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The Bahamas Environment, Science and Technology (BEST) Commission

The National Action Programme to Combat LAND DEGRADATION in The Bahamas



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LIST OF ACRONYMS AND ABBREVIATIONS

BEC	Bahamas Electricity Corporation
BEST	Bahamas Environment, Science and Technology Commission
BNT	Bahamas National Trust
CBD	Convention on Biological Diversity
CBO	Community-based Organisation
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DEHS	Department of Environmental Health Services
DLS	Department of Land and Surveys
DSS	Department of Social Services
DOA	Department of Agriculture
EIA	Environmental Impact Assessment
GEF	Global Environment Facility
GIS	Geographic Information Systems
MOE	Ministry of Education
MOFA	Ministry of Foreign Affairs
MOT	Ministry of Tourism
MOTI	Ministry of Trade and Industry
NAP	National Action Programme
NEMA	National Emergency Management Agency
NGO	Non-governmental Organisation
SIDS	Small Island Developing States
UNCCD	United Nations Convention to Combat Desertification
UNFCCC	United Nations Framework Convention on Climate Change
WRMU	Water Resources Management Unit
WSC	Water and Sewerage Corporation

GLOSSARY

Agenda 21 - Programme of action adopted by the 1992 United Nations Conference on Environment and Development, designed to protect the environment and encourage nations to move towards achieving sustainable development in the 21st Century.

Alien Species - Non-native, non-indigenous, foreign, exotic species occurring outside of their natural range and dispersal potential, and includes any part, such as seeds and larvae, that might survive and subsequently reproduce.

Arable Land - Land that is capable of being cultivated and supporting agricultural production.

Aragonite - A form of calcium carbonate (CaCO₃) that constitutes the shells of corals and other marine creatures.

Archipelago - A group or chain of islands clustered together in a sea or ocean.

Biodiversity (or Biological Diversity) - The variability among living organisms from all sources, including inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

Community-Based Organisation (CBO) - A private non-profit organisation which is representative of a community or significant segments of a community and which provides educational or related services to individuals in the community.

Conservation - The preservation and careful management of the environment to prevent its loss, change or damage and ensure its continuing availability and functionality for future generations.

Coppice - A forest originating mainly from shoots or root suckers rather than seed.

Crown Land - Land owned by the Crown; land which has no official tenure under land legislation and which is held and managed by the Government. The Government may licence the use of such land for specific purposes or may alienate the land by selling or leasing.

Desertification - Land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities.

Drought - The naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems.

Ecosystem - A dynamic complex of plant, animal, fungal and microorganism communities and their associated non-living environment interacting as an ecological unit.

Ecotourism - Tourism that involves traveling to relatively undisturbed or uncontaminated natural areas with the specific objective of studying, admiring and enjoying the scenery with its plants and animals, as well as the existing cultural areas.

GLOSSARY

Endemic Plant Species - Endemic plants are native to an area and are only found in that area.

Environment – All external factors (e.g., air, land, water, atmosphere, organic and inorganic matter and living organisms), conditions and influences that affect an organism, or community; also everything that surrounds an organism or organisms, including both natural and anthropogenic elements.

Environmental Impact Assessment (EIA) - A detailed study conducted to assess the effect on a specified environment of the introduction of any new factor (or project), which may upset the current ecological balance, and to ensure that the environmental effects of the proposed factor are fully considered before any construction/installation work is started.

Family Islands - Refers to all islands of The Bahamas, with the exception of the two most populated, New Providence and Grand Bahama. With a total population of about 50,000 scattered over these islands, they tend to be less developed than the commercial centres of New Providence and Grand Bahama.

Fauna - The total animal population inhabiting a given area.

Flora - The total plant population inhabiting a given area.

Fresh Water Lens - Fresh groundwater found beneath permeable limestone islands that contains 600 milligrams per liter or less of chlorides, 300 milligrams per liter or less of sulfates, and 1,000 milligrams per liter or less of total dissolved solids. It is limited above by a water table and below by a transition zone of brackish water (fresh/salt water mixture).

Geographic Information Systems (GIS) - This is a database, which relates spatial data (maps) with its attribute data (characteristics). A GIS can be computerised and the database queried using two variables and the required information can be extrapolated.

Global Environment Facility (GEF) - A financial mechanism that provides funds to developing countries for projects and activities to protect the global environment. The United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP) and the World Bank jointly implement GEF.

Gross Domestic Product (GDP) - Total value of all goods and services produced by labour and property located in a country during a specified period.

