

THE STATE OF **THE BAHAMAS'S**
BIODIVERSITY FOR FOOD AND
AGRICULTURE

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BAHAMAS: COUNTRY REPORT ON THE STATUS OF BIODIVERSITY FOR FOOD AND AGRICULTURE

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TABLE OF CONTENTS

Executive Summary		
Chapter One	Introduction to the country	6
	1.1 General Topography	6
	1.2 Population Distribution	7
	1.3 Climate	7
	1.4 Economy	7
	1.5 Tourism	7
	1.6 Agriculture	8
	1.7 Fisheries	10
Chapter Two	The role of biodiversity for food and agriculture	12
	2.1 Terrestrial Biodiversity	12
	2.2 Marine Biodiversity	12
	2.3 Indigenous Plant Genetic Resources	13
	2.4 Forest Genetic Resources	13
	2.5 Relatives of Crop Plants	13
	2.6 Landraces	14
Chapter Three	State, trends and drivers of change of biodiversity for food and agriculture	15
	3.1 Trends in Agriculture	15
	3.2 Threats to the Agricultural Ecosystem	15
	3.3 Coastal and Marine Ecosystems	16
	3.4 Pelagic Ecosystem	16
	3.5 Trends in Marine Ecosystem	17
	3.6 Threats to Marine Ecosystem	18
	3.7 Mainstreaming Biodiversity	20
Chapter Four	Needs and priorities	22
	4.1 Agriculture	22
	4.2 Fisheries and Mariculture	23
Chapter Five	Sustainable use and conservation of biodiversity for food and agriculture	24
	5.1 Conservation and Sustainable Use of Biodiversity	24
	5.2 Sustainable Use of Natural Resources	24
	5.3 Crop Conservation	25
	5.4 General Conservation Activities	25
	5.5 Conservation of Natural Resources	26
Chapter Six	Policies, institutions and capacity	27
	6.1 General Policy Goals	27
	6.2 Research and Technology Development	27
	6.3 National Biosecurity Policy	28
Chapter Seven agriculture	Future agendas for conservation and sustainable use of biodiversity for food and agriculture	30
	7.1 Integration of Biodiversity Concerns in Sectoral Plans, Policies and Projects	30
	7.2 Sectoral Coordination	33
	7.3 Cross-sectoral Integration of Biodiversity	33
	7.4 Regional Partnerships and Projects	38
	7.5 The Way Forward	42
References		44

LIST OF FIGURES AND TABLES

Figures

Figure 1.1: Map of the Bahama Islands

Figure 3.1: Summary of the status, trends and threats to biodiversity

Tables

Table 1.1: Production systems present in the country

Table 7.1: Institutions and Legislation based on Biodiversity Management

Table 7.2: Legal and Regulatory Framework

Table 7.3: List of International Instruments

Table 7.4: Policies and Strategies

LIST OF ABBREVIATIONS

AGRRA	Atlantic and Gulf Rapid Reef Assessment
BEST	Bahamas Environment, Science and Technology Commission
BNT	Bahamas National Trust
CARICOMP	Caribbean Coastal Marine Productivity Programme
CBD	Convention on Biological Diversity
CITES	Convention on the International Trade in Endangered Species
DEHS	Department of Environmental Health Services
DMR	Department of Marine Resources
DOA	Department of Agriculture
EEZ	Exclusive Economic Zone
EPA	Environment Protection Agency
FAO	Food and Agriculture Organisation of the United Nations
GAP	Good Agricultural Practices
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIS	Geographic Information System
GOB	Government of The Bahamas
GRAC	Gladstone Road Agricultural Centre
INP	Inagua National Park
IAS	Invasive Alien Species
IICA	Inter-American Institute for Cooperation on Agriculture
IWCAM	Integrated Watershed and Coastal Areas Management
LUPAP	Land Use, Policy and Administration Project
MAMR	Ministry of Agriculture and Marine Resources
MOE	Ministry of the Environment
MOTA	Ministry of Tourism and Aviation
NGO	Non-Governmental Agency
TNC	The Nature Conservancy
WRI	World Resources Institute

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Chapter 1. Introduction to the country

Introduction

The Bahamas is an archipelago of 700 islands and cays surrounded by coral reefs and extensive sand flats extending from about 50 miles east of Florida, USA to 50 miles northeast of Cuba. The islands are very flat with little elevation above sea level. The total land area covers about 15,000 km². The climate is sub-tropical and is subject to tropical storms and hurricanes during the rainy season from August to November. Agricultural activity is restricted to the cooler season of the year from September to March, as the hot summer months and the prevalence of pests and diseases during this period, severely limit the growing season. The economy of The Bahamas is largely based on tourism, with a small but significant contribution from the financial services industry. Agriculture, fisheries and manufacturing industries combined account for less than 10% of the gross domestic product.

Figure 1.1: Map of the Bahama Islands



Source: Department of Lands and Surveys

1.1 General Topography

There are no rivers on any of the islands but several have large brackish water lakes, and many others are deeply penetrated by tidal creeks, and contain numerous blue holes. The islands are composed of coral with a limestone base, covered by a thin layer of soil varying in fertility. The islands in the northern Bahamas are generally covered in pine forests, while those of the south are of mixed coppice vegetation and scrub lands. The islands are flat and low-lying. The highest point in the entire archipelago, at 63 m above sea level, is found on Cat Island.

The northern group of islands in The Bahamas are Andros, Abaco, Grand Bahama, and New Providence. These islands show similarities in their environmental characteristics and are dominated by a self-sustaining forest of Caribbean pine (*Pinus caribaea* var. *bahamensis*). Orchids, especially bromeliads, are found in isolated areas.

The central and southern islands include Eleuthera, Long Island, Cat Island, Crooked Island, Acklins Island, San Salvador, Mayaguana, Exuma, Ragged Island, Inagua, and Rum Cay. These islands have similar environments and have been generally described as the coppice islands. The general vegetation, both past and present, has been primarily hardwoods that are now very scarce.

1.2 Population Distribution

The population, according to the year 2000 census, was estimated to be 304,989 persons, producing a population density of 22 persons per km². Population characteristics, based on the same census, indicate that in The Bahamas life expectancy at birth is 69 years; the crude birth rate and death rate per thousand are 18 and 5.3 respectively; infant mortality (live birth) per thousand is 16; under five mortality rate per thousand is 22.9 (BEST, 2005a).

There are more than 20 inhabited islands, with the main population centers, Nassau and Freeport, located in the northern islands of New Providence and Grand Bahama, respectively. More than two thirds of the population resides on New Providence, an island having a land area of 207 km². It is the most densely populated island in the country. Data gathered for the period 1963 – 2000 clearly show a steady shift from the southern to the northern islands (BEST, 2005a). This northern migration has been explained by the availability of basic services (e.g., schools, health care, etc.).

1.3 Climate

The Bahamas has a sub-tropical climate, moderated by warm waters of the Gulf Stream, with fairly high mean temperatures and moderate rainfall. Mean annual rainfall varies from approximately 1,470 mm to 865 mm, with the northern islands receiving more precipitation than the southern islands. Most rainfall occurs between May to June and September to October. The hurricane season, which lasts from June to November, may bring gale force winds, although normally wind rarely exceeds 24 km/hr. Mean daily temperatures fluctuate between 17°C and 32°C with May to November considered the summer months. The winter season occurs from December to April.

1.4 Economy

The largest sectors of the economy are tourism and banking and finance. Together, they account for approximately 75% of the gross domestic product (GDP). Agriculture, fisheries and manufacturing are dwarfed in comparison, accounting for no more than 10% of the GDP. The contributions of the construction sector is not known, however activities within this sector have increased, due in part to the recently past hurricane season and developments in the tourism sector. In addition to development and re-development stimulated by the tourism sector and disaster recovery, agriculture and fisheries are other sectors with links to land degradation and sustainable land management.

1.5. Tourism

The economic engine of The Bahamas is the tourism sector, which employs anywhere between 50 and 60% of the Bahamian workforce and generates approximately 60% of the GDP. Recent developments in the tourism sector, through the construction of new hotel

resorts and winter resident homes, have placed added pressures on the land and marine resources. The Ministry of Tourism, recognising the need for sustainable tourism development, established a Sustainable Tourism Development Unit in 1994 to carry out the mandate expressed in its definition of sustainable tourism development.

In addition to endorsing sustainable tourism, the Ministry is also promoting ecotourism. The eco-tourism market presents an opportunity for small economies, such as The Bahamas, as it allows the participation of many Bahamians in the development of tourism without impacting negatively on the cultural, environmental and historical resources of the country. Bahamians in the Family Islands are encouraged to develop small-scale resorts. It is estimated that while traditional tourism is expected to grow by between 4% and 5% in the next decade, eco-tourism (or nature-based tourism) is expected to increase by 20% to 25% during the same period.

1.6 Agriculture

Agriculture and fisheries industries make up 5% of the GDP and about 5% employment (Agriculture Plan, 2009). Approximately 90% of the available agricultural land is owned by the government and leased to farmers. Abaco contains 20,000 ha, Andros 40,000 ha and Grand Bahama 12,000 ha. Of the 95,000 ha of arable land in the country, only 7,650 ha is under cultivation, with two very distinct types of agricultural practices taking place: mechanised methods in the northern islands where they receive more rainfall and have large underground freshwater reserves; and shifting cultivation in the central and southern islands, geared for subsistence farming (Pinder, 1996). More than 2,000 ha of agricultural land in The Bahamas are used for citrus production.

Major crops for export are grapefruit, limes, avocados, papaya, okras and pineapples. Popular fruits consumed locally are mangoes, guineps, guavas, sapodillas, sea grapes, sugar cane, bananas and sugar apples. The 1994 Census on Agriculture (DOA, 1994) indicated that there are 1,800 farms in The Bahamas.

The agricultural sector of The Bahamas contributes less than two percent to the gross domestic product of the economy. Food imports, mainly from the United States of America, total more than US\$500 million annually and represent more than 90% of the food consumed. Agricultural production is done mostly by small-scale farmers, with very little large-scale production taking place.

The soils of The Bahamas tend to be fragile, low in nutrients and not well suited for agricultural exploitation. The soils have a high pH (between 7.9 and 8.3) with a calcareous rock structure. The use of fertilisers is prevalent, with phosphorus being used in high concentrations. An estimated 6% of the total land area is arable land, and of that, less than ten per cent is actually under cultivation. The most arable and easily cultivated lands, also suitable for mechanised, large-scale commercial farming, are found in the pine islands of the northern Bahamas, where an abundant supply of groundwater may be obtained for irrigation. The southern islands are very dry and lack fresh water. Therefore, they are less suitable for farming. In addition to being converted to non-agricultural use, the arable lands of The Bahamas are subject to various forms of degradation, due to human intervention and natural causes. These include over-cultivation of soils, over-grazing, the indiscriminate use of chemicals and fertilisers, and natural disasters, such as hurricanes and drought conditions.



