated sea defenses.

At the meeting of the UN General Assembly on the 27th -28th September, coastal and marine resources were identified as a priority area in need of urgent attention. Specifically it was identified that coastal and marine resources: protecting coastal ecosystems and coral reefs from pollution and over-fishing, is in need of special attention. As a small island developing state, Antigua and Barbuda recognizes the potential impacts natural and man-made activities can have on its coastal and marine resources. As such, the resulting challenges highlighted in the previous paragraphs and the 1999 call from the UN General Assembly, provide the basis on which the country's management policy for coastal and marine resources is being established. Nationally, the government has embarked on a program to effectively manage its resources with moves to strengthen both institutional and legislative arrangements. Through the efforts of the Fisheries Division, the Barbuda Council and the Codrington Lagoon National Park as well as the Environment Division and other supporting agencies, the Government of Antigua and Barbuda has embarked on the development and implementation of management plans and legislation for effective marine resource management. Since 1999 progress has been made with the enactment of an updated Fisheries Act and relevant regulations, cabinet approval of a National Land Use Plan and the incorporation of an EIA process in the development of coastal areas. Additionally, there has been the establishment of three new marine protected areas (the NEMMA, Palaster Reef and Cades Bay Marine Reserve). National efforts to protect marine resources have been matched regionally as the Caribbean countries bond together to sustainably manage coastal and marine resources. There is evidence of this in the efforts to implement the Caribbean Challenge project for sustainable marine resources management currently being implemented in thirteen Caribbean countries including Antigua and Barbuda.

[10] http://www.nhc.noaa.gov/aboutsst.shtml

Though these efforts are on the way, challenges still remain. There are existing problems in developing and implementing proper coastal zone management plans, addressing the impacts of climate change and natural disasters, effectively collecting recording and incorporating necessary data on the marine and coastal areas on a continuous basis as well as the effective declaration and management of marine protected areas. These gaps form the basis of the priority areas identified by the government of Antigua and Barbuda on paving the way forward to achieve the objectives of the BOPA and the MSI. Regionally, there is still a need for harmonize policies on coastal and marine resource management issues as well as the strengthening of capacities of the regional institutions to monitor such issues. Internationally, the exploration of the advantages of South- South Corporation and the use of international efforts to monitor the issues relating to this activity are still lacking. A lack of available financial resources also highlight an existing gap to be addressed prior to the government's implementation of relevant activities under this priority area.

2.4.1 Fisheries

The coastal and marine areas of Antigua and Barbuda comprise a variety of ecosystems (mangroves, coral reefs, sea grass beds and beaches) with natural resources including fisheries resources. According to the Antigua and Barbuda Fisheries Development Plan 2006 – 2010F[11]F, Antigua and Barbuda established itself as an archipelagic state in 1982 with a 12 nautical mile territorial sea, an Exclusive Economic Zone (EEZ) and a Fishery Zone of 200 nautical miles. The full extent of the EEZ is unknown although it is estimated to be about 110,071 km^2 with a shelf area of about 3,568 km^2[12]. This includes the Antigua and Barbuda shelf (3,400 km^2), South Bank (40 km^2), a section of Anguilla shelf (7 km^2), Redonda shelf (98 km^2), Havers Shoal (5 km^2) and a section of St. Christopher and Nevis shelf (18 km^2). This relatively large sea space is seen by many to offer vast potential for fisheries development especially for the migratory species. There are areas of the Redonda & island Shelf that are not frequently fished by vessels from Antigua and Barbuda, due to distance from Antigua and to the apparent prevalence of ciguatoxic fishes found in the area.

The nature and extent of the coastal and marine areas are primary determinants of types, amount and to some extent the distribution of the two main categories of fisheries (demersals and pelagics) in Antigua and Barbuda. Fisheries production in Antigua and Barbuda is considered to be small scale (Horsford, I., 2008; James P. A., 2008). The demersal fishery is well developed while the pelagic fishery may be considered underdeveloped.

Demersal resources of the Antigua and Barbuda shelf, including reef fish species, conch and lobster, are closely associated with coral reefs, mangroves and sea grasses which are either adult habitats or nursery areas for juveniles (GOAB/UNEP, 1997). The pelagic resources that are highly mobile, generally migratory and seasonal are of less importance to the fisheries of Antigua and Barbuda mainly because of

[11](Appleton, Horsford, & James, 2005)

aasociated socio-economic factors such as increased operational cost[13] and a cultural tradition of harvesting the demersals[14].

The demersal resources include: the Caribbean spiny lobster (*Panulirus argus*), the queen conch (*Strombusgigas*), shallow reef fishes, and deep slopes fishes. The pelagic resources are divided into small coastal pelagics found mainly nearshore or around the coast and larger coastal pelagics at the shelf edge and in the oceanic regions of the EEZ. These resource types and the fisheries for them have been summarised in the Antigua and Barbuda Fisheries Management Plan (Appleton, Horsford, & James, 2005). Lobster, conch and a variety of finfishes form the major landings. Most of the lobster is exported to the French West Indian islands, particularly Guadeloupe[15].
Although the sector is relatively healthy there are significant threats to the basic biodiversity base of the fisheries. These include:

- Pressure from over-fishing and other marine activities
- Coastal development, particularly the development of hotels and marinas
- Pollution both from land-based and marine sources.
- Fluctuations within the global economy and market conditions.

Most scientists agree that corals' ability to adapt to shifting environmental conditions resulting from climate change depends on the severity of other human stresses, such as fishing pressure, coastal development and land-based sources of pollution. Socio-economic conditions within the sector will provide the framework to determine the stresses on the natural environment.

The Fisheries Division is the national authority mandated to manage and develop the fisheries sector of Antigua and Barbuda. The Division continues to monitor and provide status report on the fisheries sector including beach analysis changes.

2.5 Freshwater Resources

Freshwater resources on the island although significant, are also limited and have been poorly regulated. Antigua's drainage areas were initially consolidated into thirteen (13) distinct watersheds. However, six (6) major watersheds were highlighted as critical based on their socio-economic, agro-ecological and hydrological values[16]as highlighted in *Figure 1*. Combined, they constitute 43 percent of Antigua's land area; sustain 50% of its forests, and 90% of its crops. They also contain 90% of Antigua's ground water supply and 90% of its surface water reservoirs.

[13] Expansive shelf area force fishers to travel longer distances to catch these species, especially large pelagics.

[14]Householders generally prefer 'plate size' fish.

[15] Fisheries Division Statistics

[16]ESAL, 2008 based on Fernandez 1990

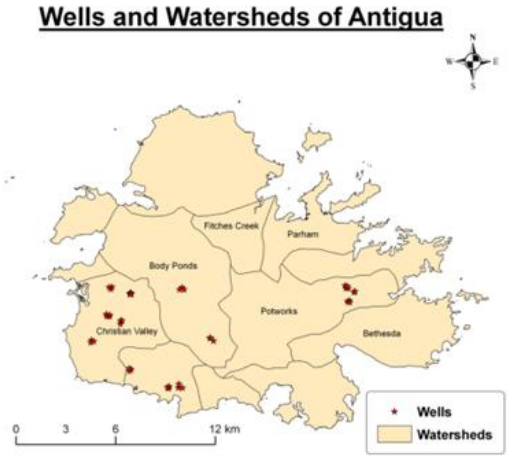


Figure 1: EIMAS image of Wells and Watersheds of Antigua

On the other hand, the watersheds in Barbuda are poorly defined with no comprehensive studies. Barbuda's watersheds are divided into ten (10) watersheds that are solely located in the highlands or areas with any 'appreciable slope.' There are no delineated for flat areas on the island where surface runoff is limited normally but may become significant in flood conditions. Reports highlighted that sand mining has impacted the major ground water source for Barbuda however, many of the properties in Codrington, are able to source ground water using their own wells. Reports further suggest that the water is often brackish and in some cases contaminated due to the proximity of household sewage.

Water resources on the twin island state are used for both domestic and agricultural purposes. However, the demand for water has drastically exceeded the available supply from ground and surface water sources. This has been primarily due to population growth and improper development. As a result, the country is increasingly dependent on desalination which is more expensive to produce to meet national needs[17].

National capacity to manage and regulate water resource management is severely constrained with a variety of agencies having the onus of different aspects relating to its management. The Antigua Public Utilities Authority has legislative oversight to regulate the use of water sources but does not manage or regulate the disposal of wastewater. This is managed under the Public Health Act (Cap 353) that provides legislative powers to the Central Board of Health, another Government agency. During consultations on the formulation of a Model Water Policy and Act as part of an OECS regional project, the following constraints were highlighted:

- a fragmented and poorly coordinated approach to water resources management and services provision;
- rising and competing demands for water and an absence of allocation and mediation mechanisms to resolve conflicts over the use of water resources;

[17]Sustainable Island Resource Zoning Plan for Antigua and Barbuda (including Redonda) 2012

- inadequate control of land-based sources of marine pollution (LBS) and concomitant provision of wastewater management services;
- poor enforcement of regulations;
- weak financial position of the water service providers and an inability to mobilise adequate financial resources;
- lack of planning for the impact of natural disasters and climate change.