Groundwater - Any water naturally stored underground in aquifers, or that flows through and saturates soil and rock, supplying springs and wells.

Habitat – The specific area or environment that provides all the basic requirements for survival of the particular flora and fauna living in that place.

Invasive Alien Species – Alien species that become established in a new environment, then proliferate and spread in ways that are destructive to native ecosystems, human health, and ultimately human welfare.

GLOSSARY

Land Degradation - The reduction or loss, in arid, semi-arid and dry sub-humid areas, of the biological or economic productivity and complexity of rain-fed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from land uses or from a process or combination of processes, including processes arising from human activities and habitation patterns, such as (i) soil erosion caused by wind and/or water; (ii) deterioration of the physical, chemical and biological or economic properties of soil; and (iii) long-term loss of natural vegetation.

Local Government - An administrative body of government dealing with local matters concerning the residents of a particular island.

Native Species - A species occurring within its natural range and dispersal potential, i.e., within the range it occupies naturally or could occupy without direct or indirect introduction by or care of humans.

Non-governmental Organisation (NGO) - Democratic entities generally formed around a focussed set of goals, and having no affiliation with governments (or the business establishment).

Pelagic - Refers to fish and animals that live in the open sea, away from the sea bottom.

Protected Area - A legally established area under public or private ownership that is regulated and managed to achieve specific conservation objectives.

Recharge Rate - The quantity of water per unit of time that replenishes or refills an aquifer.

Reverse Osmosis (RO) - A treatment process used in water systems by adding pressure to force water through a semi-permeable membrane. Reverse osmosis removes most drinking water contaminants.

Salinas – A salt lake, marsh, pit or pond.

Salt Intrusion - The movement of saline or brackish water into a body of fresh water, generally as a result of over-abstraction of freshwater.

Scrub Lands - Dense vegetation consisting of stunted trees or bushes

Shifting Cultivation - A method of cultivation in which a forest area is cleared of trees, burned to release mineral nutrients, farmed for a few years until the soils become too poor to sustain crops, and then abandoned.

Slash and Burn - Cultivation with recurrent clearing and burning of vegetation and planting in the burnt fields.

Small Island Developing States (SIDS) - As recognised throughout Agenda 21 small islands, especially the Pacific islands, are home to a huge array of plant and animal life, both terrestrial and marine. There are at least 40 Small Island Developing States recognised by the United Nations (UN). Although they have no universally recognised definition, they have similar

GLOSSARY

problems to the developing world, however their small size and remoteness has led to these problems being intensified.

Sustainable Development - Development that ensures that the use of resources and the environment today does not restrict their use by future generations.

UN Principle 6 – The Rio Declaration on the Environment and Development which states “The special situation and needs of developing countries, particularly the least developed and those most environmentally vulnerable, shall be given special priority. International actions in the field of environment and development should also address the interests and needs of all countries.

Water Table - The upper surface of the groundwater or that level below which the soil is fully saturated with water.

Well Field - Area containing one or more wells that produce usable amounts of groundwater.

Wetlands - Areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres, including areas which may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water, deeper than six metres at low tide, lying within the wetlands.

EXECUTIVE SUMMARY

Desertification is defined as land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities. The effects of this environmental issue may pose additional challenges to Small Island Developing States (SIDS). The Bahamas, like other SIDS, must cope with a small (geographic) size, the isolation and fragility of its ecosystems and the limited range of natural resources (e.g., freshwater reserves, forests, fertile soils, etc.). In addition, The Bahamas is an archipelago of low-lying islands and particularly vulnerable to severe storm events, particularly hurricanes, as well as climate change. These factors, coupled with high population density, increase the pressure on the limited resources of the country and contribute to their overuse, premature depletion and degradation.

In addition to SIDS, other countries, particularly many in Africa, are also threatened by desertification; and in a global effort to formalize a combat strategy, the United Nations Convention to Combat Desertification (UNCCD) was prepared and adopted in Paris on 17 June 1994, and later entered into force 26 December 1996. As of June 2004 there were 191 Parties to the Convention, of which 39 are Small Island Developing States (or 76% of all SIDS).

The Bahamas became a signatory to the UNCCD on 10 November 2000, and the Convention came into force in The Bahamas on 8 February 2001. As a signatory, the first obligation of The Bahamas is to increase awareness of land degradation and to develop and implement a National Action Programme (NAP).