Farming on the sandy soils of Kemp's Bay in South Andros, just inland from the coastline

Subsistence farming is still important in most of the islands, where corn, cassava, sweet potatoes, beans and pigeon peas are cultivated. However, the number of farmers has declined in the past two decades and the average age of farmers has increased. A number of farmers do not have access to the traditional farming areas within their islands, due to the lack of farm roads. Some of them have been growing crops on the sandy soil in the area of land just beyond the coastline. Before planting, soil and organic material is placed in each hole to preserve moisture and to provide nutrients.



Farmer on Cat Island, using slash and burn method to cultivate a variety of crops including, sweet potato, yam, tomato and hot pepper.

Farmers continue to use agricultural practices such as slash-and-burn, inadequate crop rotation and intensive tillage of the soil that negatively impact the land. In some of the smaller uninhabited islands and cays, sheep and goat are allowed to roam freely. This practice has led to the complete stripping of vegetation from these cays. Land degradation is directly attributed to these unsustainable land management practices.

Efforts have been made by The Bahamas Government to expand food production in order to reduce the import bill and generate foreign exchange. Foreign investment has been encouraged to increase exports in beef and pork production and processing and production of fruits and vegetables. Most of these agricultural products are highly perishable commodities, however, with inadequate facilities in place for agro-processing. The development of the infrastructure required for a viable agricultural industry would make a significant

contribution to achieving food security and enhancing the incomes and livelihood of the farming communities.



Goat rearing on limestone rock surface with sparse vegetation. Note pot holes in limestone rock surface

1.7 Fisheries

The important commercial species of fish and other marine fauna, as well as a large number of species with little or no commercial value, live on the extensive shallow water banks. In 2004, the total fisheries landings were valued at US\$95.3 million (BEST, 2005a). Particularly important commercially is the spiny lobster, which comprised 88% of the fisheries product in 2004 (BEST, 2005a). Other commercially important species include the queen conch, the Nassau grouper, the lane snapper, jacks and bonefish. There are also a number of important offshore pelagic game fish including blue marlin, tuna, wahoo, sailfish, swordfish, amberjack, dolphin and white marlin. The Bahamas exports lobster and some fish but, with the exception of shrimp, does not raise these items commercially.

In addition to commercial fisheries, there are two other categories of fisheries: recreational/subsistence and sport fishing (BEST, 2005a). Recreational/subsistence fishing involves the capture of small quantities of fish for recreation or subsistence and both tourists and Bahamians practice it. Sport fishing involves the catch and release of generally large pelagic species, such as the blue marlin. This activity appeals to many visitors and it is widely promoted by the Ministry of Tourism and various businesses in the tourism sector.

In general, the fisheries sector is not considered a major economic sector; however, its sustainability and growth are essential for Bahamians, both present and future generations. It is also an element of the tourism-marketing package. In turn, the health of this sector is linked to the viability of the marine and coastal environments, which serve as habitats for the fisheries species. Most of the commercially significant fisheries utilise coastal wetlands (mangroves) as nurseries. In addition, once they have matured and move to open waters, the coral reefs and seagrass beds become significant for their survival. Consequently any land-based activities (e.g., coastal developments, agricultural operations) that cause or contribute to coastal erosion and sedimentation may impact the health of these environments and may also affect the viability of the fisheries sector.

Table 1. Production systems present in the country.

Production system	Indicate if present in the country (Y/N)	Description
Livestock grassland-based systems		Traditionally, livestock production is carried out on coppice vegetation, with animals tethered to a certain area to graze the shrubbery. Few large animals are reared. Pigs, sheep and goats are preferred. Animals are sometimes left to graze on the small islands and cays that abound.
Livestock landless systems	No	
Naturally regenerated forests	Yes	Most pine forests (<i>Pinus caribaea</i>) are self-sustaining secondary growths. They protect the soil and the fresh water lens and provide habitats for many plants and animals--including the Bahama parrot in Abaco. This ecosystem is also known as “pineyards”, “pinelands” or “pine barrens”, and they may be “wetbarrens” or “dry barrens”. The pine forests of Abaco, Andros and Grand Bahama occupy about 6,185 km ² .
Planted forests	No	
Self-recruiting capture fisheries	No	
Culture-based fisheries	No	
Fed aquaculture	No	
Non-fed aquaculture	No	
Irrigated crops (rice)	No	
Irrigated crops (other)	Yes	In the pine islands of the northern Bahamas, large and medium-sized farm operations utilise overhead sprinkler systems and drip-irrigation systems to irrigate vegetable crops during the vegetable growing season of October to march, which is generally cool and dry. Mechanised farming is possible in these islands where they receive more rainfall and have large underground freshwater reserves.
Rainfed crops	Yes	In the central and southern Bahamas, the islands are very dry and lack fresh water. Therefore, they are less suitable for farming. Crops such as pigeon peas, corn, cassava and sweet potato are cultivated.
Mixed systems (livestock, crop, forest and/or aquatic and fisheries)	Yes	Most farmers in the Family Islands (the islands excluding New Providence and Grand Bahama with sizeable populations) cultivate a variety of vegetable and staple crops (cassava, yam, sweet potato, peas and beans), in addition to rearing sheep, goats, pigs and chickens.
Others (please specify)		

Chapter 2. The role of biodiversity for food and agriculture

2.1 Terrestrial Biodiversity

- *Pine Forests.* Most pine forests (*Pinus caribaea*) are self-sustaining secondary growths. They protect the soil and the fresh water lens and provide habitats for many plants and animals--including the Bahama parrot in Abaco. This ecosystem is also known as “pineyards”, “pinelands” or “pine barrens”, and they may be “wetbarrens” or “dry barrens”. The pine forests of Abaco, Andros and Grand Bahama occupy about 6,185 km².
- *Coppice.* This comprises the dense, upright and narrow-stemmed, regrowth of mixed hardwood tree species (*Bursera*, *Metopium* and *Swietenia*). It provides habitats for many orchids and bromeliads (both terrestrial and epiphytic), and for birds, snakes and crabs. Coastal coppice may occasionally flood, and on windward coasts receive salt spray which may lead to sculpting and wind-shaping.
- *Inland ponds.* Plant life may be restricted to micro-algae either dispersed or in mats along the edges. Salinity can vary widely, with some hypersaline ponds. Animal life in the latter includes crabs, insects, brine shrimps and wading birds. Anaerobic decomposition may release sulphides with unpleasant smells. Heavy rainfall or flooding with freshwater seriously disturbs hypersaline ecosystems.
- *Mangrove Forests.* These are dominated by one or more species of mangrove (*Avicennia*, *Laguncularia* and *Rhizophora*) with other plant species in drier areas. They encourage sedimentation, hold the sediments in place, and help build land. They also provide nursery habitats for many marine animals, including commercial fishery species, and habitat for water fowl and other fauna. Mangrove forests minimise flooding and erosion. They occur mainly in protected locations on leeward coasts. The Bahamas has about 4,286 km² of mangrove forest and other wetlands.

2.2 Marine Biodiversity

- *Blue holes.* Ocean blue holes provide habitats for many marine animals, including commercially important fish. Inland blue holes comprise photo-synthesising cyanobacteria (often called blue-green algae) around the edges, and several different bacterial species at specific depths and levels of salinity. They are also home to several unique species of fish. The inland blue hole ecosystem is easily disrupted.
- *Coastal rock.* These ecosystems occur close to the sea, and comprise several low-growing and salt-tolerant shrubs, including *Strumfia*, many of which are most attractive. Iguanas may be found in this ecosystem.
- *Coastal sand.* These communities include beaches and strips among coastal rock ecosystems. Above the high water mark, the plants are typically vines and low-growing spreading perennial species and shrubs. Sea oats (*Uniola*) are often conspicuous.
- *Tidal flats and salt marshes.* These have saline soils which may be high in silt content, and are typically covered with rather succulent low-growing plants tolerant of salinity. Typical is *Salicornia*.

- *Seagrass beds*. These stabilise the sea-bed, are a primary source of food for many grazing marine reptiles, and provide nursery habitats for many commercial fisheries.
- *Coral reefs*. These protect low-lying coast-lines from wave action, provide habitat for numerous fish species and for other sea creatures, and have aesthetic value for Bahamians and tourists. They are the most diverse ecosystems in The Bahamas. The Bahamas may have as much as 4 to 5% of the world's coral reef biodiversity.
- *Open ocean*. This ecosystem abounds with numerous species of fish, marine mammals (such as whales and dolphins), jelly fish, octopus and squid, as well as seaweeds and an abundance of other organisms that provide food for the larger animals.

2.3 Indigenous Plant Genetic Resources

Of the 1,371 varieties of Bahamian higher plants recognised and described more than 120 are endemic (Correll and Correll, 1982). Included in this listing are many wild relatives of cultivated species including grape (*Vitis*), sweet potatoes (*Ipomea*), and yams (*Dioscorea*) to name some more commonly recognised plants. It is certain that the described list is incomplete for both terrestrial and marine plants. As an intended list of higher plants there is no listing of algae and fungi of either marine or terrestrial environments. The unique geography of The Bahamas provides a range of specialty micro environments in both aquatic and terrestrial environments. The occurrence of many small lakes of fresh, salt, and hyper-saline water provide many micro environments with an equally diverse complement of organisms. The aquatic marine environment varies from exposed Atlantic coastline to tidal flats and mangrove swamps. The myriad of environments have fostered a wide range of plant tolerance to drought and salinity.

2.4 Forest Genetic Resources

The Pine (*Pinus caribaea* var. *bahamensis*) forests of the northern islands are the only species presently recognised of value as timber. These forests are now in a recovery period following two previous harvests for timber during the 1920's and pulpwood from 1957-1972. Hardwood species formerly considered as valuable for timber is virtually unavailable at this time due to the loss habitat and over-harvesting. The interior of northern islands are covered by pine with broadleaf coppice covering the coastal strip of these islands and forming the vegetation of the remaining islands of the Central and Southeastern Bahamas. Traditionally, the coppice covered islands of the Central Bahamas and the coastal areas of the Northern Bahamas where the sites of early settlements resulting in private and commonage types of land tenure. Consequently, these sites were no longer public lands and were used for both human settlements and agriculture.

The resultant changes in the makeup of the flora can only be surmised at; however, the shifting nature of the disturbance should have resulted in less depletion than the complete clearing of large tracts. The remaining diversity has served to provide timber, construction materials, food, pharmaceuticals for traditional medicine and export products such as indigo, brasiletto, and sandalwood in the past. The true nature of this diversity remains to be described and catalogued.

2.5 Relatives of Crop Plants

Within this diversity are wild relatives of many crop plants such as sweet potatoes, yams, grapes, passion fruit and many other fruit crops. None of these relatives have been used to

date in breeding and improvement of existing crops. There is no plant breeding and development programme being implemented at this time.

2.6 Landraces

Traditional use of landraces in the Central and Southeastern Bahamas continues to provide a reservoir of well adapted, although low-yielding, cultivars of maize, sorghum, pigeon pea, okra, pepper, and sesame along with long-standing varieties of vegetatively propagated selections of manioc, sweet potato, banana, eddoe and pineapple. There is great diversity in characteristics in many seedling fruit crops. Many are deserving of description and preservation as useful varieties. There is no organised system of cataloguing and conserving any of these landraces at this time. Comparatively, broadleaf coppice areas appear to offer the greatest diversity in genetic material for crop improvement. Pine forests by contrast do provide some examples such as wild yams (*Dioscorea*) and grapes (*Vitis*).