The draft National Water Policy and Act in addition to watershed regulations are currently under review for possible amendments prior to enactment. Moreover, the National Physical Development Plan in recognizing the above mentioned constraints calls for Watershed management units to not only facilitate water supply but to also restrict development within the surrounding parameters.

2.6 Land Resources

Antigua and Barbuda became a party to the United Nations Convention to Combat Desertification on June 6th 1997. Initial communication reports highlighted two priority issues, namely drought and land management. As previously highlighted in Section 2.5, the management of water resources are being addressed both through the National Water Policy and National Physical Development Plan to assist in the alleviation of drought. With regards to the use of land resources, preliminary reports concluded that Antigua and Barbuda, including the offshore island of Redonda relies heavily on the integrity of its variety of ecologically significant species and ecosystems to support three prime competing land uses, namely agriculture, residential and tourism development. However, there has been a general lack of cohesive conservation, management and planning frameworks for the islands' development[18].

The existing legislative framework is disjointed with approximately forty pieces of legislation that govern various elements geared towards sustainable development by a variety of Government Departments and Statutory Organizations with little or no means for cooperation or consultation. This fragmented institutional structure developed as a tradition to provide legislative jurisdiction to Government agencies that were major users of the various resources. An example of this may be seen in the management of water resources. The Government of Antigua and Barbuda however, intends to achieve a more consultative legislative and institutional framework while consolidating issues of land resources and sustainable development through the implementation of two major national policy documents: the National Physical Development Plan (NPDP) and the National Environment Management Strategy (NEMS) and their respective enabling legislations. The adoption of the NPDP provides the context through which the Physical Planning Act (2003) can effectively guide the development process of Antigua and Barbuda. This sets the pace for addressing many of the challenges faced with land and water resources, biodiversity, tourism and agriculture.

2.6.1 National Physical Development Plan

As part of a large scale GEF based financing initiative, the Government of Antigua and Barbuda

[18]Government of Antigua and Barbuda. SIRMM Project: Preliminary State of the Country Report 2010

undertook to develop and elaborate the National Physical Development Plan. Titled the Sustainable Island Resource Management Zoning Plan (SIRMZP), it was developed through a series of public consultations before gaining adoption by Parliament in July 2012. The Plan is supported by the Physical Planning Act 2003 and will shortly benefit from updated regulations. With a strategic view of attaining sustainable development, the Plan creates an "umbrella" that will guide national development to achieve the following objectives:

1. Provide for the protection of critical ecosystem functions and habitats, minimizes environmental risks, and seeks to optimize the productive use of environmental resources;
2. Promote the development of a network of cohesive mixed- use settlements that offer a range of housing options that respond to different income levels and living preferences while providing ready access to local commerce, public services, and facilities;
3. Establish economic growth and employment centres that focus on tourism, professional services, agriculture, and industrial development;
4. Presents proposals to improve the configuration and efficacy of the road network and public transportation system;
5. Specify substantive and procedural regulations and administrative frameworks that may be used to guide development in accordance with national policies; and
6. Provide a framework for the preparation of detailed local plans that are in accordance with national land use priorities and strategies.

Through the implementation of the NPDP, the following national outcome are attained:

- improving the country's socio-economic base;
- reforming the public sector;
- sustaining and conserving the country's biodiversity;
- reducing the national debt/GDP ratio to sustainable levels;
- alleviating poverty;
- reducing vulnerability to national disasters;
- strengthening the relationship between the inhabitants of the island of Antigua and Barbuda; and
- enhancing private and public sector partnerships.

2.6.2 National Environmental Management Strategy

The NEMS is a national-level outcome of a sub-regional environmental framework, the St. Georges Declaration of Principles for Environmental Sustainability. The Government of Antigua and Barbuda, along with other member states in the Organisation of Eastern Caribbean States (OECS) signed the Declaration in 2000. The Declaration is a framework document that incorporates principles from the Barbados Plan of Action for SIDS. The NEMS is therefore the adaptation of the regional principles of Rio Declaration and other International agreements that have been adapted to the national situation in Antigua and Barbuda.

The NEMS has a vision for Environmental Sustainability that considers the inclusion of all citizens in striving:

"to build a nation that treasures the environment and voluntarily acts to ensure the protection, conservation and sustainable use of natural resources" .

This vision is supported by a strategy which is driven by the following 12 principles from the St. George's Declaration which the GOAB decided were directly relevant to the country:

- Foster the Improvement in the Quality of Life.
- Integrate Social, Economic and Environmental Considerations into National Development Plans, Policies and Programs.
- Improve on Legal and Institutional Frameworks.
- Ensure Meaningful Participation by Civil Society.
- Ensure Meaningful Participation by the Private Sector.
- Use of Economic Instruments for Sustainable Environment Management.
- Foster Broad-Based Environmental Education, Training and Awareness.
- Manage the Impact of Disaster.
- Ensure the Sustainable Use of Natural Resources.
- Protect and Conserve Biological Diversity.
- Manage and Conserve Energy.
- Negotiate and Implement Multi-Lateral Environmental Agreements.

These principles are supported by 12 strategies and several recommended actions and are considered the backbone of environmental sustainability in Antigua and Barbuda and the main policy vehicle in which international agreements, legislation and national policy are reflected. The NEMS is currently being updated to reflect adjustments in the recent developments within the legislative framework, most notably the NPDP and the National Biodiversity Strategic Action Plan.

2.6.3 Environment Protection Management Bill

The development of the draft Environment Protection and Management Bill has been a long journey. Initial drafts commenced in 2005 with an overall aim to establish and consolidate a legal regime for sustainable environmental protection and management in Antigua and Barbuda and for incidental and connected purposes. The Bill builds on other existing legislations and endeavours to address gaps therein particularly as it relates to the development planning process and protection of environmental resources. The document also addresses the nation's coordination and management of multilateral environmental agreements.

After much stakeholder consultations and objections, the final draft will be brought before Cabinet in September 2013 for enactment.

2.7 Energy Resources

Antigua and Barbuda relies almost exclusively on fossil fuels for electricity generation, transportation and cooking[19]. There are no natural resources of fossil fuels in Antigua and Barbuda. Secondary fuels including gasoline, jet kerosene, gas, oil/diesel, heavy fuel oil (bunker fuel oil) and LPG, all are imported for local consumption. A 2005 study by the Caribbean Energy Information System reveal that Antigua and Barbuda's energy costs relative to GDP and GNP exceed those of the other members of the OECS.

The draft National Energy Policy highlighted that during the period 2005 to 2009 total sales by the West Indies Oil Company (WIOC), sole importer of the country's fuel, averaged 12% of the GDP. The Policy further notes that in 2008 the sales revenue peaked at 15% of GDP which translates into unsustainable demands on the country's foreign exchange reserves. The previously referenced study from 2005 also shows that energy costs consumed one-third of the country's foreign exchange.

The National Energy Policy sets out the Government's vision as follows:

> *"Antigua and Barbuda will meet the energy needs of the present generation while safeguarding the environment and enabling future generations to meet their own energy needs. All citizens and residents will have access to affordable, efficient, socially responsible and reliable forms of energy."*pp5.

One of the largest consuming forms of fossil fuels on the island is electricity generation. From since the enactment of the Public Utilities Act (Cap.359) in 1973, it became an offence for any person or company to "generate, distribute, supply or sell electricity without the prior written permission of the Antigua Public Utilities Authority". That is to say that the Authority held the monopoly for electricity generation and distribution.

It therefore stood to reason that alternative sources of generating electricity were not automatically legal in Antigua and Barbuda. This arrangement was seen as a mechanism to ensure a sustained source of revenue for the Antigua Public Utilities Authority. However, in accepting the SIDS DOCK Challenge and making the voluntary commitment to the Copenhagen Accords, various measures have been established to integrate renewable sources of energy within the economy in a coordinated manner.

In 2010, the government formed the Energy Unit, in the Office of the Prime Minister and developed a National Energy Policy and an associated plan. The Unit was formed to assist with the coordination of all actors within the economy and to provide the government with a coherent low carbon way forward. The key players in the implementation of this and other uses of energy and their roles and responsibilities are described below.

- **TheEnergy Unit** under the Office of the Prime Ministry will be responsible for the overall implementation of the other Energy-Use Policy and will provide expert advice and guidance with respect to all Other Energy-Use initiatives.