To fulfil this obligation, a two-day seminar entitled “National Awareness Seminar on Land Degradation in The Bahamas” was held 23 – 24 November 2004. Officials of the relevant government ministries and departments, public corporations, non-governmental organisations and the private sector made valuable contributions to the discussions. The main objective of the seminar was to educate local stakeholders on the objectives of the UNCCD and the issues of land degradation as they relate to The Bahamas.

The stakeholder participation during the seminar provided the Government with some indication of the main causes of land degradation in The Bahamas. The outcomes from the various discussions guide the development of the NAP. As a result the NAP development process for The Bahamas is a dynamic, three-tiered approach, with components capable of changing in order to effectively meet national requirements, while hopefully incorporating the latest and most appropriate technologies and practices. It offers a unique opportunity to involve various stakeholders in building a strong and vibrant partnership in fulfilling their commitments to present and future generations. The overall vision is to set The Bahamas on a course of sustainable growth and development, through the responsible use of its land, coastal, marine and freshwater resources, in order to secure prosperity for present and future generations.

This document demonstrates the commitment of The Bahamas in fulfilling its obligations under the UNCCD. The NAP is a positive response by the Government of The Bahamas to address the environmental challenges confronting a nation continually striving for sustainable growth.

INTRODUCTION

Small Island Developing States (SIDS) recognize that ill-conceived development can be extremely costly and threatening to the present and future livelihood of their peoples. Many SIDS, such as The Bahamas, are entirely or predominantly coastal states. The small (geographic) size, isolation and fragility of the island ecosystems make the biological diversity of SIDS among the most threatened in the world (BEST, 2004a). In addition, the limited range of natural resources (e.g., freshwater reserves, forests, fertile soils, etc.), coupled with high population density, increases the pressure on those limited resources and causes their overuse, premature depletion and degradation.

As a result, a destructive pattern of unsustainable development emerges, and one symptom of this phenomenon is desertification. Desertification, which refers to land degradation caused by climatic variations or land mismanagement, is an internationally recognized issue of concern that either causes or contributes to economic, social and environmental problems. In a global effort to formalize a strategy to address desertification, the United Nations General Assembly established a committee to develop a convention. Through that effort, the United Nations Convention to Combat Desertification (UNCCD) was prepared and adopted in Paris on 17 June 1994, and later entered into force 26 December 1996. As of June 2004 there were 191 Parties to the Convention, of which 39 are Small Island Developing States (or 76% of all SIDS).

The UNCCD attempts to effectively respond to the call for innovative and integrated approaches to promoting sustainable development and addressing the problem of desertification at the community level. Support through international cooperation and partnership arrangements, in the framework of an integrated approach, is consistent with Agenda 21, and an important tactic encouraged by the Convention. This tactic leads to improved living conditions of communities, but requires holistic strategies that focus on improved productivity of land and the rehabilitation, conservation and sustainable management of land resources.

To foster necessary action within the framework of these approaches, the Convention outlines four principle categories of obligations:

- international cooperation, particularly in the areas of the collection, analysis and exchange of information, research, technology transfer, capacity-building and awareness-building, as well as in ensuring that adequate financial resources are available for programmes;
- Parties affected by desertification in the regions of Africa, Asia, Latin America and the Caribbean, and the Northern Mediterranean undertake to prepare national action programmes and to cooperate at the regional and sub-regional levels;
- developed country Parties provide support to affected countries (particularly but not exclusively affected developing countries) by providing financial resources and by facilitating access to appropriate technology, knowledge and know-how; and,
- Parties report on measures they have taken to implement the Convention, and those that have prepared National Action Programmes are obliged to provide regular progress reports on their implementation.

The Convention came into force in The Bahamas on 8 February 2001, following the submission of the instrument of ratification on 10 November 2000. As a Party, The Bahamas demonstrates solidarity with affected countries in facing an urgent and growing issue; and therefore, is duty-

INTRODUCTION

bound to meet the first obligation under the Convention – develop and implement a national action programme (NAP).

The Bahamas can benefit from cooperation with other affected countries, and with developed countries, in designing and implementing its own programmes to combat and mitigate the effects of land degradation. This document was drafted to present a framework for implementing the Convention through a NAP that is both practical and flexible. The intent is to develop a NAP that coordinates various initiatives (local, national, sub-regional, regional and international) and includes various tools to self-monitor and facilitate necessary change.