Chapter 3. State, trends and drivers of change of biodiversity for food and agriculture

Out of all the threats identified for affecting biodiversity in The Bahamas, climate change is considered to have the greatest effect as 80% of The Bahamas' landmass is within 1.5 meters of sea level rise and 90% of The Bahamas' freshwater lenses are within 1.5 meters of the land surface, making the groundwater resource fragile and highly vulnerable to contamination. According to Dr. Kouwenhoven (Tribune, 2010), a climate change expert, The Bahamas could see a 20% reduction in rainfall and incremental increases in temperature within the next 40 years. Some of the potential impacts due to temperature increases are loss of biodiversity, compromised groundwater tables, saline soils, and increases in incidences of flooding and impaired fishery resources. Therefore, the threat of climate change encapsulates all of the ecosystems of The Bahamas. According to the 2007 World Bank study (Worldbank, 2007), The Bahamas is in danger of facing losses in coastal population, coastal GDP and coast urban areas, due to storm surge intensification, and was ranked number one of 10 countries in each of those categories. The Bahamas appears as one of the top three countries most vulnerable to the consequences of climate change such as coral bleaching, increasingly powerful tropical hurricanes and rising sea level. It is a threat not only to the valuable marine resources but of the very existence of the islands of The Commonwealth of The Bahamas. The persistent challenge of climate change with its dire prognosis for The Bahamas is of paramount concern.

3.1 Trends in Agriculture

In 2008, the Ministry of Agriculture and Marine Resources embarked on a "Backyard Farming Programme" for householders in The Bahamas, aimed at lowering food imports and household food bills during the present economically hard times. Additionally, through subsidies the Department of Agriculture is encouraging farmers to expand sweet potatoes, bananas, onion, Irish potatoes, and pigeon peas acreage. Recently, the cultivation of several crops, notably ornamental plants and citrus fruits, has expanded, while the farming of poultry and livestock has declined. Livestock production is one of the areas emphasised in the agricultural policy and the aim is to make each island self-sufficient in poultry and pork. Poultry, eggs, and livestock production in The Bahamas has increased by 4%, 1%, and approximately 4% in 2008 from 2007, respectively (Dupuch, 2010).

3.2 Threats to the Agricultural Ecosystem

The primary threats to the Agricultural ecosystems are:-

- Land conversion – lack of protection for agricultural land
- Hurricanes
- Fires – slash and burn could result in uncontrollable fires
- Diseases – mealy bug, canker rust, insects, fungus, foot and mouth disease etc.
- Lack of water supply

According to the 1998 Food and Agriculture Organisation (FAO) Country statistics (FAOSTAT, 2011), The Bahamas imports approximately 98.1% of its net cereal imports and food supplies. The Government has instituted a policy to utilise agricultural lands to aid in the growth of the economy through increased exports, by providing jobs and by reducing dependence on the tourism sector, in hope of providing food sustainability. In many instances, it costs more to grow locally, than to import products which results in an actual decrease in wealth.

3.3 Coastal and Marine Ecosystems



The Bahamas is a coastal country, with the entire population living within the coastal zone. Marine environments cover the greatest area of The Bahamas and are linked in both the flow of energy and matter through biological and ecological cycles (BEST, 2005c) which provide jobs, food and recreational services. Each year thousands of visitors frequent the shores of The Bahamas to dive and fish on the reefs, or cruise the beautiful turquoise and warm aquamarine waters of the archipelago. As a result tourism accounts for more than 50% of the total GDP

with 67% of the visitor arrivals by sea (Dupuch, 2010). The seagrass meadows and coral reefs along with coastal mangrove wetlands are the environments at the core of the Bahamian economy (Bahamas Environment Handbook). In the past two years, a significant threat to marine species has entered the Bahamian waters in the form of the Lionfish (*Pterois volitans*). The numbers of lionfish have increased from 2, initially sited in 2006, to tens of thousands throughout the Bahamian archipelago in 2009. It is likely to have an impact not only on native biodiversity, but also on fisheries. Researchers have confirmed that these fish are feeding on commercially important juvenile and adult fish species such as grunts and snapper and it is feared that they are impacting other species as well as coral reefs through their predation of herbivores that keep the reefs free of algae (BEST, 2009a).

The Bahamian commercial fishing industry is important both socially and economically to The Bahamas. The three main important fisheries in The Bahamas are spiny lobster (*Panulirus argus*), queen conch (*Strombus gigas*), stone crab and scale fish – including species of grouper, snappers, jacks, grunts, hog fish and others (BREEF, 1998).

The Bahamas is known as one of the world's premier flat fishing destinations. Anglers travel from around the globe to hunt in the crystal clear shallows of The Bahamas, seeking the elusive bonefish, known as the Grey Ghost of the Flats. The islands with the greatest economic benefit from flats fishing are Andros and Abaco (BNT, 2010b).

As stated in the Ecological Gap Assessment, the Berry Islands, Bimini, Cay Sal, Long Island and the Southern Bahama Bank are critical areas for marine resources, and none of these areas currently receive any form of protection. The current marine protected areas do not provide adequate connectivity between reef and nearby mangrove nurseries areas.

Many different species of seabirds can be found in The Bahamas, particularly on San Salvador Island (Hayes, 2003). Species include Audubon's shearwater, white-tailed tropic bird, magnificent frigate bird, brown booby, red-footed booby, double-crested cormorant, laughing gull, brown noddy, gull-billed tern, royal tern, roseate tern, bridled tern, sooty tern, and least tern.

3.4 Pelagic Ecosystem

The pelagic ecosystem consists of the Tongue of the Ocean, Exuma Sound, Great Bahama Canyon, Gulf Stream and the Atlantic Ocean. The pelagic environment of The Bahamas (top 3000 ft of water) is attractive to deep-diving whale and dolphin species, such as short-finned pilot whales, melon-headed whales and Atlantic spotted dolphins, many of which occur year-round in these pelagic environments (Claridge, 2006). Additionally, some baleen whales,

such as endangered humpback whales, may occur during winter. The Exclusive Economic Zone (EEZ) is the area northeast of Little Bahama Bank and covers 260,000 square miles of islands, banks, reefs, shipping lanes, and pelagic fisheries (BEST, 2004a). It sustains an enormous food network from plankton to blue marlin and giant tuna. Sportfish found in the pelagic ecosystem are tuna, wahoo and blue marlin (National Fish of The Bahamas). Spiny lobster larvae can spend up to nine months adrift in pelagic environments, while conch larvae drift in these environments for 3 to 4 weeks.

3.5 Trends in Marine Ecosystems

Even though, a few trends have been identified for various species and ecosystems in The Bahamas, there is no long term, systematic way of collecting information, nor is there a requirement for how results from research is presented in the country. From observation, fishermen have to go further and further out to sea to catch species (conch, lobster, snapper, etc) that use to be in the nearshore indicating a decline in the species. According to Gittens and Braynen (2002) the deep water populations are reaching a point of overfishing. Gascoigne and Elliot's (2002) research on the queen conch showed that the queen conch is heavily overfished in the Exuma Cays. According to the World Resources Institute's (WRI) "Reefs at Risk" the populations of grouper and conch show clear evidence of overfishing. The most recent mortality rates available on spiny lobster indicate that the stock was close to being fully exploited (Gittens and Braynen, 2002). The Ecological Gap Assessment (2007) found that reefs with high mangrove connectivity have been shown to have a greater biomass of several fish species.

Research in the Exuma Land and Sea Park marine fishery reserve showed that the park is functioning to help protect the abundance, size, and reproductive output of marine species. "There were clearly more and larger Nassau grouper inside the park than outside it and those individuals within the park are likely producing on the average 4.6-7.1 times as many eggs per unit area, compared to smaller individuals outside of the park (Sluka *et al.*)."

Through the Atlantic and Gulf Rapid Reef Assessment (AGRRA) it was found that coral reefs have declined in waters near the more developed and populated islands, such as New Providence and San Salvador, but are generally in good condition. In less developed islands such as the Abaco's, Andros, Bimini, Eleuthera, Cat Island, Long Island and the Exumas, the relatively isolated reefs have a high percent cover of hard corals, as well as high densities of fish and are considered very healthy. "Sites in North and Central Andros seem to be the healthiest based on lower mortality, lower abundance of microalgae and higher abundance and diversity of fish" (Linton, *et.al*, 2002).

On San Salvador, monitoring by the Caribbean Coastal Marine Productivity Programme (CARICOMP) since 1994 showed changes in coral cover at a 10 m depth of 9.6% to 4% in 2001, with macroalgae being predominant. This resulted in the transition of that reef community from one in which corals and algae were co-dominant, to a community dominated by macroalgae. Additionally, The Lindsay's Reef, Rocky Point Reef and Rice Bay Reef were studied from 1992 to 2007 in San Salvador. "Rice Bay Reef had a lower coral cover and seemingly less healthy assemblage of biota than Rocky Point and Lindsay's Reef and exhibits a greater degree of stasis than they do (McGrath, *et al*, 2007)." Overall, the study showed that the coral reef systems showed remarkable resilience and stability despite three major hurricanes, periods of prolonged high sea-surface temperature, episodes of coral bleaching and outbreaks of diseases on both scleractinian and gorgonian corals.

In The Bahamas seagrass beds and their geographical distribution is the least documented and must be seen as an important aspect of fisheries habitat and baseline data must be collected and accessible (BEST, 2005a).

In 1984, Sprunt estimated the total number of nesting seabirds to be 75,000 pairs (14 species). In 1995, Lee *et. al.*, estimated a minimum of 3,000 – 4,000 pairs of seabirds nest in the Exuma Land and Sea Park.

In the 1950s the West Indian Flamingo was frequently hunted and near extinction. Banding studies at the Inagua National Park (INP) show that the park is providing nesting and feeding habitat for the last stronghold of the West Indian Flamingo and that the Inagua birds have served to repopulate Cuba, Mayaguana, Turks and Caicos Islands and Cayman Islands. Today, there are approximately 50,000 Flamingo's in the Inagua National Park (BNT, 2009a).

The prehistoric Lucayan people of The Bahamas (A.D. ~ 600-1500) considered blue holes to be sacred (BEST, 2002). Nowadays, depending on which island you are on, people consider blue holes as either recreational areas of environmental importance or as dumping grounds.

The continuous beach monitoring for fecal bacteria, salinity, ph and conductivity indicate that The Bahamas is well within range of the Environment Protection Agency (EPA) of the United States of America's recommended levels for fecal coliform in recreational waters. The beach vegetation and beach erosion is only monitored during the summer months due to the availability of summer students. Vegetation counts inclusive of invasive alien species (IAS) (e.g. *Casuarina equisetifolia* and *Scaevola taccada*) are collected annually. Even though there is a management plan in place it is not used and no action is taken to control or alleviate the invasive species. The amount of sand on the beach is measured for erosion using a measuring tape from the high water mark inland. While this data on beach vegetation and beach erosion is gathered, it is not compared or analysed. The quality of the data is not reliable due to the diverse persons collecting it.