[19]Government of Antigua and Barbuda 2010: National Energy Policy (draft)

- **The Office of the Prime Minister** has the portfolio responsibility for other Energy-Uses, and will have responsibility for the development and implementation of Other Energy-Use initiatives, including economic performance.
- **The Environment Division** (Ministry of Agriculture, Housing and Environment) will provide advice and guidance on the environmental impacts of all Other Energy-Use programs. The Division will facilitate proposals for consideration of projects to benefit from the Clean Development Mechanism.
- **The Ministry of Finance and the Economy** will be responsible for establishing any financial or tax incentives;
- **Local Education Institutions** will play a key role in keeping abreast of research in Other Uses of Energy and the linkages between their uses and impact on human health and the environment, and thus ensuring environmental sustainability.
- **Antigua Public Utilities Authority -** As the lead agency charged with the responsibilities of national generation and distribution of electrical energy, have standardized training and practices for persons wishing to get involved in renewable energy sources as highlighted in the "Interconnection Policy."

One of the key priority areas identified during the scoping exercise for the National Energy Plan (NEP) is the need for an action plan on sustainable energy consumption and generation. The ultimate challenge for sustainable energy consumption and generation is, therefore, to satisfy the appropriate level of energy-related needs of every human being by using a variety of technologies and fuels tailored to local conditions rather than merely increasing energy supplies, while keeping the overall cost and environmental damage as low as possible.

The Sustainable Energy Action Plan (SEAP) is intended to serve as a road map for future energy use in Antigua and Barbuda from 2012 until 2030. The SEAP contains short (1-5 years), medium (5-10 years), and long (10-20 years) term actions designed to enhance the implementation of the policies and goals of Antigua and Barbuda' National Energy Policy (NEP). These actions foster energy conservation, energy efficiency, and diversification of energy source and energy use needed for sustainable energy consumption and generation.
The strategies identified to meet the above are as follows:

- Strategy1: Energy Conservation and Energy Efficiency
- Strategy 2: Renewable Energy Development
- Strategy 3: Education and Awareness

In order to implement the aforementioned SEAP it is necessary to define for each strategy the following points:

- Indicate the target "quotas" to be accomplished
- Identify the specific actions to be implemented
- Identify the responsible agency for each action
- Identify and choose appropriate indicators to measure the outputs of each project
- Assigned the appropriate priority in terms of short, medium and long terms
- Specify cost and potential sources of funds for each project

The Energy Unit will be responsible for the creation of the first draft of the SEAP based on the above-mentioned strategies and points.

Roles and Responsibilities of the Energy Unit

The Energy Unit was mandated by the Cabinet to take on the following responsibilities:

- To develop with consultation a SEAP for submission and approval of the Cabinet;
- To lay down rules and conditions for prescribing the price of energy in accordance with the NEP, the SEAP and APUA;
- To monitor, evaluate, and act as the focal point for coordinating and supporting the implementation of energy policies, management and development plans of the country.
- To facilitate coordination among all key stakeholders responsible for energy matters, to ensure compliance of their operations with the NEP and the SEAP;
- To monitor and evaluate the results of the implementation of the NEP and the SEAP, and make adjustment measures if required;
- To compile energy balance, for analysis of the energy supply and consumption trends and evaluate the anticipatory impact for the purpose of preparing the proposals in respect of the NEP and the SEAP,
- To perform other functions as entrusted by the Prime Minister or the Cabinet.

In 2012, the APUA launched Green Antigua, an initiative powered by APUA that seeks to provide an environmentally friendly approach to resource management. Globally, focus has been shifted on preserving the environment through the reduction of wastage. Green Antigua focuses on reducing the wastage of water and electricity through the conservation of the above mentioned resources, specifically the project hopes to achieve its goals through the use of market incentives, public awareness, training and certifying RE technicians and allowing interconnection of non-fuel generation of up to 50 Kw.

Based on the country's energy consumption and its commitment to the UNFCCC process, the country has begun the process of investigating potential investments in renewable and alternative energy sources. Antigua and Barbuda has on average 268 hours of sunlight per month, solar energy has considerable potential and, in fact, is currently widely used to heat water. In addition, wind energy, which was extensively used in colonial times as evidenced with remnants of windmills throughout the country, may also be harnessed. The feasibility of both forms of energy is now being explored in the interest of lowering GHG[20] emissions and reducing outward foreign exchange flows. It is worth mentioning however that in a study by ONREL and the OAS titled "Energy Policy and Sector Analysis in the Caribbean 2010-2011" it was estimated that Antigua and Barbuda could generate 400MW from wind[21].

[20] Second National Communication for Greenhouse gases (GHG)

[21] http://www.ecpamericas.org/data/files/Initiatives/lccc_caribbean/LCCC_Report_Final_May2012.pdf

With regards to the transport sector, changes within the international market are forcing the local private sector to import newer fuel types, namely ultra-low sulphur based diesel. As of 2006, a new fleet of ULSD diesel engines have been issued from international manufacturers. Like many of the SIDS, Antigua and Barbuda is forced to cope with this transition on its own, with the incurred costs being absorbed by consumers, the private and public sector. Additionally, The Island has seen the emergence of micro-scale businesses creatively recycling used oil, both crude and cooking oil, to create other types of vehicular fuel.

2.8 Tourism Resources

The country's primary resources include a very agreeable climate, outstanding land and seascapes, extensive areas of high ecological value, an engaging history, democratic governance, a well-educated and healthy population, and significant natural resources (beaches, agricultural lands and fish stocks). While the country's natural resources were of primary economic importance throughout much of its history, the other resources listed, in addition to easy accessibility to North America and Europe, have led to a thriving tourism industry; which now makes the country even more susceptible to both the impacts of climate change and global economic recession.

Tourism is the lead employment generator in the twin island state with and is regarded as the most important productive sector, and was in 2007 estimated to account for 40 % of all employment, 85 % of foreign exchange earnings, 52 % of total investment and 70 % of GDP (directly and indirectly). Total earnings, and tourist arrivals saw a strong growth in 2007 (up 26.5% from 2006), but has since declined with the economic crisis. For Antigua and Barbuda, economic growth in the medium term will continue to depend on income growth in their tourist markets, the US and UK.

The growth in tourism has previously led to environmental degradation primarily along the cost. However, in pursuit of sustainable development, the Ministry of Tourism has established a Sustainable Tourism Unit focussed with ensuring that tourism products do not negatively impact the environment within which they are developed. A National Sustainable Tourism Plan and Policy is currently being developed through regional partners to address six thematic areas, mainly: tourism management, capacity, marketing, transportation, environment linkages and health, safety and security. Moreover, the NPDP, highlights areas that are not ecologically sensitive for the development of tourism products. The Government, through the implementation of donor funded projects are in the process of establishing co-management strategies and partnerships with community based groups for eco-tourism products.

In the 2013 Budget Statement, the Government of Antigua and Barbuda identified a commitment to launch a Green Tourism Initiative Programmed to assist tourism operators to assess and reduce their environmental impact. The programme will focus on the adoption and facilitation of energy efficiency of buildings, renewable energy, and water conservation, integrating waste management, environmental/energy-efficient technologies and developing "green" policies and procedures. As a precursor to this the Government had already reduced and waived import duties on the various renewable energy and energy efficient technologies.

By contrast, Antigua and Barbuda's agricultural sector accounted for 3.3% of GDP in 2007, in 2010 this had decreased to between 2.5 and 3 %.[1,2] The fishing sub-sector grew by almost 5 % from 2006 to 2007, reflecting new facilities for fisheries in St. John. The sub-sector contributed almost 52 % of the sector's output. Agricultural production is focused on the domestic market and is further constrained by a shortage in labour. The tourism and construction sectors compete with higher wages. Furthermore, local production has not been able to meet local demand all year round.

The Global economic recession resulted in a slowdown in the tourism sector. As the island's resources are extremely vulnerable to the impacts of climate change coupled with the outcomes of multilateral negotiations, further decline may be inevitable.

2.9 Sustainable Consumption and Production: Agriculture & Food Policy

Antigua and Barbuda's agriculture can be described as vibrant, modern, and to some extent prosperous and competitive. The Government's overall goal in the agricultural sector is to "improve Antigua and Barbuda's food security and reduce poverty". To this end a policy was developed to guide the development of this important sector. The policy was formulated to ensure that the capability of the agricultural sector's strategic role in national development is sustained and enhanced in light of the new and emerging challenges facing agricultural development. This is because global imperatives require agriculture to become internationally competitive; unfortunately, not all areas in agriculture in Antigua and Barbuda can realistically become competitive. Thus, the policy will focus on new approaches to increase productivity and competitiveness, deepen linkages with other sectors, venture into new frontier areas as well as conserve and utilize natural resources on a sustainable basis.