CHAPTER I

BACKGROUND

1.1 GEOPHYSICAL CHARACTERISTICS

The Commonwealth of The Bahamas is an archipelago of 700 islands and cays surrounded by coral reefs and extensive sand flats extending from about 80 km (50 mi) east of Florida, USA to 80 km (50 mi) northeast of Cuba. The archipelago, located between latitude 20°.50'N and 27°.30'N and longitude 72°.35'W and 80°.30'W, covers 321 159 km² (124 000 mi²), with a total land area of 15 000 km² (5 792 mi²). The islands have a total of 3 542 km (2 200 mi) of coastline. There is an estimated reef area of 1 981 km² (765 mi²) found throughout the archipelago.

Figure 1: Map of the Bahama Islands



Source: Department of Lands and Surveys

The seas around the islands are shallow and clear. The name Bahamas comes from the Spanish words for shallow sea, 'baja mar'. The shallow banks around some of the islands are intersected by deep-water channels that for hundreds of years have facilitated the marine transport of goods and people through a myriad of natural shipping lanes.

1.1.1 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

CHAPTER I - BACKGROUND

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 (206 ft) above sea level, is found in 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.

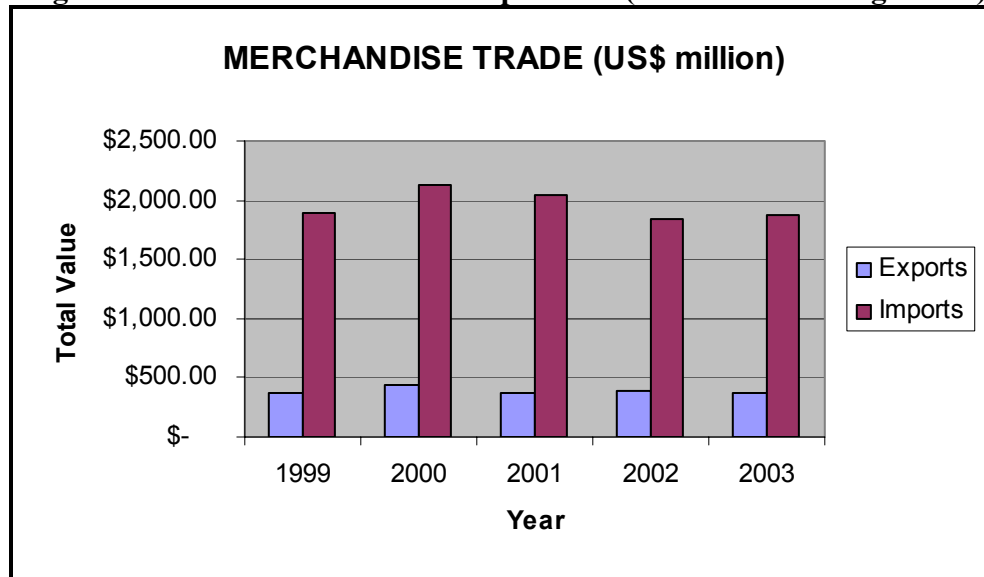
1.1.2 Climate

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 (58 in) to 865 mm (34 in), 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 (15 mi/hr). Mean daily temperatures fluctuate between 17°C and 32°C (63°F and 90°F) with May to November considered the summer months. The winter season occurs from December to April.

1.2 SOCIO-ECONOMIC CLIMATE

Rural to urban drift is readily apparent in The Bahamas. Over the years, economic growth has occurred primarily among the northern Bahama Islands. This is due to the fact that these islands are situated closer to major markets and they are less arid than the southern islands. Basic services and infrastructure are more readily available, and employment opportunities are more abundant in the Northwest Bahamas. Consequently, people are drawn to the northern islands, and according to 2002 statistical data, approximately 96% of the total population is found in the Northwest Bahamas (BEST, 2005).

The Bahamas has the third highest per-capita gross domestic product (GDP) in the western hemisphere. This ranking is misleading due to the uneven distribution of income and the high costs involved in the administration of an archipelagic nation. Furthermore, the economy is small. It is disproportionately service-based and subsequently, expenditure on imported goods is extremely high. In fact, between 1999 and 2003, the total value of imported goods averaged approximately five times that of exported goods (see Figure 2).

Figure 2: Merchandise Trade Comparisons (Years 1999 through 2003)

Source: Ms. Nerissa Gibson, Department of Statistics

1.2.1 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, 2005).

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, 2005). This northern migration has been explained by the availability of basic services (e.g., schools, health care, etc.).