3.6 Threats to Marine Ecosystems

Natural and anthropogenic hazards that threaten the marine and coastal environment are presented below.

- Illegal dumping – boaters haul unwanted material out into deep water and drop it over the side of the boat into the ocean or blue holes
- Unsustainable exploitation - illegal harvesting during closed seasons and undersized species by locals and foreigners
- Lack of resources – for enforcement of conservation measures and research
- Pollution – inadequate waste water treatment and fertiliser run-off
- Underwater noise pollution – regular use of Navy sonar and increased noise from ship traffic
- Physical destruction – dredging and development, docks and piers, the creation of navigational channels; destructive fishing methods such as bleaching or dynamiting of reefs; inappropriate use of fishing gear (e.g. drag nets), anchor damage and the use of fish traps
- Coral disease - white band disease of the main *Acropora* species has been widespread.

- Coral bleaching – excess shade, increased levels of ultraviolet radiation, sedimentation, pollution, salinity changes, and increased ocean temperatures possibly due to climate change
- Water quality changes – long-term changes in characteristic of the water that flows over the coral reefs which are sensitive to chemicals, nutrients, sediment, and anything else
- Natural threats and storms, wind-driven waves and rise in sea level
- Filling in of wetlands – for refuse sites, roadways, airports, residential developments and health reasons – to control mosquitoes
- A lack understanding as to the function of wetlands has led to a rapid decline
- Hurricanes, storm surges and the potential effects of sea level rise

The coastal and marine environment is blessed with many sandy beaches, clear warm waters and colorful coral reefs which support the tourism and fishery sectors in The Bahamas. Ironically, development in the tourism sector, as well as urban and infrastructure expansion has resulted in many physically damaging changes to the coast and the marine environment. Habitats are fragmented as result of the development resulting in ecosystems having less resilience to hurricanes and storm surges; which is expected to be amplified by climate change. Devastation of coral reefs and mangroves lessens shoreline protection and makes The Bahamas more vulnerable to storm damage, erosion and flooding. Plus, there would be diminished income earning potential and decreased availability of resources due to the reduction in shelter, food and nursery areas for many species of fish, crustaceans, honey bees and birds, notwithstanding, the loss of important fishery areas providing food to Bahamians and visitors. More importantly, educational and scientific opportunities would be lost.

Figure 3.1: Summary of the status, trends and threats to biodiversity

Ecosystems / Biodiversity Component	Threat/Menaces				
	Climate Change	Habitat Loss	Invasive Species	Pollution	Over-exploitation
Agricultural	↗	↗	↗	→	↘
Coppice Forest	↗	↗	↗	↗	↗
Pine Forest	↗	↑	↗	↗	↗
Inland Waters	↗	↗	↗	↑	↗
Islands	↗	↗	↗	↗	↗
Coastal	↑	↑	↑	↑	↑
Coral Reefs	↑	↗	↗	↗	↑
Mangroves	↗	↗	↗	↗	↗
Deep Water	↗	→	↗	↗	↗
Seagrass Beds	↗	→	↗	↗	↑

Driver's Impact on Biodiversity

	Very High
	High
	Moderate
	Low

Driver's Trends

↘	Decreasing Impact
→	Stabilizing Impact
↗	Increasing Impact
↑	Very Rapidly Increasing Impact

3.7 Mainstreaming Biodiversity

Ecosystems and biodiversity is impacted by the agriculture, fisheries, forestry and tourism industries that are required to sustain life. In an effort to minimise the impacts on biodiversity from these industries; actions for conservation and sustainable use has to be incorporated in all of the sectoral and cross-sectoral strategies. This incorporation into the strategies is considered ‘mainstreaming’.

Currently, The Bahamas has sectoral plans (five year) for Agriculture and Fisheries. The enactment of the Forestry Act, 2010 requires the development of a five year forestry plan. The Ministry of Tourism has a national plan for sustainable tourism and ecotourism, but only some aspects of the plan have been implemented. An ecotourism plan for Andros is being developed as an output of the Integrated Watershed and Coastal Areas Management Project (IWCAM) Andros demonstration project that is nearing its completion. The sole entity responsible for 26 of the protected areas, The Bahamas National Trust (BNT) also developed a strategic five year plan. The various sectoral plans and policies have incorporated measures for the conservation and sustainability of biodiversity, but this has not been a direct result of mainstreaming efforts.

The agriculture sector plan aims to ensure long term development and conservation of the national agricultural resource base as well as the protection of the country’s future capacity to produce. Aspects of the plan include conservation and protection of the water resources through the development of an agricultural sector water policy and training in good agricultural practices (GAP), protection of agricultural land through the development of a land evaluation system and land zone maps and preservation of agricultural biodiversity by establishing an ornamental research and development programme (e.g. to study Invasive Alien Species (IAS)). The plan should assist in the sustainable expansion of agricultural products in order to provide food locally at a competitive price. It also calls for the construction of a diagnostic laboratory to protect the health, welfare and food and safety of agricultural animals. Threats such as IAS, diseases, land conversion and water pollution should be reduced if the plan is successfully implemented.

The marine resources sector plan is based on “the conservation and sustainable use of fisheries resources and the marine environment for the benefit of current and future generations of all Bahamians” (Agriculture Plan, 2010). Some of the main aspects of the plan are to develop a data collection system to provide necessary biological, economic and social data for assessment and management for all major species/fisheries; maintain and restore populations of marine species at levels that can produce the optimal sustainable yield by promoting efforts to reduce lionfish in The Bahamas, through research and educational campaigns and by introducing a certification process for crawfish fisherman; to preserve rare or fragile ecosystems, as well as habitats and other ecologically sensitive areas by designating and policing protected areas. Once the plan is implemented, it will assist with reducing the threats of lionfish and illegal fishing. It will also provide a data collection system for vital marine resources information. Gaps and deficiencies in the current legislation should be identified and addressed during the regulatory review.

The Bahamas has had numerous studies conducted, adopted policies and enacted legislation which would contribute to the protection of biodiversity in the country. Despite using the various mainstreaming mechanisms to develop these documents, the country struggles with making the document a reality, resulting in a decline of biodiversity. Many environmentalists in the country feel that the environment is considered as an afterthought when it comes to

development in the country. Implementation is hampered by lack of technical skills, lack of man power, lack of equipment and scarce financial resources. Even though tools exist to assist in decision making for development in the country they are more often than not referred to for guidance.

Chapter 4. Needs and priorities

The Bahamas is concerned about the participation of small states in the protection and preservation of genetic diversity at the global level. However, as with many other small states, it lacks the trained personnel and financial resources to implement a thorough inventory and conservation effort targeting organisms occurring in the various habitats. The Bahamas like many developing countries is often faced with the dilemma of choosing between generating economic activity and conservation issues. The Bahamas can contribute to global conservation efforts through several long and short term measures.

Short term proposals include:

1. Inventory of genetic resources.
2. Enactment of necessary legislation.
3. Promotion of greater public awareness and wider public participation in conservation efforts.
4. Expanded training of personnel involved in conservation activities.

Proposed long term activities are:

1. The further development and maintenance of permanent conservation sites.
2. To seek to foster a greater conservation consciousness within the population.

4.1 Agriculture

The Bahamas government seeks to accelerate the growth and development of agriculture for import substitution and generation of foreign exchange. Priorities include the control of agricultural imports; protocols for the importation of alien plants and the importation of live plants; land and water use policy; pesticide legislation; plant and animal quarantine facilities; and integrated pest management.

The Bahamas government has recognised agriculture as being important for its contribution to food security and the diversification of its economy. The Department of Agriculture is the principal support institution for the agricultural sector, and as such is expected to provide a policy direction for that sector. Agricultural production is being increased through more efficient use of land and increasing the amount of land under cultivation in a strategy aimed at a combination of import substitution and increased share of export markets.

The short and long term objectives of the planned agricultural expansion are to increase export earnings (thereby continuing to diversify the economy), to increase employment opportunities and to achieve greater self-sufficiency in food supplies. Much of this expansion will be in fruit crops (especially citrus) and vegetables for export. Continued expansion in livestock agriculture is also expected but primarily for the local market. An expansion in food processing activity is also envisaged, in parallel with the expansion in production.

In the area of environment, goals are to develop a strategy to improve environmental performance in the agricultural sector. Included in these goals are the proper management of pesticides and fertilisers, and biodiversity conservation.

Recent developments elsewhere in biotechnology, including tissue culture and rapid propagation techniques, are presently being adopted here in order to preserve endangered species and develop sustainable agricultural programmes. Agricultural research will be strengthened to improve service to the agricultural community. Growth and expansion of the agricultural sector is inherent to the development of the rural communities of the Family Islands of The Bahamas and to national food security.

4.2 Fisheries and Mariculture

It is clear that the future for fisheries is highly uncertain in view of growing demand for fishery products, and current legislation and enforcement capabilities. Mariculture is being promoted to meet a portion of the demand. A Fisheries and Mariculture Development Plan is needed to address possible conflicts.

Needs

- _ Develop a Fisheries Master Development Plan with provisions for mariculture
- _ Strengthen institutional capacity for all aspects of the mandate, especially up-graded communication technology, technological skills, specialized training, and professionally trained staff
- _ Establish mechanisms for cross-sector coordination and communication
- _ Strengthen regulatory and enforcement capacity
- _ Expand extension arm, with special attention to training and community-based fisheries management programmes
- _ Provide new legislation to meet emerging needs (e.g., for new fisheries regulations, controlled access to fishery resources, and marine mammals)
- _ Reduce impacts and conflicts of fishery enhancement programmes
- _ Encourage fishery investments by identifying options and opportunities
- _ Prepare environmental impact assessments and statements
- _ Expand capacity for data acquisition, research and monitoring
- _ Establish a system of fisheries reserves for restoration and enhancement, experimental use, recovery of endangered and depleted species, and research and monitoring
- _ Examine methods of traditional fishing
- _ Create national information and collection centers (e.g., National Library, National Museum, GIS facility for habitat analysis)
- _ Increase funding and logistic support
- _ Promote public understanding

Chapter 5. Sustainable use and conservation of biodiversity for food and agriculture

5.1 Conservation and sustainable use of biodiversity

The primary goal related to conservation and sustainable use of biodiversity in implementation of the Convention on Biological Diversity, which The Bahamas is a Party to. Achieving this primary goal will involve successfully completing the following secondary goals:

- i. Integration of conservation and sustainable use of biodiversity in national planning and decision-making
- ii. Adoption of measures relating to the use of biological resources to avoid or minimise adverse impacts on biodiversity
- iii. Support of local populations to develop and implement remedial action in degraded areas where biodiversity has been reduced
- iv. Encouraging cooperation between Government agencies and between Government agencies and other sectors in developing methods for sustainable use of biodiversity
- v. Establishment of the national Clearing House to provide information on Bahamian biodiversity and to link to the CBD Clearing House Mechanism
- vi. Implementation of relevant components of the biodiversity programmes of work on inland waters, marine and coastal systems, agriculture, forests, dry and sub humid lands, and islands
- vii. Development and adoption of measures to address scientific assessments, incentives, ecosystem approach, monitoring and indicators, taxonomy, protected areas, public education and awareness, research and training, and technology transfer and cooperation.