The Agriculture sector in Antigua and Barbuda is yet to attain its full potential. Despite a dramatic decline after the collapse of the sugar industry many years ago, the Agriculture sector accounts for approximately 4 percent of the nation's GDP. Sustainability reports indicated that Antigua and Barbuda may be approaching a critical stage where the country has less agriculture land per capita than is required for sustainable agriculture development. This places greater pressure on the need for sound agricultural land use practices and policies for conservation and reclamation of all possible Class 1, Class 2 and Class 3 lands[22].

In an attempt to build national resilience and sufficiency, attempts are being made to optimize development opportunities within this sector through national policies and programs. The Ministry of Agriculture in 2009 produced a National Food Production Plan aimed at strengthening the country's capacity for food production to ensure national food security. Four year targets were set with areas of strategic focus including agro-processors, farm roads, analytical services, plant protection and marketing and post-harvest. The National Food and Nutrition Security Policy, issued in 2012, targets the critical food and nutrition security problems in Antigua and Barbuda. An analysis of the current situation indicated that these problems relate to all four components of food and nutrition security, viz.,

[22]Government of Antigua and Barbuda: State of the Country Report: Preliminary Findings 2010

Availability, Accessibility, Consumption/Utilization and Stability of supply[23]. The policy highlights priority areas including capacity building, legislation, and protection of water and land resources necessary for food production. Efforts are also being made to strengthen inter-regional trade.

It is anticipated that the sector will achieve a growth rate of 2.1 per cent per annum. Thus, the contribution of the agricultural sector to Gross Domestic Product (GDP) is expected further increase from its present 4% base. New sources of growth are expected to emerge in agriculture resulting from various initiatives to promote new products and emerging industries such as agroforestry, biotechnology products, and specialty natural products.

At the heart of the National Land use policy is the fundamental premise that agricultural land must be protected in Antigua and Barbuda and so the policy embraces Antigua and Barbuda's Agricultural Land Use Policy as part of the issue to be addressed in the National Land Use policy; the purpose of the Antigua and Barbuda Agricultural Land Use Policy is to foster and facilitate rapid development of the island's agricultural land resource, while ensuring the continued productive capacity of the island's agricultural land resource and guaranteed economic profitability of all producers; the agricultural land use policy considers the location, size, function and growth of existing and new settlements and their spatial and functional relationships and this policy provides a framework for the provision of physical and social infrastructure and opportunities for economic activity, in accordance with a comprehensive settlement strategy. In addition, this policy also articulates a sustainable development strategy that allocates the most appropriate land for various activities and in so doing considers the capacity of such land to sustain development in the long term, that is, from 2010 and beyond, and the need to provide for economic growth, without degrading or damaging the island's scarce and fragile land resource base.

2.10 Biodiversity

Photo 2 Antigua Racer Snake
(*Alsophisantillensis Antiguae)*

Photo 3 Barbuda Warbler
(Dendroicasubita)

Based on recent assessments, there are 71 freshwater fish species and 400 marine fish species found in Antigua and Barbdua. Additionally, two native species of amphibians; namely a tree frog (*Eleutherodactylusjohnstonei*) and a marine toad (*Bufomarinus*)also call Antigua and Barbuda home.

[23] Antigua and Barbuda National Food and Nutrition Security Policy 2012

Twenty terrestrial reptile species or sub-species have been documented for Antigua and Barbuda of which four are thought to be extinct , one is presently considered endangered; namely the Antigua Racer Snake (*Alsophisantillensisantiguae*). The Iguana *delicatissima* was also on the endangered list but is now extinct in this country though it still exists in neighbouring islands such as Anguilla. The Antigua Racer Snake is the rarest snake in the world, with only about two hundred living. It is found on Bird Island, an island off the coast of Antigua. Antigua and Barbuda has three endangered species of turtles which nest on the beaches, namely the hawksbill, green and leatherback (the loggerhead is known to traverse the waters). Other examples of reptilian species found include the following: The Red-footed tortoise (*Geochelonecarbonaria*); The Green lizard (*Anloisbimaculatusleachi*)which is a sub-species endemic to Antigua and introduced to Barbuda; A *wattsiwattsi* which is an endemic sub-species which was introduced to Saint Lucia; an endemic ground lizard (*Ameivagriswoldi*)which is common in Barbuda, but found only in selected sites in Antigua; and an endemic subspecies of lizard which has been recorded for Redonda.

With regards to birds, there are 182 species found on the island. Two-thirds of the population is migratory leaving 60 residents. Antigua and Barbuda is considered an important stopover along the Trans-Atlantic migratory route between North and South America. Approximately 20 of the 60 resident birds are considered endemic to the West Indies sub-region and in some cases restricted to the Lesser Antilles. Inventories have revealed at least two species which are considered endemic sub-species (the Broad-winged Hawk, Buteoplatypterusinsulicola; and a Barbuda endemic sub-species or Dendroicaruficauda).

Photo 4 Green Heron

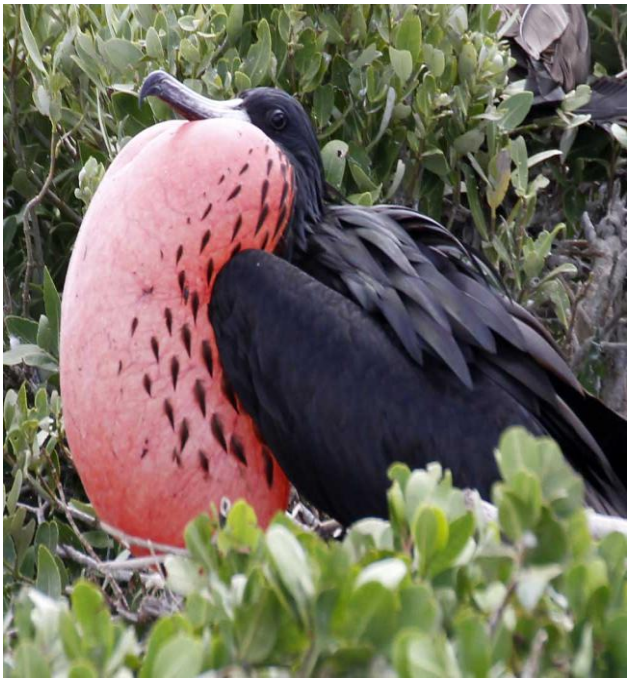
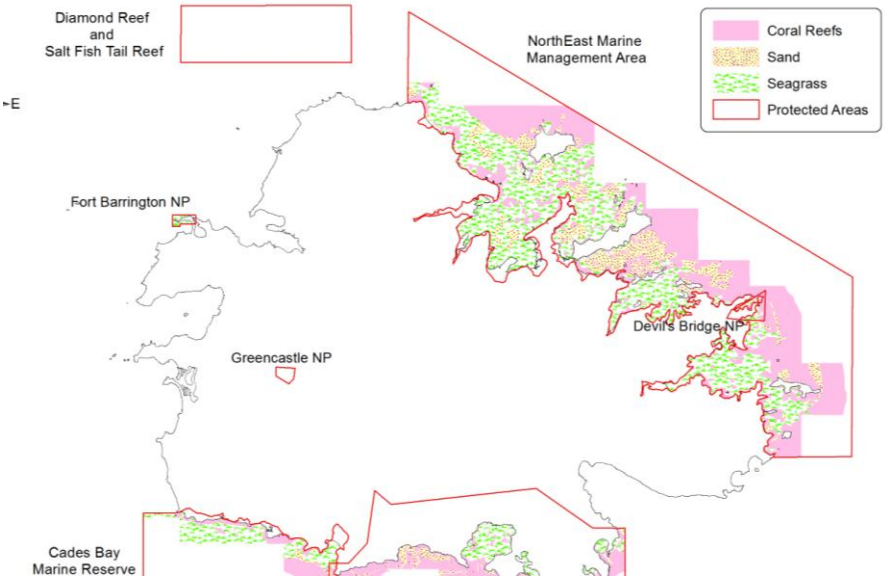


Photo 5 Frigate Bird

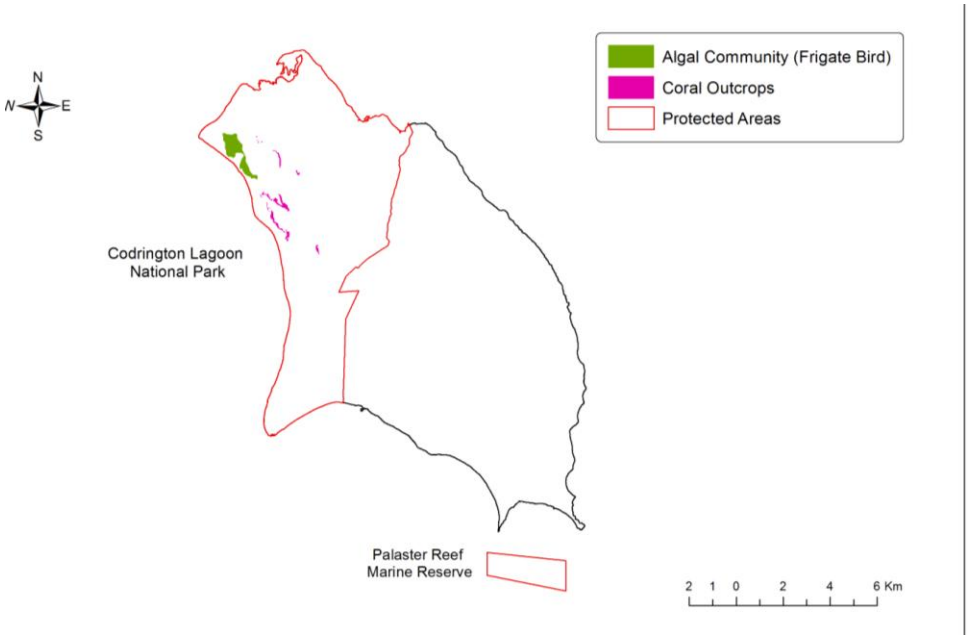
Bats are the only native terrestrial mammals, with seven species of bats resident in these islands. There are several introduced mammal species, for example, the European Fallow deer (endangered) the Giant

African Snail, the Cuban Tree Frog and the Indian mongoose. Some of these species, such as the Giant African Snail are a threat to the country's economy as well as its biodiversity; a situation that may be exacerbated by the impacts of climate change. Finally, there are 26 recognized Cetacean (marine mammals) species associated with the islands

Antigua has a variety of vegetation types; however, as previously mentioned clearing of lands during colonial rule to accommodate increased size sugar plantations means that the biodiversity of vegetation is not as robust as it once was. The current climatic and geological conditions however have contributed to the development of a diversity of habitats in which species thrive. There are 1158 species from 149 families (Lindsay &Horwith 1997b) of plants found in Antigua and Barbuda. This includes 45 species of ferns and fern allies; 4 species of gymnosperms and 1,109 species of flowering plants. Approximately 197 species of flowering plants merit special conservation measures of which 22 are endemic to the Lesser Antilles, one of which *Pectisericifolia* may be endemic to Barbuda, and 73 are classified as rare.



Map 1 Protected Areas in Antigua



Map 2 Protected Areas in Barbuda

There are six designated protected areas based on their historical and ecological values. These areas include Nelson's Dock Yard National Park; the North East Marine Management Area (NEMMA); Cades Bay Marine Reserve; Codrington Lagoon National Park; Diamond Reef Marine Park and Palaster Reef Marine Bark. Finally, there are other smaller protected areas grouped under the establishment of the National Parks Act of 1984. This comprises of the Devil's Bridge National Park (244 acres), Green Castle Hill National Park (87acres) and the Fort Barrington National Park (85 acres). Ten (10) additional sites have also been proposed however, many of the established protected areas lack proper management plans or the institutional structure to implement such management plans.

One of the concerns for biodiversity currently, is the number of threats to their survival in Antigua and Barbuda. These include:

- Fragile terrestrial and marine ecosystems such as mangrove wetlands and coral reefs endangered by development projects, pollution and misuse.
- Vulnerability to external economic and natural environmental events, such as economic recessions, hurricanes, and climate change. Droughts and hurricanes have severely impacted the bird population, as well as vegetative communities and their dependent fauna.
- Lack of human resource capacity in key biodiversity areas
- Inadequate physical infrastructure.
- Conflicting land use activities, especially among housing, tourism and agricultural activities.
- Land degradation due to uncontrolled grazing; and limited institutional capacity to manage the development process due to the presence of weak and fragmented land use and development control mechanisms.
- The loss of habitat primarily through the sub-division of lands for housing, tourism development, agriculture and the mining and dredging of sand.

- Fragmentation of natural communities by road-ways, and other man-made features that form a barrier to the movement and dispersal of species.
- The introduction of non-native species, like the mongoose, lemon grass and Lion Fish that have a detrimental effect on native wild species by acting as predators, parasites or competitors.
- Overgrazing by livestock mainly goats, sheep, cattle and donkeys that pose a serious threat, particularly in upper watershed areas.
- Pollution as a result of excessive nutrients or sewage discharge into coastal waters, as well as the unregulated and excessive use of pesticides.
- Natural and anthropogenic activities that stress coral reefs through direct destruction and over-fishing and

The main trend shows that the biodiversity of the country, on which its economy depends, is being destroyed by the unsustainable use of resources. The purpose of development is to improve the quality of human life through utilization of and access to the resources provided by biodiversity. If this biodiversity is used in non-sustainable ways, the quality of human life both in the present and the future is being compromised.

Antigua and Barbuda's marine biodiversity is increasingly threatened by habitat destruction, overexploitation, and destructive fishing methods. Mangroves that function as nurseries, breeding grounds and habitats for both marine and terrestrial wildlife are being destroyed for coastal development, especially those associated with the tourist sector. In Barbuda, the sustainable use and protection of the Codrington Lagoon and its mangroves are critical to the biodiversity of Barbuda, particularly the conservation of the Frigate Bird Sanctuary.

For both Antigua and Barbuda, the sea turtle is being depleted through the destruction of its habitats by coastal construction, sand mining, pollution and over-fishing. Additionally, the regulatory mechanisms to protect nesting and foraging turtles and their habitats are inadequate.

Sea grasses that provide food for fish and turtles and that function as nurseries for young conch, spiny lobsters, shrimp and a variety of fish are being destroyed. Coral reefs are in very poor condition, stressed by high sedimentation, and activities like over-fishing, destruction by the anchoring of boats, improper placement of fish traps, garbage, breakage by recreational diving, and the release of partly treated sewage from coastal holiday developments directly into the sea.

In general, fishing and tourism are the main activities that are adversely affecting Antigua and Barbuda's marine biodiversity. However, sand mining still constitutes a significant threat to coastal properties and resources. Agro-diversity is being destroyed through the over-use and misuse of herbicides and pesticides, though the number of different kinds of pesticides and the amount of pesticides used are now better managed through the Pesticides Control Board. Still, one concern is the disposal of obsolete chemicals and other hazardous wastes.

In an effort to address these issues and actively protect the country's biodiversity, the country has undertaken the completion of a Systems Plan for the development and management of an effective system of protected areas and the revision of its current National Biodiversity Strategy and Action Plan (NBSAP). The plan outlines a strategy and a clear set of objectives, along with activities designed to achieve them. This National Biodiversity Strategic Action Plan (NBSAP), a requirement under the UN Convention of Biodiversity, is near completion and represents the island's long term plan of action for sustainable use of biodiversity. It is aimed at the sustainable use and conservation of biological diversity in Antigua and Barbuda based an established list of national targets guided by the UNCBD Achi Targets. Additionally, the country has undertaken the development of relevant institutional support (human and technical) for conservation as well as necessary innovative means of ensuring financial sustainability in managing the country's biological resources. There have also been efforts to include local communities and relevant groups into the process of conserving and sustainably using the countries natural resources. Internationally, Antigua and Barbuda has shown its commitment to the protection of biological diversity through its ratification of the UNCBD and the CITIES conventions. Its move to ratify the Nagoya Protocol on Genetic Resources also confirms its determination to ensure ownership of its rights over its biological resources. Priority has also been given to working with regional as well as international organizations to support regional, national and international integration of sustainable natural resource management policies into the management system developed by the country.

Ongoing studies on plants, birds and other wildlife are helping to build a reliable information base of the various areas of significant biodiversity value in the country. However, gaps still exists in efforts to ensure conservation, protection and sustainable use of resources. These require better understanding of species abundance, location and habitat requirements[24]. There is still a critical need for financial, human and technical resources in order to effectively achieve the goals of the BOPA and the MSI with regards to biological diversity. The priority areas to be addressed as part of the country strategy moving forward include management of invasive species, biodiversity valuation and its impact on the social and economic development of the country, the mainstreaming of biodiversity into other sectors and the building of climate change resistant biodiversity habitats and species.

2.11 National Institutions and Administrative Capacity

Agencies are encouraged to refer to the various policy documents (which are periodically reviewed for Cabinet approval) when developing their work program. Ministries have instituted an aggressive approach to the development of work programs and for the development of annual budgets. These are brought before the Ministry of Finance at the level of the Budget Director's office and the Office of the Director of Planning where the work programs are scrutinized for adherence to the various plans and programs. Departmental Budgets are then approved based on their adherence to national goals and objectives.

The process is quite rigorous and occurs over a period of five months. At the time of the adoption of the Budget by Parliament the budget should reflect the activities related to the NEMs and the NPDP.