5.1 Sustainable Use of Natural Resources

The Convention on Biological Diversity stresses the sustainability of resource use. It is important to determine which Bahamian resources are in danger of depletion, and which ecosystems are under threat of degradation. It is recommended that:

1. Sustainable use of natural resources be fully integrated with national policy planning, to ensure the most effective use of these resources.

2. A comprehensive plan for sustainable agriculture be developed including:

- conservation and improvement of agricultural soils
- programmes of integrated pest management
- agricultural systems that are environmentally-friendly
- evaluation and adoption of new product technologies

3. A National Fisheries Development Plan be implemented to maintain and enhance the productivity and biodiversity of Bahamian fisheries, through:

- allocation of fishery resources according to limited entry, property rights and zoning
- establishment of appropriate fisheries protected areas
- conservation and restoration of coastal habitats and wetlands important to fisheries recruitment and to the health of fringing reefs
- evaluation and adoption of appropriate new fisheries resources and technologies, including mariculture

4. A National Forestry Development Programme for sustainable management of all forest resources be developed and implemented including:

- establishment of a permanent forest estate
- design and implementation of appropriate management strategies
- development of sustainable resource utilisation plans
- forest resource assessment and continuous monitoring
- an inventory of mangrove forest and their resources

5. A comprehensive Integrated Water Resources Management Plan, that includes all forms and uses of water, be developed, including:

- consideration of the needs of all living organisms in a healthy environment
- discouraging wasteful practices
- management of water resources for agriculture
- strengthening of regulatory and institutional arrangements
- expansion of waste water and waste disposal facilities for ecosystem preservation and prevention of water pollution

6. The use of native trees and shrubs in landscaping be encouraged, and the importation of alien plant species be discouraged.

7. A national plan for sustainable tourism and ecotourism be implemented.

5.3 Crop Conservation

There is no organised conservation effort targeting landraces of traditional crops. The introduction of high-yielding improved varieties and hybrids have resulted in the displacement and loss of traditional landrace varieties in the Northern Bahamas. The remaining landraces in Central and Southern Bahamas are in danger of loss due to the lack of sound conservation practices. The reduction in numbers of subsistence farmers due to population migration from the surrounding islands to New Providence has resulted in fewer farmers in the Central and Southeastern Bahamas and a general increase in the average age of the remaining farmers. The number of custodians of the traditional varieties is diminishing annually.

5.4 General Conservation Activities

General conservation activities aimed at preserving Bahamian fauna have resulted in the conservation of many native plant species occurring in those habitats. The Bahamas National Trust, a non-governmental statutory organisation oversees the management of: the Exuma Land and Sea Park on Exuma island, Flamingo National Park on the island of Inagua, the Village Road Retreat on New Providence island and more recently the Abaco Parrot Reserve on the island of Abaco. This latest reserve comprises 7,000 ha of mixed coastal coppice and pine forests reserved specifically for the conservation of the Bahama Parrot (*Amazona leucophala bahamensis*). Inadvertently, this site includes most hardwood and coppice species of the Northern Bahamas, many of the fresh water wetland species of plants of the Northern Bahamas and the full complement of species found in the understory of the Northern pine forests.

5.5 Conservation of Natural Resources

The Convention of Biological Diversity stresses conservation of the total portfolio of biological diversity and the maintenance of the structure and function of ecosystems. Therefore it is recommended that:

1. An inventory be taken and a determination be made of which Bahamian ecosystems and species are most at risk in order to determine priorities for conservation and protection, utilising appropriate technologies (such as satellite imagery, GIS and others).
2. A comprehensive national system of parks, protected areas and reserves be developed for the conservation of biodiversity, including:
 - _ further development of guidelines for the selection of areas
 - _ further development of management plans for all protected areas
 - _ strengthening of legislation of Bahamas National Trust Act to more effectively protect national parks and protected areas
 - _ strengthening institutional capacities of Bahamas National Trust
3. Regulatory and enforcement measures be developed to ensure continued and sustained management of natural resources biodiversity and to safeguard critical ecosystems.
4. Breeding aggregations of species of commercial, recreational, sport, and aesthetic value, be effectively managed to ensure sustainability.
5. Protocols controlling the importation and evaluation of alien and invasive species, and of genetically modified organisms be developed, to include:
 - _ risk analysis of alien species and of living modified organisms
 - _ management of useful alien and genetically modified organisms
 - _ contingency plans for the control and eradication of invasive alien and genetically modified organisms
6. Plant and animal genetic resources for food and agriculture be conserved, using in-situ and ex-situ methods, based on modern technologies.
7. The National Herbarium be properly housed and curated, and other national natural history collections be established.

Chapter 6. Policies, institutions and capacity

6.1 General Policy Goals

Sustainable use is the use of biological resources in a way and at a rate that does not lead to the long-term decline of biodiversity. Sustainable use therefore maintains the potential of biological resources and thus biodiversity to meet the needs and aspirations of present and future generations.

The aims of the agricultural policy are to:

- Institute measures to increase the efficiency, productivity and competitiveness of local farmers
- Provide food security through the development of agro-industry, technology innovation, the environment, income distribution and benefit sharing by family island farmers
- Transform the economy.

6.2 Research and Technology Development

The principal areas of achievement in the agricultural and food sectors have been:

- Development of food safety laboratories.
- Development of food safety standards has been initiated.
- The food technology unit is presently being revitalised. A bottled tomato project in cooperation with the Inter-American Institute for Cooperation on Agriculture (IICA) has been initiated. The project objectives are to improve the food quality standards of bottled tomato operations on the island of Eleuthera and to place those operations on a more commercial footing. Through the food technology unit, the commercial processing of peas, beans, tomatoes, hot pepper as well as fruit jams and jellies are being encouraged.
- Seed technology project, focusing on hot peppers is ongoing. The objective is to produce quality seeds for the hot pepper industry.
- Cassava waxing project
- Upgrade of packinghouse and produce exchange facilities to improve refrigerated storage, ripening chambers.
- Projects in the areas of livestock production and animal disease control.
- *Telefood* programme of FAO has implemented an Irrigation Development Project with the Department of Agriculture. This project is being executed in the island of Exuma with the Exuma Agricultural Cooperative Society.
- Agricultural technologies adopted by farmers have included the use of improved crop varieties, mineral and organic fertiliser application, irrigation systems, and drip irrigation in bananas.
- Controlled environment technology has recently been introduced to The Bahamas through a Bahamian owned and operated hydroponic greenhouse facility, which

specialises in import-substitution products. This company is presently producing horticultural crops, such as lettuce, tomato and sweet pepper, for the local market.

6.3 National Biosecurity Policy

The Government of the Commonwealth of The Bahamas,

Recognising its obligation as a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety,

Recognising the need to develop and implement biosecurity systems for safeguarding the economy and environment, human health, and plants and animals of The Bahamas, from the risks of introduced pests, diseases and other threats,

Noting that the natural barriers to the movement of species, including pests and diseases, that provided the isolation essential for the evolution of unique and endemic species, have become increasingly ineffective,

Acknowledging that globalisation and the emphasis of free trade provide even greater opportunities than hitherto for species to be introduced, either deliberately or accidentally, to new habitats, with the opportunity to become threats to biosecurity and biodiversity,

Aware that the impacts of species that threaten biodiversity are immense, insidious and often irreversible and that the costs due to their damage on a global scale are enormous, both in ecological and economic terms, and in terms of human welfare,

Recognising that The Bahamas relies heavily on its natural resources, including biological and genetic resources, and has an open economy heavily dependent on imports,

Recognising also that there are direct economic costs of control of alien animals, plants, diseases and pests,

Noting that introduced alien diseases and parasites of humankind not only result in suffering and perhaps death, but also have economic costs of medical treatments and the loss of productivity, and

Determined to conserve and sustainably manage the biological diversity of The Bahamas for the benefit of present and future Bahamians,

Has decided to adopt the following Policy:

To enact legislation and regulation for the control and eradication of threats to ecosystems, habitats, endemic species and the human health and welfare of The Bahamas;

To prepare and implement a National Biosecurity Strategy for The Bahamas which addresses the priorities and systems for achieving biosecurity and conservation and sustainable use of biodiversity;

To facilitate and manage research that will aid in development of biosecurity systems and conservation and management of biodiversity;

To prevent the introduction of alien pests and diseases into The Bahamas by regulatory and other mechanisms;

To promote, undertake and facilitate the reestablishment of native species, where appropriate, and the restoration of degraded habitats;

To promote public education, awareness and outreach on biosecurity and biodiversity at all levels of society by appropriate methods;

To promote international and regional cooperation that would aid in the fulfillment of this policy and implementation of the National Biosecurity Strategy;

To mandate such cooperation between Government Ministries, Departments and other Agencies including Non-Governmental Organizations and the private sector, as necessary, to implement this policy and to carry out the National Biosecurity Strategy; and

To promote and facilitate such institutional and infrastructural development as is necessary to enable Ministries, Departments and other Agencies to implement this policy and the National Biosecurity Strategy.

Chapter 7. Future agenda for conservation and sustainable use of biodiversity for food and agriculture

7.1 Integration of biodiversity concerns in sectoral plans, policies and projects

7.1.1 Agriculture Resources Sector Five Year Plan

The Five Year Plan for Agriculture and Marine Resources (2010 - 2015) was developed with the assistance of the Food and Agriculture Organisation of the United Nations (FAO) through a Rapid Assessment process. The Rapid Assessment entailed review of existing literature, consultations with key stakeholders and inter-island subsector teams for specific thematic areas. The thematic areas focused on in agriculture were: vegetables, root crops and herbs; tree crops; ornamental horticulture, livestock, agro-processing; land and water. The policy framework for The Bahamas agriculture resources is based on the long term development and conservation of the national agricultural resource base as well as the protection of the country's future capacity to produce.

The specific agricultural objectives are:

- **Vegetable, root crop and herbs:** Increase in production and productivity of selected commodities for import substitution.
- **Tree crops:** Develop, expand and improve the existing tree crop production systems.
- **Ornamental horticulture:** Engagement and intensification of ornamental systems in The Bahamas.
- **Livestock:** Establish a system of integrated livestock production, allowing for access to markets and based on principles of sustainable development so as to improve livelihoods, food security and animal health and welfare.
- **Agro-processing:** To support the cottage type processing industries in the sparsely populated Family Islands and encourage and strengthen the links between the commercial agro processors and the farming communities to minimise the periods and levels of gluts.
- **Land and water:** To promote sustainable use of land and water resources in agriculture.
-

7.1.1.1 Management Objectives of the Agriculture Sector Plan for addressing threats to agriculture biodiversity

Invasive Species

An ornamental research and development programme will be established within the Gladstone Road Agricultural Centre (GRAC) with the initial research priority being, to investigate possible invasive species pathways for importations from Florida and mites which affect the *Ficus* species. Recommendations from the research would be considered for improved legislation and regulatory protocols within the industry.

Diseases

To combat diseases, the DOA will establish experimental investigations in tree crop diseases and production systems in order to provide appropriate technologies. Measures will be taken to improve the Tree crop research capabilities at the GRAC. In addition, a tree crop plant nursery will be established to multiply selected planting material for cultivation by producers.

Land Conversion

Currently in The Bahamas, even though land may be zoned as agricultural land, the land may be re-zoned and used for a different use. In order to combat this, Department of Agriculture (DOA) is proposing the development of a land evaluation system and land zone map for agricultural lands.

▪ Marine Resources Sector Five Year Plan

The policy framework for The Bahamas marine resources is based on the conservation and sustainable use of fisheries resources and the marine environment for the benefit of current and future generations of all Bahamians (DMR, 2009).

The specific marine resources objectives are (DMR, 2009):

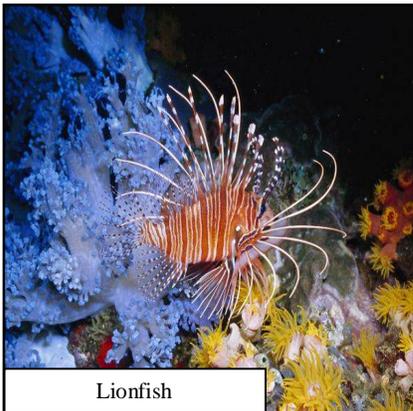
- Ensure that the fishing issues are integrated into the policy and decision-making process concerning coastal zone management;
- Take into account traditional knowledge and interests of local communities, small-scale artisanal fisheries and indigenous people in development and management programmes;
- Ensure effective monitoring and enforcement with respect to fishing activities;
- Promote scientific research with respect to fisheries resources;
- Promote a collaborative approach to freshwater and marine management;
- Maintain and restore populations of marine species at levels that can produce the optimal sustainable yield as qualified by relevant environmental and economic factors, taking into consideration relationships among various species;
- Protect and restore endangered marine and freshwater species (e.g., marine turtles);
- Promote the development and use of selective fishing gear and practices that minimise waste in the catch of target species and minimise by-catch of non-target species;
- Cooperate with other nations in the management of shared or highly migratory stocks;
- Preserve rare or fragile ecosystems, as well as habitats and other ecologically sensitive areas, especially coral reef ecosystems, estuaries, mangroves, sea grass beds, and other spawning and nursery areas; and
- Develop and increase the potential of living marine resources to meet human nutritional needs, as well as social, cultural, economic and development goals in a manner that would ensure sustainable use of the resources.

A few of the priority areas for development are:

- Creation of a data collection system to provide necessary biological, economic and social data for assessment and management for all major species/fisheries;
- Promote efforts to reduce the amount of lionfish in The Bahamas;
- Approve a Government policy for aquaculture and provide the legal framework for aquaculture in The Bahamas; and
- Consult with the public to develop a marine reserve network/national marine park network.

7.1.1.2 Management Objectives of the Fisheries Sector Plan for addressing threats to marine biodiversity identified in Chapter 1

Lionfish



Lionfish

In 2009, DMR in conjunction with the College of The Bahamas Marine Environmental Studies Institute (COB-MESI) developed a National Lionfish Response Plan which has been incorporated as an activity into the 5 year strategic plan for marine resources. Through Global Environment Facility (GEF) funding, studies will be conducted on the effects to lionfish populations and other marine species populations in areas where lionfish will be captured and removed. An educational and outreach programme will also be undertaken to educate people about the policies and regulations that will be developed to manage lionfish in The Bahamas.

Illegal Fishing

To help combat illegal fishing, The Bahamas intends to conduct additional patrols and investigations during the spiny lobster and Nassau Grouper closed seasons, to address illegal fishing in the southeastern and northwestern areas of The Bahamas. The GOB purposes to develop the necessary diplomatic contacts to reduce illegal fishing/poaching by Dominican Republic fishermen in the southern Bahamas and US fisherman in the north western Bahamas.

Data (Biological, economic, social)

A data collection system is to be implemented to provide the necessary biological, economic and social data for assessment and management for all major species. A Fisheries Census will be collected as part of the dataset. The data will be posted on the DMR website for access to the general public.

Regulatory Review

A regulatory review will be completed to ensure that all major fisheries are covered by adequate regulations. Issues such as lionfish, aquaculture, and licensing requirement for certain types of gears and vessels will be considered for incorporation into the legislation/regulations.

▪ Forestry

The Bahamas has taken steps to develop a national forestry programme for the sustainable management of all forest resources, by the enactment of the Forestry Act, 2010. The Department of Forestry will be under the Ministry of The Environment. The Forestry Act provides protection to wetlands, endemic flora and fauna and protected trees. The key objectives of the Forestry Act are to:

- Provide a legal framework for the long-term sustainable management of forests;
- Establishment of a Governmental forestry agency;
- Appoint a Director of Forestry;
- Establish a permanent forest estate;
- Declaration of protected trees; and
- Licensing of timber cutting activities.

The Act specifically addresses the following biodiversity concerns:

- Section 4 of the Act under subsections (e) (f) (g) (h) (l) and (m) mandates that the Forestry Plan include resources assessment and continuous monitoring activities.
- Section 4 of the Act under subsection (g) and (h) mandates that the Forestry Plan include these activities.
- Section 5 of the Act mandates that the Director of Forestry develop such plans that included ways and means for sustaining resources.
- Section 8 of the Act classes forest into the following designations Forest Reserves, Protected Forests and Conservation Forests
- Section 9 of the Act specifies how the Forest Management Plans are to be formulated by the Director of Forestry.

This Act mandates that a National Forest Plan be developed every five years to govern management activities, such as harvesting and reforestation measures, prescriptions for fire prevention, wildfire suppression and prescribed burning and soil and water conservation. The GOB is partnering with FAO to develop a five year National Forest Plan. The Department of

Forestry has a Memorandum of Understanding (MOU) with the BNT. The MOU provides for financial assistance in establishing programmes to protect and manage the protected forest reserves.

7.2 Sectoral Coordination

7.2.1 Inter-Ministerial Coordination

In July 2008, The Ministry of the Environment was established. It has the overall responsibility for coordination of environmental management activities in The Bahamas. Four departments within the Ministry share various responsibilities. The Bahamas Environment Science & Technology (BEST) Commission is responsible for protection, conservation and management of the environment and manages relations with the National and International organisations on matters relating to the Environment. The Department of Physical Planning is responsible for land use planning and review of environmental impact assessments. The Port Department is responsible for maritime affairs and the Department of Environmental Health Services (DEHS) is responsible for scientific research and environment control. However, several other government ministries, departments, statutory organisations and NGO's have varying responsibilities for different aspects of biodiversity management (Table 7.1).

7.2.2 Legal and Regulatory Framework

The Bahamas has a cadre of legislation, which fragments the management of environmental issues among several public agencies. In 2010, the Forestry Act and the Planning Subdivision Bill were passed by Parliament. The Planning Subdivision Act, requires EIAs be completed for projects that may likely have adverse impacts on the environment. The Forestry Act establishes forest reserves, protected forest and conservation forest. Table 7.2 provides key features of the legislation and the applicable Agencies.

7.3 Cross-sectoral Integration (mainstreaming) Biodiversity

7.3.1 Multi-sectoral Committees

The Bahamas has many agencies that share the responsibility for national resource management. The BEST Commission sub-committees bring together experts from relevant agencies. The sub-committees are: National Implementation Support Partnership (NISP), Biodiversity, Climate Change, Science & Technology and Wetlands. The BEST Commission itself needs to be strengthened.

The NISP Committee was established in 2004 to implement the Programme of Work on Protected Areas. The Committee consists of The BEST Commission, DMR, BNT and TNC. A gap analysis, a management effectiveness plan, a capacity and needs assessment, a sustainable finance plan and a master plan for protected areas has been completed. The Master Plan with the incorporation of a Trust Fund mechanism has been presented to the GOB for approval.

Table 7.1: Institutions and Legislation based on Biodiversity Management

Subject Area	Name of Legislation	Institutions Responsible
Urban Planning	Town Planning Act	<ul style="list-style-type: none"> • Dept. of Physical Planning • Dept. of Local Government
Forestry	<ul style="list-style-type: none"> • Penal Code • Forestry Act 	<ul style="list-style-type: none"> • Forestry Section (Ministry of the Environment) • Dept. of Agriculture • Dept. of Local Government

Subject Area	Name of Legislation	Institutions Responsible
Agriculture	Agriculture and Fisheries Act Animal Contagious Diseases Act Plant Protection Act	<ul style="list-style-type: none"> • Dept. of Agriculture • Dept. of Fisheries • Forestry Section (Ministry of the Environment) • Customs • Dept. of Local Government
Crown Lands	<ul style="list-style-type: none"> • Lands Surveyors Act • Forestry Act 	<ul style="list-style-type: none"> • Dept. of Lands and Surveys • Dept. of Agriculture • Bahamas National Trust • Bahamas Agricultural and Industrial Corporation • Water and Sewerage Corporation • Ministry of Housing • Dept. of Local Government • Office of The Prime Minister
Beaches	<ul style="list-style-type: none"> • Town Planning Act • Conservation and Protection of the Physical Landscape Act • Coastal Protection Act 	<ul style="list-style-type: none"> • Dept. of Physical Planning • Dept. of Lands and Surveys • Port Department • Dept. of Local Government • DEHS
Protected Areas	<ul style="list-style-type: none"> • Bahamas National Trust Act • Wild Birds Protection Act • Forestry Act • Plant Protection Act • Water and Sewerage Act Fisheries Resources and Jurisdiction Antiquities Monuments & Museums Act 	<ul style="list-style-type: none"> • Bahamas National Trust • Dept. of Agriculture • DMR • Dept. of Lands and Surveys • Water and Sewerage Corporation • Dept. of Local Government • AMMC • Clifton Heritage Authority
Wildlife	<ul style="list-style-type: none"> • Wild Animals Protection Act • Wild Birds Protection Act • Plant Protection Act Marine Mammal Protection Act Fisheries Resources and Jurisdiction Wildlife Conservation and Trade Act 	<ul style="list-style-type: none"> • Bahamas National Trust • Dept. of Agriculture • Dept. of Lands and Surveys • Royal Bahamas Police Force • Dept. of Local Government • DMR
Marine Habitat	<ul style="list-style-type: none"> • Agriculture and Fisheries Act • Fisheries Resources (Jurisdiction and Conservation Act) • Continental Shelf Act • Merchant Shipping (Oil and Pollution) Act Conservation and Protection of the Physical Landscape Act 	<ul style="list-style-type: none"> • Dept. of Marine Resources • Royal Bahamas Defence Force • Royal Bahamas Police Force • Bahamas National Trust • Dept. of Lands and Surveys • Port Department • Local Government
Waste Management	<ul style="list-style-type: none"> • Environmental Health Act • Water and Sewerage Act 	<ul style="list-style-type: none"> • Dept. of Environmental Health Services • Water and Sewerage Corporation • Dept. of Local Government
Water	<ul style="list-style-type: none"> • Water and Sewerage Act 	<ul style="list-style-type: none"> • Water and Sewerage Corporation • Forestry Section (Ministry of the Environment) • Dept. of Local Government
Land Use Development	Conservation and Protection of the Physical Landscape Act	<ul style="list-style-type: none"> • Dept. of Physical Planning • Dept. of Lands and Surveys • Dept. of Agriculture