[24] Sustainable Island Resource Zoning Plan for Antigua and Barbuda (including Redonda) 2012

Furthermore, as a means of tracking and coordinating the implementation of MEA related projects on the ground, the Project Management Unit was established in 2012. This Unit coordinates the development of national projects seeking donor funding for the implementation of MEAs. The Unit is comprised of agencies across the various Ministries involved in sustainable development, including, Tourism, Agriculture, etc.

2.11.1 Data Mapping and Information

The GEF funded SIRMM project assisted with the creation of a Geographical Information Systems (GIS) based platform to map not only all environmental resources but also socio-economic amenities. The Environmental Information Management and Advisory System (EIMAS) is currently used by five key government agencies. These include the Environment Division, Development Control Authority, Surveys Division, National Office of Disaster Services and the National Parks Authority. The Surveys Division act as the central data hub and holds all digital copies of referenced geographic data while the other agencies continually update GIS map layers relating to their respective usage. The introduction of EIMAS has greatly influenced development planning, disaster risk mitigation and management as well as environmental impact analysis.

2.12 Regional Institutions and Technical Cooperation

Antigua and Barbuda has been fully involved in regional activities executed by the OECS, ECLAC, UWI, CARICOM and most recently CEHI. The two national actions agreed to under the BPOA have been previously implemented (NEMS and St. George's Declaration). Participation in regional projects are ongoing. Current initiatives include the IWCAM, IWeco, SIDS Dock, OECS Water Policy and Act, and the Caribbean Challenge Initiative.

2.13 Transport and Communication

Antigua and Barbuda is well networked with access routes both by land and sea. The VC Bird International Airport is currently under expansion to address international safety and efficiency standards. The NPDP recommends an airport expansion area and buffer zone which has been encompassed within the airport's expansion. Deep Water Harbour is the main infrastructure to support passenger and cargo sea transportation with a docking capacity to hold up to 4 cruise ships. The NPDP strongly recommends improving the efficiency of road linkages between the airport and port facility.

Commuting in Barbuda is negligible due to its small size however, Antigua has 2 public transportation hubs known as the East and West Bus Stations. Except for dedicated school buses, buses are privately owned with no Government subsidy. Although the public transportation system provides good coverage, the south east of the island is inadequately serviced, with no service after 6pm. 2001 Census data highlighted that 23% of the population utilize public transportation to commute to work.

A preliminary report compiled by the Ministry of Transport highlighted that Antigua has approximately 443 miles (713 kilometres) ofprimary main roads and 120 miles (193 kilometres) of secondary roads. However, road infrastructure in Barbuda accounts for 7miles (11km) of paved major roads while

secondary roads and other routes are mainly made of dirt, gravel or crushed corals. The network in Antigua provides for good coverage throughout the island except within the southwest and southeast regions that are comprised mainly of steep mountain slopes and large resort estate limiting public access.

As it relates to inter-island ferry service between Antigua and Barbuda, there is currently a privately owned service in operation, however, the Government has recently upgraded the ferry in Barbuda as is intending among other things to alloiw small cruise vessels to start docking off Barbuda. However due to the shallowness of the waters around Barbuda a short-ferry service from the ships to the port facility will have to be developed.

Communications is also a notable direct and indirect contributor to the GDP. In the 90's, there was a significant increase in offshore business in Antigua; including off-shore gaming and betting, benefiting from the high quality telecommunications and internet services available.[25] Since the late 80's, the telephone service was upgraded from old "switching" technology (analogue) to a more modern digital system DMS 100 (Antigua & Barbuda was one of the few Caribbean islands with updated telecommunications at that time). Investments were maintained and many upgrades were installed over the years to keep the telecommunications system up to date; for example the Centrex system. The local telecommunications company APUA (Antigua Public Utilities Authority), in consultation with Cable & Wireless, installed fiber optic cables underground, island wide, encased in conduits. Although, the major hurricanes of the mid to late 90's destroyed much of the telephone wiring above ground, the major network cables were unharmed being buried. Once the wiring above ground was replaced, the telecommunications system was up and running. The increase in the number and intensity of storms that is expected with climate change is a motivating factor to bury as many cables as possible but at this stage it would be more expensive to bury even more cables than to replace above ground cables annually.

2.14 Science and Technology

The Ministry of Information, Broadcasting, Telecommunication, Science and Technology has undertaken a number of initiatives to advance technology within the public domain. Most notably is the Connect Antigua Barbuda Initiative which strives to improve computer literacy in schools, communities as well as the elderly population. The Ministry has also initiated a project to teach interested resident how to develop mobile applications so as to encourage greater innovation and development.

The Ministry is also in the process of establishing an Open Data Readiness Unit to manage the Government's open data initiative. An assessment was conducted by representatives of the World Bank, the International Development Research Centre of Canada, and the Caribbean Open Institute.
It was concluded that Antigua and Barbuda is in a position to move forward quickly with an Open Data initiative.

25Environment Division, Integrating Management of Watersheds & Coastal Areas in Small Island Developing States of the Caribbean - National Report for Antigua & Barbuda:(January 2001), p 14

However, as it relates to climate change mitigation and adaptation, the country has been slow in accessing green technology primarily due to the high costs incurred for capital expenditure. Currently, the use of Green technology is primarily centered on solar and small scale wind energy.

2.15 Human Development Resources and Culture

As previously highlighted, one of the key goals of the NPDP is to enhance liveability to provide a good quality of life for all. This includes education, social and healthcare amenities, culture and recreation.

The second Millennium Development Goal (MDG) of the United Nations is to achieve Universal Primary Education or more specifically, "to ensure that by 2015 all children (both boys and girls) will be able to complete a full course of primary schooling". Primary or elementary education consists of the first years of formal, structured education that occur during childhood. Within the Caribbean universal free and compulsory primary education is nearly achieved by all countries, but with a marked gender performance gap in favor of girls. In Antigua and Barbuda, this was found to be the case in that primary education is both free and compulsory. As a means of supporting and encouraging attendance, the Government provides all text books and two uniforms free to all students. Additionally, there is subsidized optional transport and a growing school meals programme.

In 2012, out of the 1577 children that wrote the Common Entrance Exam (exam taken at the end of the primary education) 84.6% passed and of those who passed 54.6% were girls and 45.4% were boys, indicating that there is a slightly better performance of girls.

Education facilities are widely available in Antigua and Barbuda at the pre-primary, primary, and secondary by both the public and private sectors. In addition, the Antigua State College, the Antigua and Barbuda Institute of Technology, the University of the West Indies Open Campus , the American University of Antigua (AUA), as well as, numerous institutions that provide specialized vocational training are available for post-secondary studies. As of 2012, the Government of Antigua and Barbuda began the process of merging the Antigua State College, the Antigua and Barbuda Institute of Technology, the Antigua and Barbuda Hospitality Training Institute as part of a longer term goal to establish the University of Antigua.

In recent years, as a means of addressing problems with overcrowding in urban secondary facilities, the Government has made plans to increase the number of school plants. With this increase in public and private secondary school plants, the Government has also taken the opportunity to expand beyond MDG 2 and set universal secondary education as a national goal. The increase in the number of public schools will also have the positive side effect of increasing the number of hurricane shelters as many schools due to their space, facilities and proximity to communities double as emergency shelters.

A further concern is the number of students who do not complete secondary school. Data from the 2001 census indicates that among residents 15 years of age and over, 96% have completed primary standard (4-6 year), while 67.3% completed secondary school, 24.2% pre-university, and 9% university (CSO, 2001). Greater attention to providing the facilities and programs that will encourage students to continue to the secondary and tertiary education levels is needed if the country is to compete in the knowledge economy

Antigua is subdivided into six medical districts, each of which is assigned a District Medical Officer (DMO). Health care is provided through a number of public health care clinics in addition to 3 privately owned institutions. The Mount St. John Medical Centre is the main public provision of specialized medical services on the island with 187 beds. This hospital has affiliation with the American University of Antigua thereby establishing it as a teaching hospital which augments the number of services provided.

Provision of adequate medical services in Barbuda is hindered by the lack of modern laboratory facilities, which necessitates that basic tests be performed in Antigua140. Further, in Antigua, the commitment to decentralize health services as a basis for developing local health districts did not yield the expected results. The system is still centrally managed. Patients from rural areas continue to travel to St. John's for X-ray, laboratory, and drug services. In 1994, 82,988 visits were made to all services in the clinics, with approximately 20 % for child health services, 17.6% for hypertension, and 9.1 % for diabetes141. The Spring View Hospital in Barbuda is usually closed on weekends, with staff on call.

In keeping with the recreational needs of Antiguans and Barbudans, efforts are being made to provide a number of activities throughout the year. These are predominantly sporting activities which include cricket, sailing, tennis and golfing. Additionally, sports and other recreational facilities and playgrounds are well established throughout the country. Of note, one of the most popular cultural activities in Antigua and Barbuda is Carnival.