Subject Area	Name of Legislation	Institutions Responsible
		<ul style="list-style-type: none"> • Ministry of Public Works • Dept. of Local Government
Fisheries	<ul style="list-style-type: none"> • Agriculture and Fisheries Act • Fisheries Resources (Jurisdiction and Conservation Act) Wildlife Conservation and Trade Act 	<ul style="list-style-type: none"> • Dept. of Marine Resources • Bahamas National Trust • Port Department • Dept. of Lands and Surveys • Royal Bahamas Defence Force • Royal Bahamas Police Force • Customs • MOE • DOA • Dept. of Local Government

Table 7.2: Legal and Regulatory Framework

ENABLING LEGISLATION	AGENCY	KEY FEATURES
Continental Shelf Act, 1970	Department of Marine resources (administration); Department of Environmental Health Services (DEHS) (monitors and enforces)	Protection, exploration and exploitation of the continental shelf
Coast Protection Act, 1968	Port Department	Provides power to carry out works for the protection of the coast (Minister responsible for Ports and Harbours) Mandates publication of specific maintenance work being conducted Provides a recovery mechanism from owners of land abutting the coast for coastal maintenance work
Archipelagic Waters and Maritime Jurisdiction Act, 1993	Department of Marine Resources	Delineates the archipelagic waters and exclusive economic zone of The Bahamas
Roads Act, 1968	Ministry of Public Works & Transport	Governs the removal and possession of sand from coastal areas Establishment and control of public roads
Local Government Act, 1996	Ministry of Lands and Local Government	Govern solid waste collection in the Family Islands
Freeport Bye-Laws Act, 1965	The Grand Bahama Port Authority	Regulatory oversight of sanitation and hygiene within the Grand Bahama Port Area Conservation of water in the Grand Bahama Port Area
Water and Sewerage Corporation Act, 1976	Water & Sewerage Corporation	Development and control of water supply and sewerage facilities and related matters; Regulates the granting of licenses Designation of water and waste control areas Protect water resources
Environmental Health Services Act, 1987	Department of Environmental Services	Regulatory oversight and disposal of solid and liquid wastes Regulatory oversight of emission or discharge of contaminate or pollutant into the environment Facilitates a tipping fee for solid waste and environmental levies for some imported goods
Ministry of Agriculture (Incorporation) Act, 1993	Department of Agriculture	Provides the Minister of Agriculture powers to acquire, hold, lease and dispose of agricultural land
Agriculture and Fisheries Act, 1963	Ministry of Agriculture and Marine Resources	Establishment of protected areas Management of Botanical Station

ENABLING LEGISLATION	AGENCY	KEY FEATURES
		Prohibits export of cave earth or guano Governs produce exchanges and packing houses Grants powers to inspect, seize and arrest
The Wild Life Protection and Trade Act, 2004	Ministry of Agriculture	Regulates trade in protected plants and animals Establishes a National Advisory Committee for the management and enforcement of wildlife protection Governs the export and import of species listed in the Appendices of the Convention on International Trade in Endangered Species of Wild Flora and Fauna
Marine Mammal Protection Act, 2005 Marine Mammal Protection (General) Regulations, 2005	Department of Marine Resources	Protection and conservation of marine mammals Governs facilities with dolphins in captivity, and marine mammal research Governs the export, import, transport and selling of marine mammals
Sportfishing Regulations	Department of Marine Resources	Regulates licensing, method of fishing, type of equipment and catch limits for specific species
Fisheries Resources (Jurisdiction and Conservation) Act, 1977	Department of Marine Resources	Establishment of exclusive fishery zones, protected areas, fisheries access agreements Regulates local and foreign fishing licensing Governs fish processing establishments, fisheries research, fisheries enforcement and the registration of fishing vessels Provides for conservation measures such as prohibiting the use of any explosive, poison or other noxious substance for the purpose of harvesting marine resources; gear restrictions; close seasons; size restrictions of any fishery resource Creation of new regulations for the management of fisheries as and when necessary (Minister responsible) Prohibits taking, having in one's possession, buying or selling any marine turtle, any part of a marine turtle and marine turtle eggs Protects the nest of a marine turtle
Fisheries Resources (Jurisdiction and Conservation) Regulations	Department of Marine Resources	Prohibits fishing or molesting for marine mammals Limits the size of the sponges Governs aquaculture and sport fishing licensing
Wild Animals (Protection) Act, 1968	Ministry of Agriculture and Marine Resources; Ministry of the Environment	Governs the removal and export of wild animals such as: Wild horses (on Abaco Island) and any member species (<i>Equus Caballus</i>) Agouti or Hutia (<i>Geocapromys ingrahami</i>) Iguana (<i>Cyclura species</i>)
Wild Birds Protection Act, 1952	Ministry of Agriculture and Marine Resources Ministry of the Environment	Governs hunting licenses and wild bird research Provides for conservation measures such as closed seasons; kill and catch limits Designation of wild birds protected areas and appointment of game wardens
Plants Protection Act, 1916	Department of Agriculture	Governs the importation, detention and examination of plants Control of pests and diseases injurious to plants
Conservation and Protection of the Physical Landscape of The	Department of Physical Planning	Protects physical landscape from environmental degradation, regulates filling of wetlands, drainage basins or ponds, prohibits digging or removing sand

ENABLING LEGISLATION	AGENCY	KEY FEATURES
Bahamas Act, 1997		from beaches and sand dunes Regulates excavation, landfill, quarry/mine operations and indiscriminate land clearing and issuance of permits Management of protected trees Levies fines for illegal movement of sand, trees, vegetation and excavation
Merchant Shipping (Oil Pollution) Act, 1976	Port Department; DEHS (nearshore)	Governs the provision concerning oil pollution of navigable waters by ships
The Bahamas National Trust Act, 1959	The Bahamas National Trust	Management of parks and protected areas; Protection of places and buildings of historic interest
Planning and Subdivision Bill, 2010	Department of Physical Planning Ministry of The Environment	Ensuring appropriate and sustainable use of all land Providing for the orderly sub-division of land Protecting and conserving the natural and cultural heritage of The Bahamas Governs the preparation of Land-use plans for each island, the preparation physical plans, development control and regulation, environmental impact assessment and miscellaneous matters
Registered Land Bill, 2010	Department of Lands & Survey	Govern the registration and transfer of land
Animal Protection and Control Act, 2009	Animal Control Unit of the Department of Agriculture	Establishes an Animal Protection and Control Board Protecting animals from cruelty
Forestry Act, 2010	Ministry of the Environment	Management of the National Forest Estate Development of management systems compatible with conservation Protects rare and endangered species and threatened ecosystems Requires an EIA for consideration of an alternate land use Issues permits for harvesting of protected trees Governs forestry on private lands

7.3.2 Co-management Partnerships

The Government of The Bahamas has partnered with various Non-Governmental Organisations (NGOs) for sustainable development and conservation of biodiversity ecosystems. The Department of Marine Resources (DMR) continues to work with The Bahamas National Trust (BNT) to implement the “Master Plan for The Bahamas National Protected Area System.” The DMR partners with TNC and BNT for meeting the requirements of “The Caribbean Challenge” and the “UN convention on Biological Diversity.”

The DMR partnered with The Bahamas Marine Exporters Association and TNC for the Lobster Fisheries Implementation Project (FIP). The project resulted from an independent pre-assessment of the lobster fishery against Marine Stewardship Council (MSC) certification standards. The pre-assessment showed that the lobster fishery would not be likely to attain MSC certification. As a result the FIP was developed to address the various shortfalls in the way the fishery is managed with hopes that MSC certification and better management result. Multiple areas are addressed as a part of the FIP including data collection, outreach, monitoring, enforcement, stock assessments and management. The hope is that MSC

certification will allow the Bahamian lobster fishery to maintain access to foreign markets and at minimum result in greater assurance that the fishery is well managed.

The GEF Full Size Project – “Building a Sustainable National Network of Marine Protected Areas” is being implemented by BEST, DMR, TNC and BNT. The project life is four years and funding is provided by GEF.

7.3.3 Land Use Project

“In 2010, a new Planning and Subdivision Act 2010 was enacted by Parliament, which consolidated all aspects of town planning and subdivisions; including regulations for a revised and restructured Department of Physical Planning and Town Planning Committee, a new Appeals process and public participation. A key component of this new law is provisions for land use plans to be prepared for every Family Islands. The Act sets out what shall comprise a land use plan, which must be consistent with the National Land Use Development Policies (First Order, 2010).”

To assist in creating the land use plan, first order existing land use maps were created from the compilation of all existing land use and land resources datasets and information in the country, that was collected from relevant governmental agencies. For large tracts of land privately owned, the owners were consulted to ascertain their plans for developing their landholdings. Designations such as Agriculture, Forest, Green Spaces, Conservation Forest, National Parks, Restricted Development/mangroves, Heritage Site, Industrial, Residential and Commercial were assigned to the zoning maps. See Figure 3.2 for the zoning areas assigned for New Providence. One of the major outputs of the project is the creation of land use and zoning maps, which would be accessible online to accompany the Land Use Plan. Maps will be created for all of The Family Islands.

7.3.4 Cross-sectoral Strategies

The Bahamas has not developed other national and sub-national strategies and programmes, such as a Poverty Reduction Strategy Paper or a National Plan for Achieving the Millennium Development Goals but is seeking to conserve its environment and improve coastal management. A Draft National Action Programme to Combat Land Degradation was developed and shelved.

7.4 Regional Partnerships and Projects

7.4.1 International Agreements

The Bahamas is a party to approximately twenty (20) International Agreements (Table 7.3) that deal with environmental and public welfare issues. From a national perspective, The Bahamas is actively involved in the following Conventions:

- Ramsar Convention – The Bahamas has developed a draft policy on wetlands that seeks to balance conservation and development efforts and promote greater public awareness. The Bahamas has also designated the Inagua National Park a Ramsar site, which limits the type of development in and around the park.
- The United Nations Framework Convention on Climate Change – The Bahamas has developed a National Climate Change Policy and is in the process of completing the 2nd National Report for Climate Change. The report will include a national inventory of anthropogenic emission sources.

- United Nations Convention to Combat Desertification – A draft National Action Programme to address land degradation has been developed, but has not received government’s approval.
- The Convention of International Trade in Endangered Species (CITES) – In December 2004, the Wildlife Conservation and Trade Act (2004) was passed by Parliament to implement CITES in The Bahamas. This Act allows the Department of Agriculture (the managing authority) to assume responsibility for implementing CITES in The Bahamas. Included among the implementation duties are: the coordination of implementation and enforcement legislation relating to conservation of species, the establishment of a scientific authority to advise on the import and monitor the export of species and the appointment of a national advisory committee to advise the Minister responsible for agriculture on matters relating to the Act and the implementation of CITES.
- The United Nations Convention on Laws of the Sea (UNCLOS) - The BNGIS Centre continues to play a pivotal role in providing the Ministry of Foreign Affairs with GIS technical expertise in conducting desktop studies for the establishment of the Country’s Maritime Border (Published with the United Nations December 2009). The Centre also conducted desktop studies on UNCLOS Article 76 “outer limits’ of the continental shelf and beyond” which resulted in The Bahamas submission of its claim to the Continental Shelf to the United Nations. Further as a member the Ministry of Foreign Affairs Delegation for the resumption of talks with Cuba, The BNGIS Centre continues to perform complex geodetic calculations utilising specialised modeling software for map reproduction to support The Bahamas position. This work continues with the latest talks taking place in September 2010 with The Republic of Cuba Officials. Future talks with Cuba and the Turks and Caicos Islands are anticipated. A list of the policies and strategies with key features are provided in Table 7.4.

7.4.2 Mitigating the threat of Invasive Alien Species in the Insular Caribbean (MTIASIC)

The MTIASIC project is a regional project between The Bahamas, The Dominican Republic, Trinidad and Tobago, St. Lucia and Jamaica for the development of a regional invasive species strategy based on terrestrial, marine and freshwater invasive species. Each country will design a project to either control/manage or eradicate/prevent the chosen invasive species. The results from the individual projects would provide input into the regional strategy for combating aquatic and terrestrial invasive species in the wider Caribbean. The project has a five year life span from 2009-2013 and is funded by GEF and is implemented by UNEP and Centre for Agricultural Bioscience International (CABI).

The Bahamas’ component will consist of a population control experiment, the development of a Lionfish Collection and Handling Protocol, research into the lionfish ecology, policy and regulatory reform to aid Lionfish Management and a public education and awareness campaign. The population control experiment will monitor and determine the effect of lionfish removal, frequency on lionfish densities and on native fish diversity and food web structures. The study sites are located in New Providence, Eleuthera, Abaco and Andros. The project provides training of local persons to assist in the underwater assessments of biodiversity at the study sites. The project involves the Department of Marine Resources, some of the local NGOs: BEST, BNT, Stuart Cove, BREEF, TNC, along with international partners from REEF, Simon Fraser University and the University of Oregon.

Table 7.3: List of International Instruments

Legal, International Environmental-Related Instruments to which The Bahamas is a signatory	Date of Conclusion	Date entered into force in The Bahamas
United Nations Convention on the Law of the Sea of 10 December, 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks	4 December, 1995	16 January, 1997 (accession)
FAO Code of Conduct for Responsible Fisheries.	31 October, 1995	
Amendments to the International Convention for the Prevention of Pollution of the Sea, concerning the Protection of the Great Barrier Reef	12 October, 1971	16 February, 1969
Amendments to the International Convention for the Prevention of Pollution of the Sea by Oil 1954	15 October, 1971	28 March, 1977
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	22 March, 1989	12 August, 1992 (accession)
United Nations Convention on Biological Diversity Cartagena Protocol	29 January, 2000	15 January, 2004 (ratification)
United Nations Convention on Biological Diversity (UNCBD)	5 June, 1992	2 September, 1993 (ratification)
Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)	3 March, 1973	18 September, 1979 (accession)
United Nations Convention on Wetlands (Ramsar Convention)	2 February, 1971	7 June, 1997
International Convention on Civil Liability for Oil Pollution Damage	29 November, 1969	20 October, 1976 (accession)
International Convention on Oil Pollution Preparedness, Response and Cooperation	30 November, 1990	4 January, 2002 (accession)
International Convention for the Prevention of Marine Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78)	2 November, 1973	2 October, 1983 (accession)
Protocol to the International Convention on Civil Liability for Oil Pollution Damage	19 November, 1976	9 April, 1981 (accession)
United Nations Convention on the Protection of the Ozone Layer Montreal Protocol	16 September, 1987	4 May, 1993 (accession)
United Nations Convention to Combat Desertification (UNCCD)	15 October, 1994	10 November, 2000 (accession)
United Nations Convention on the Law of the Sea (UNLOS)	10 December, 1982	29 July, 1983 (ratification)
United Nations Framework Convention on Climate Change (UNFCCC)	9 May, 1992	29 March, 1994 (ratification)
United Nations Framework Convention on Climate Change Kyoto Protocol	16 March, 1998	9 April, 1999 (accession)
United Nations Convention on the Protection of the Ozone Layer (Vienna Convention)	22 March, 1985	1 April, 1993 (accession)
United Nations Convention on Persistent Organic Pollutants (POPS) (Stockholm Convention)	20 March, 2002	3 October, 2005 (ratification)

Table 7.4: Policies and Strategies

POLICY / STRATEGY	CABINET APPROVAL DATE	KEY FEATURES
The Bahamas National Energy Policy	November 2009	Recommends measures to make the country more energy efficient by utilizing more sustainable sources of energy
National Policy for the Adaptation to Climate Change	March 2005	Recommends steps to be taken to combat climate change as it relates to agriculture, coastal and marine resources and fisheries, forestry, terrestrial biodiversity, tourism and water resources.
National Environmental Management and	August 2005	Outlines how consideration of conservation and sustainable use

POLICY / STRATEGY	CABINET APPROVAL DATE	KEY FEATURES
Action Plan		of biological resources can be integrated into national decision making through the identification of appropriate administrative structures and involvement of technical and scientific advisors
National Clearing House Mechanism	June 5, 2005	Facilitate the exchange and cooperation with other partners on <u>biodiversity information</u>
Draft National Action Programme to Combat Land Degradation	DRAFT	Identifies some issues of concern within local communities and aims to develop activities to remedy the negative effects of land degradation in specific ecosystems.
National Environmental Policy	2005	Highlights five basic principles to guide the environmental policy of The Bahamas Deals with conserving the diversity, integrity and productivity of natural resources
Road Map for the Advancement of Science and Technology in The Bahamas	March 2005	Presents the Science and Technology Policy Outlines goals for Science and Technology within the educational system and indicators of progress and achievement Promotes the popularization of Science, Technology, <u>Environmental Protection and Sustainable Development</u>
National Invasive Species (Policy and Strategy (NISS)	October 28, 2003	Code of conduct for various categories of stakeholders Recommends five plant species and two animal species for eradication Recommends sixteen plant species and six animal species for <u>control and management</u>
Pollution Control and Waste Management Regulations	2000	Regulates releases of certain hazardous wastes, contaminants and pollutants Establishes water quality and air quality criteria Governs discharge and hazardous waste management permits, <u>packaging and labeling standards</u>
National Oil Spill and Contingency Plan	2000	Manage oil spills in territorial waters to minimise damage to the environment and biodiversity
National Biosecurity Strategy (NBS) The Commonwealth of The Bahamas	DRAFT	Interconnects activities outlined in the NISS and the NBSAP Highlights priorities and threats to Biosecurity, along with commercial and economic opportunities arising from Biosecurity Draws attention to Intellectual Property Rights (IPR) issues such as the need to regulate access to and benefits derived from biological and genetic resources in The Bahamas Establishes a sequenced approach to invasive species control Outline measures that should be implemented for the Protection of traditional knowledge Includes a Biosecurity Act for the eradication of effective management of unwanted organisms within The Bahamas, and governance of the entry of all alien organisms. Provides regulations for: management of unwanted organisms and for the control and management of GMO's, conservation and sustainable use of biological resources, access and benefit sharing and protection of <u>traditional knowledge</u> .

7.5 The Way Forward: Enhancing Cross-Sectoral Integration (Mainstreaming) of Biodiversity in The Bahamas

The Bahamas has had numerous studies conducted, adopted policies and enacted legislation which would contribute to the protection of biodiversity in the country. Despite using the various mainstreaming mechanisms to develop these documents, the country struggles with making the findings of the document a reality. Many local environmentalists feel that the environmental protection is considered as an afterthought. Implementation is hampered by lack of technical skills, lack of man power, lack of equipment and scarce financial resources. Even though these tools exist to assist in decision making for development in the country they are more often than not referred to for guidance. In order to enhance cross-sectoral integration in The Bahamas, the GOB has to make a commitment of adequate financial resources to provide the needed technical skills, manpower and equipment to successfully implement the strategic plans for the agriculture, fisheries, forestry and the tourism sectors. In addition, all of the plans need to have a follow-up mechanism to evaluate the effectiveness of the plans.

Further, to the five year plan for agriculture, the DOA should ensure that new leases issued on agriculture land have clauses relating to conservation of biodiversity and the use of pesticides. The DOA should promote management of agricultural lands with plant biodiversity in mind. Farmers should be encouraged to set aside a portion of their agricultural land to be fallow for biodiversity conservation and establish protocols for valuable plant conservation. The number of trained people working with appropriate facilities in plant conservation should be increased, according to the national needs. The country should also establish networks for plant conservation activities at the national, regional and international levels.

In conjunction with the five year plan for marine resources, the DMR should conduct ecological assessments and continuous monitoring of selected coral reefs and develop and implement restoration and rehabilitation plans for designated degraded coral reef habitats. EIAs should be required for all mariculture projects. DMR needs to develop an effective evaluation method for site selection of mariculture projects along with the appropriate guidelines for effluent and waste control. Also, The Bahamas should expand the number of inland water ecosystems (e.g. Big Pond) in the existing national system of protected areas.

The Forestry Act, 2010 mandates that a five year management plan be developed for the forestry sector. In order to enhance biodiversity conservation and sustainable use, the plan should include the following:-

- Incorporation of the ecosystem approach in the management of the three types of forest areas (forest reserves, protected forest and conservation forest);
- An assessment of based plant sources (e.g. silver tops, cascarilla, etc.) and creation of a management plan for these species;
- Programmes to protect, recover and restore forest biological diversity;
- Plans to promote the sustainable use of forest biological diversity;
- Measures to improve the country's understanding of the role of forest biodiversity and ecosystem functions; and
- Mechanisms to promote access and benefit-sharing of forest genetic resources.

Further enhancement of cross-sectoral integration in The Bahamas requires increasing knowledge and awareness regarding biodiversity issues among the key decision makers in the

various government agencies, policy makers, stakeholders and the school populous. Policy makers need to be sensitised to the issues facing biodiversity and should be educated on the economic worth of biodiversity in the country. Through this insight it will be understood that protection of biodiversity does not hinder economic development in the country, but helps to safeguard the environment and livelihoods for future generations. Agencies need to be educated on their responsibilities for implementation of the Convention on Biological Diversity and other biological diversity related conventions. This should assist in broadening the mindset of the involved persons. Tourists and locals should be educated on some of the regulations and conservation methods being used to protect biodiversity in the country, such as looking at but not touching the marine turtles or that it is illegal to catch, transport or sell birds captured in The Bahamas. Currently, NGO and private sector partners have on-going educational programmes on biodiversity matters but are limited due to lack of funding.

Implementation is hampered by the lack of communication among and within agencies. There needs to be a shift in thinking from territorialism to integrated thinking and that the sharing of knowledge does not mean a loss of control. Due to the size and archipelagic nature of The Bahamas, enforcement is a vast task. Dedicated resources such as man-power, equipment and money would assist in more efficient implementation and enforcement. To truly make enforcement better, the entire country needs to assist with enforcement. An environmental hotline should be established to direct concerns to the relevant agencies, instead of the current situation where an individual reporting a concern must often endure the frustration of calling several different agencies before locating the appropriate contact.

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