Crime, poverty and environmental degradation are considered major issues affecting the future development of Antigua and Barbuda. The CDB in its recent economic review noted that violent crime involving firearms had the potential to undermine the "... social and economic fabric of the country, but also because of its potential impact on tourism". Poverty is also a major concern with estimates as high as 18% being quoted, up from an estimated 12% in 1994. A survey conducted in 2006 estimated the country's poverty levels at 18.4%. In 2012 however poverty estimates has decreased to 9% based on a survey done by the Food and Agriculture Organization[26]. The poverty level is of concern and the Government is well aware of this situation. In October 2012 the Ministry of Agriculture initiated steps to address this situation by signing an agreement with the FAO to reduce extreme poverty in the twin island state.

It is worth noting that the previous report mentioned from the CDB also noted that there was an increase in evidence of coastal degradation which could have adverse impacts on the quality of the environment and the tourism industry. Antigua and Barbuda enjoys a high standard of living but the economy like many SIDS, is fragile and vulnerable to social and environmental issues, which includes the impacts of disasters, in particular hurricanes.

[26] http://www.caribarena.com/antigua/news/latest/101977-agreement-signed-to-eradicate-extreme-poverty.htm

2.16 Trade Liberalization and Globalization

The Government of Antigua and Barbuda has made efforts to improve the level of participation in international trade to enhance the economic development of the island. Antigua and Barbuda has identified mechanisms to expand foreign direct investments, increase the role of the services sector in the national economy and develop and strengthen national initiatives and economic reform policies.[27] Most recently, the Government of Antigua and Barbuda has begun development of its national implementation plan for trade facilitation measures. The draft plan considers approximately 39 measures to facilitate trade. These measures cover publication, rights of appeal, penalty disciplines, uniform forms and documentation requirements. In light of this, a national committee on trade facilitation has been established to administer the implementation of these measures.. The Plan has been undertaken as part of the United Nations Conference on Trade and Development (UNCTAD) initiative on implementation of the WTO Trade Facilitation for developing countries.

However, sustainable development as facilitated by the strengthening of national economic policies may continue to be undermined by both internal and external factors. Internal factors include the existence of specific vulnerabilities such as the small size, inadequate capacity (institutional, financial, regulatory and technical) and vulnerability to natural disasters. External factors mainly include the impact of unilateral foreign policies on national economic sectors such as the financial and gaming industries.

The 1998 harmful tax competition report by the Organization for Economic Co-operation and Development (OECD) classified Antigua and Barbuda as a "tax haven" with "potentially harmful tax regimes." The Government of Antigua and Barbuda responded to the continuous repositioning (by the OECD) of regulatory requirements of the offshore financial sector amidst concerns of money laundering during the late 1990s. As a result, the number of offshore banks in Antigua fell from 57 in 1997 to 15 in 2003[28]. This yielded a slump in the economic sector and further highlighted the nation's vulnerability to external directives.

Moreover, Antigua's offshore gaming industry employed over 2,000 people and generated over US $7 million in license fees. As a result of severe legislative pressure from the United States, employment within the sector declined significantly. In response, Antigua and Barbuda presented arguments to the WTO panel that showed that the US government's legislation against transactions between US financial institutions and Antigua and Barbuda-based Internet gaming companies were in breach of the US government's obligations under the General Agreement on Trade in Services (GATS). The Dispute Settlement Panel at the WTO has recently recommended that the US government bring the offending

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[27] Government of Antigua and Barbuda (2004). Barbados Program of Action (BPOA)

(BPOA) National Assessment Report for the Ten Year Review of the BPOA

[28] Government of Antigua and Barbuda (2004). Barbados Program of Action (BPOA)

(BPOA) National Assessment Report for the Ten Year Review of the BPOA

revenue measures into conformity with US obligations under the GATS but the US has failed to comply with the WTO rulings. The government of Antigua and Barbuda sought the right to impose retaliatory measures and was awarded by the WTO the right to target US $21 million per annum against US intellectual property rights.

The development of the services sector is also an area of great concern. Under the GGATS, Antigua and Barbuda has experienced a pervasive drain of skilled service professionals in the health and educational sectors to the US and Europe. Summarily, it should be noted that the plethora of regional agreements and multilateral frameworks have great implication to Antigua and Barbuda as government's decisions are becoming increasingly restricted by external forces in which there is minimal input. With the high dependence on trade and foreign direct investment, Antigua and Barbuda suffers from a high fiscal sensitivity to trade globalization and liberalization.

The existence of investment distorting trade barriers in the form of foreign policies which hinders national access to global markets will continue to present great challenges and will become a priority area to achieving sustainable development.

3 Emerging Challenges

In addition to the various innate challenges of the multi-sectoral areas previously highlighted, the country is now faced with new and emerging threats. These include:

- Invasive species- The country has seen an increase in the influx of invasive species that threatens both the ecosystems and livelihoods. Such species include the Lion Fish, the Giant African Snail and Lethal Yellowing of Palms. There is a need to determine the impact of these invasive species and implement levels of redress. Invasion of the Lion Fish may become one of the greatest threats to the region's marine reef system, primarily due to their ferocious appetite. The impacts of the Lion Fish will not only affect the ecology of the island's marine system but also cause ripples in the livelihood of fisher folk communities and eventually tourism. The Giant African Snail also threatens national food security as their appetite incorporates over 500 types of plant species, of which these include food crops. Each snail has the capacity to lay approximately 1200 eggs in a year in addition to their innate ability to burrow underground and remain dormant for up to 2years. This now proves difficult for national authorities to control the population and impacts therein. The Lethal Yellowing is impacting facets of the tourism product and hundreds of Palms on the island are being affected and subsequently destroyed. Finally, given the emerging concerns of biotechnology and genetically modified organisms, adequate mechanisms will have to be identified and implemented to circumvent possible negative implications for biosafety.

- The Global Financial Crisis and subsequent G-20 growth framework – ODI Publications highlighted that the recent global financial crisis has had large and variable effects on the economies of developing countries. The Global Financial crisis has crippled tourism investment as a number of properties/developments have been stalled or abandoned. Also with major markets like US and UK/Europe affected, tourist arrival numbers are down. The Government is now part of an IMF fiscal adjustment program and as a result, the Government's resources are tightly constrained for only critical expenditures.

Furthermore, economic deliberations within G20 summits may stimulate financial regulations that may severely impact developing countries like Antigua and Barbuda. Discussions continually highlight the need for global bank levies as well as banking capital and liquidity rules. These may in turn reduce investment opportunities in developing countries as revenues will be used to alleviate national deficits[29].

- Rise in global Fuel prices / Green Economy– as the price of oil has doubled (at least) since 2003 it has made the cost of doing business in Antigua and Barbuda increasing demanding. It has also threatened the viability of our regional airline. Additionally, the G-20 growth framework emphasizes the need for economic growth to be sustainable, and consistent with environmental policy goals. As a result, subsidies on fuel are being removed and will be ceased by 2020.

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[29] ODI Publications. (2010). *G-20 financial regulation, international bank lending and low-income country growth*

4 Priority Areas

Set against the backdrop of pursing sustainable development, the main areas of grave concern include climate change adaptation and mitigation, biodiversity, waste management and energy resources. Climate Change adaptation and mitigation were cited as the biggest challenge faced by the country based on the impacts summarized as follows:

- *Destruction of /damage to critical habitats (beaches, mangroves, sea grass beds, coral reefs)*
- Climate change impacts may contribute directly to overfishing, pollution, and loss of wetlands and nurseries
- Increased coral bleaching as a result of a 2°C increase sea surface temperature by 2099
- Sea-level change can cause loss of coastal wetlands and land area in general; saltwater intrusion
- Destruction to coastal infrastructure, loss of lives and property due to the increase occurrences of extreme weather events.
- General economic losses to the country due to the loss of infrastructure
- Changes in coastal pollutants will occur with changes in precipitation and runoff

With regards to national biodiversity, the influx of invasive species as well as the growing impacts of climate change, the country desperately needs a strategy to effectively address these issues. Given the current gaps previously highlighted, biodiversity conservation and valuation must be balanced with managing invasive species, as well as mainstreaming biodiversity into other sectors and the building of climate change resilient habitats and species.

Further, Antigua and Barbuda's sewage mechanism has begun to suffer to the point where it will have negative implications for public health and the country's natural environment. The coastal zone is also degrading and guarantees an adverse impact on tourism in the near to medium term if the appropriate measures are not taken. Establishing the necessary infrastructure to effectively address waste management as well as explore waste to energy initiatives require significant financial investment which is currently not available due to the fiscal situation of the country.

In terms of energy resources, the country is still heavily dependent on fuel imports and attempts made to increase the use of renewable energy sources are still limited. Long-term financing for appropriate technologies that can be developed as small scale systems must be balanced with the development of national technical capacity. Additionally, use of renewable energy sources must be regulated and will require legislation. Finally, a strategy and implementation thereof are needed to divert the current focus of increasing energy supplies to sustainable energy consumption and generation.

Sustaining and improving economic growth in the country will be the foremost priority area of the Government. Tourism, construction, agriculture and fisheries, and Small and Medium Enterprises will be the priority sectors over the next five years. These will be the focus of considerable effort by the Government to harness domestic and external resources to support economic growth and sustainable development but are all vulnerable to the impacts of climate change.

5 Lessons Learnt & Remaining Gaps

The following chapter seeks to highlight major gaps within the thematic areas of the BPOA and MSI as well as within the national framework for monitoring and achieving sustainable development. Nationally, data collection and management is a persistent gap when attempting to establish baselines for monitoring and review. Finance, although a major gap, attempts are being made through the establishment of a national fund. Gaps within key thematic areas have been compiled in a tabular format.

5.1 Data Collection and Management

During the preparation of the National Land Use Plan/ Sustainable Island Resource Zoning Plan, a significant amount of data was observed to be lacking, outdated and poorly recorded. As in the case of the legislative framework, the storage of data is also disjointed with a number of agencies holding various types of data with no standardized means of verification or certification. Attempts are currently underway to utilize one government agency as a center for data certification and storage.

Moreover, the lack of sufficient human resource capabilities is an inevitable challenge for all SIDS. However, collaborations are being made with academic institutions to utilize students to assist with data collection and management.

There are still gaps within the transportation sector as there is a need for a national transportation policy to provide efficient public transportation systems and reduce the number of private passenger vehicles. These will in-turn contributes to the country's GHG emissions. .

5.2 Finance

Although many management plans for the various facets of sustainable development have been created, sufficient financing and human resources are deemed insufficient for successful implementation, particularly in recognition of the Government's fiscal situation. Gaining international access to grant based financing for shifts towards a green economy and technology transfer have proven to be difficult as SIDS such as Antigua and Barbuda may not yield substantive economic dividends. Additionally, much finance is needed to transform the transport sector to ensure alignment with international issue of fuel efficient vehicles including ULSD.

It is envisaged that through the enactment of the Environmental Protection and Management Bill, a Sustainable Island Resource Fund (SIRF) will be established. The SIRF will be designed to promote the sale of ecosystem services and divert from the traditional polluter pay principle. A major source of revenue for the Fund will be the deployment and sale of renewable energy and the provision of wastewater management services, including the treatment and resale of used oil. The fund will establish these services with assistance from international donors, regulatory levies, and budgetary allocations from the Government's consolidated fund. Services will be provided at rates lower than that of the private sector.

5.3 Thematic Gaps

In pursuance of sustainable development through the BPOA and MSI Framework, major gaps and challenges within ten (10) of the respective thematic areas have been captured below as follows:

Table 2: Gaps and Challenges in key thematic areas of the BPOA and MSI

Thematic Area	Gaps	Challenges
Climate Change and Sea Level Rise	Establishment of effective institutions and systems to ensure the achievement of the UNFCCC and BPOA objectives in the country is still not been completely implemented.	Full compliance to all requirements of the UNFCCC obligations.
Natural and Environmental Disasters	Implementation of Early Warning Systems	
Waste Management	Establishing efficient wastewater management systems to curb pollution of marine and terrestrial ecosystems.	The financial investment required to establish a national or central sewer system is too exorbitant. Therefore, small scale systems are being pursued through international donor funding.
Coastal and Marine Resource	Development and implementation of proper coastal zone management plans. Regional harmonization of policies on coastal and marine resource management issues as well as strengthening the capacities of regional institutions to monitor such issues. Internationally, the exploration of the advantages of south- south corporation and the use of international efforts to monitor the issues relating to this activity are still lacking.	A lack of available financial resources to develop and implement the relevant activities.
Freshwater Resources	Completion and implementation of Water Policy and Act. Regulations for Watershed Protection.	
Land Resources	Development of local area plans to achieve national objectives that are responsive to the economic, environmental and social needs. Harmonization of land administration, and tenure. Improved enforcement and monitoring of regulations and	False scarcity of land.

	performance bonds.	
Energy Resources	Reducing energy consumption and establishing a balance with energy generation. Establishment of baselines and targeted quota for generation and consumption Investment in research capabilities of energy sources.	Increase in fuel prices. Affordable access to environmentally sound sources of energy and energy efficient technologies. Increasing financial investments
Tourism	Completion and implementation of the National Sustainable Tourism Plan and Policies	
Biodiversity	Lack of ecosystem services valuation. Lack of human capacity specialized in biodiversity management.	Invasive species Reduced land availability due to the competing uses of land
National institutions and administrative capacity	Poor coordination amongst stakeholders. Failure to increase partnerships with the private sector.	
Transport and Communication	Lack of a National Transport Policy	
Science and Technology	Establishing linkages with environmental policy	

6 Political Commitment

Based on the previously compiled sections, the Government of Antigua and Barbuda has demonstrated much commitment by developing the necessary policies and management plans needed to guide the various facets of sustainable development. However, additional commitment is needed as it relates to national financial investments and strategies to implement and support these policies. Efforts may be made either through national budgetary allocations or enabling earmarked revenue streams and establishment of national environmental/ development funds with regional affiliations. Considerations should be made to the diversification of the economic base to cater to a green economy that is low carbon.

The movement towards a green economy is deemed as a critical pathway to sustainable development. The definition for "Low Carbon" is still actively being debated. To many vested interests this means a change in way they do business. In the petroleum industry low carbon is not a word that is welcomed with open arms. Within the Climate Change convention this term raises significant problems with certain countries and is hotly debated. In Antigua and Barbuda this term is still yet to be defined at the national level and the relevant actions to get there are still being contemplated.

If the term for Low Carbon is that of the AOSIS position, where this drop in the use of Carbon is consistent with the 1.5 degree target, then for Antigua and Barbuda this would mean a correspondent drop in the use of fossil fuels. Since the sources of emissions are mainly from electricity generation and transportation, this could translate in an over 80% drop in the use of fossil fuel. If the country was to achieve this it will have a significant impact on the country's competitiveness in the market place. More importantly however it would significantly reduce the cost of living and poverty levels of the citizens of the country. The overall economic impact would be revolutionary. The country would be almost completely immune to the shocks of oil prices.

To get from energy dependence to energy independence, is technically possible for Antigua and Barbuda but will require a significant political effort to accomplish. Even if there is complete and total political will however, this process will require the access to technology and financing. This is the situation that poses the most challenge to SIDS. It is easier to get financing for a diesel power electric generator that it is for wind turbines or solar panels. The reality of a low carbon economy will be almost impossible for a small country like Antigua and Barbuda to reach unless access to financing and priority for financing is changed.

The extent of the political will to date has resulted in the development of a new energy policy and the setting a target under the Copenhagen accord to cut its emission by over 25% using 1990 as the base year. This target will be evaluated and actions plan drawn up during 2012. This process will be done as part of the Third national communication for Climate Change. Until this additional plan is drafted up the concept of the low carbon economy is still very much undefined in Antigua and Barbuda. Until the time that such a policy document is available the NEMS and NPDP and the NEP policies will continue to be the guides to a more "green economy."

7 Conclusion

The government of Antigua and Barbuda has made many strides in its implementation of the BPOA and the Mauritius Strategy for Implementation. Of the 14 priority areas of the BPOA, all or most received attention with 4 areas needing priority focus in light of the emerging challenges. These priority areas include Climate Change, waste management, Biodiversity, and Energy Resources. The recent enactment and adoption of the National Physical Development Plan (NPDP) provides the framework which will assist in advancing these areas.

Moreover, the additional areas of the MSI are still being addressed and have made significant improvements. These include health, education, sustainable production and consumption, national and regional enabling environments. The area of trade globalization and liberalization continues to be an issue due to external forces in the form of foreign policies which hinders national access to global markets.

Antigua and Barbuda is in a situation where it is in the top twenty in terms of global electricity prices. This is coupled with high fuel prices for transportation places this tiny economy in an unsustainable position. The country has made great strides in policy and institutional arrangements for the protection of its natural resources and in its social programs. These however have come at a significant price and the country has had to enter into an IMF program to restructure its finances.

During the consultations for this report many of the participants saw the way forward for the country is via a low carbon approach. This was a very popular view in the country. However, the undue and growing pressures of climate change adaptation and mitigation make the necessary finances and political will to get there require tremendous effort. The country is looking to the international community to come up with the necessary financing mechanisms to make this transformation happen.

At the national level the Government is satisfied that much of the institutional support required is in place to facilitate the necessary legislative and policy initiatives and will continue to initiate the development and implementation of the necessary plans to achieve sustainable development.

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