The archipelagic make-up of The Bahamas challenges the public administration of the country. This is apparent in the infrastructure throughout the country. The northern islands, being more populous, receiving more rainfall and situated geographically closer to the United States of America, have the more developed infrastructure network (e.g., potable water supply, transportation, etc.) that services (or can service) the northern island populations. By comparison, development of many aspects of the same network in the drier, less populated southern islands is still in its infancy, as many settlements have limited services.

1.2.2 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.

1.2.2.1 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 gross domestic product (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. The Ministry defines sustainable tourism development as “that development that responds to the needs of present Bahamian visitors and the travel industry without compromising the ability of future participants in Bahamian travel industry and guests to meet their respective business and vacation requirements.” A set of sustainable tourism development policies was established to assist in guiding this unit in its mandate.

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.

1.2.2.2 Agriculture

Agriculture contributes less than 2% of the gross domestic product of The Bahamas, despite the potential for making an even greater contribution to the economy. More than US\$300 million is spent annually on food imports, representing more than 90% of the food consumed. There is very little large-scale commercial production and most of the food produced is consumed locally. The sector produces substantial quantities of broilers and eggs, though all the inputs are imported. There is little red meat produced, other than goat and sheep mutton. There is some local manufacture of dairy products; however, this activity uses imported ingredients. Subsistence farming is still important in the Family Islands, growing typically corn, cassava, sweet potatoes, beans and pigeon peas, but the number of farmers has declined in the past two decades and the average age of farmers has increased.

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.

1.2.2.3 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, 2005). Particularly important commercially is the spiny lobster, which comprised 88% of the fisheries product in 2004 (BEST, 2005). 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, 2005). 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 utilize 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.

CHAPTER II

STATUS OF THE NATURAL RESOURCES

CHAPTER II – STATUS OF THE NATURAL RESOURCES

2.1 NATURAL RESOURCES

Energy requirements are met through imports, as The Bahamas does not have petroleum reserves. The main natural resources of the country are its marine and coastal environments. There are no surface water bodies, other than salinas and tidal creeks. The only source of freshwater is groundwater.

There is also some forest cover. The northern islands have pine forests, while the southern islands have coppice forests. From the early 1900s until the mid 1970s, timber had been exploited from the pine forests, and then all rights to fell timber were surrendered to the Crown. Today, forestry, as industry, is non-existent in The Bahamas.

In terms of mineral resources, The Bahamas does not have any exploitable quantities, although aragonite and salt have been commercially mined. In the 1990s, production of natural mineral resources was mainly limited to aragonite and salt.

2.1.1 Marine and Coastal Resources

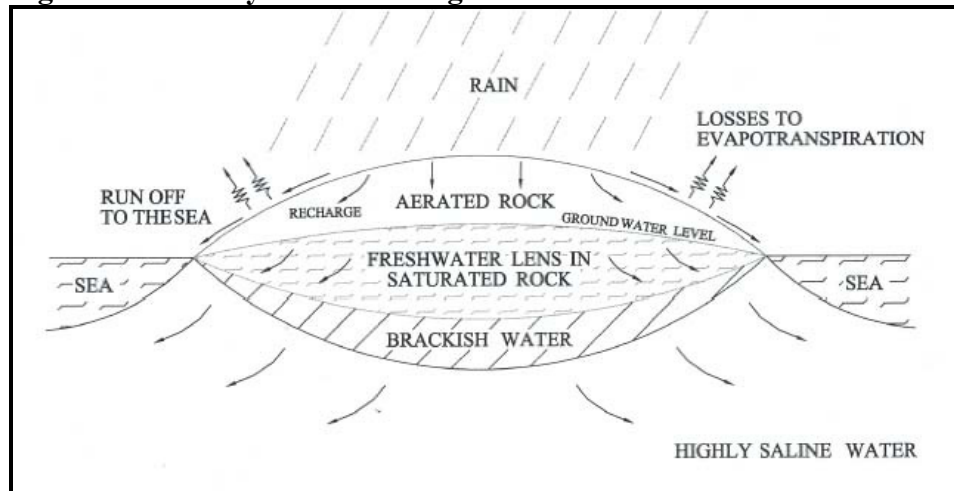
The coastal and marine resources of The Bahamas includes an extensive ecosystem of about 700 islands and more than 2 000 cays, reefs and rocks, extending 1 225 km (761 mi) from north to south. These islands are spread over two shallow oceanic banks, the Little Bahama Bank and the Great Bahama Bank, with depths of 10 m (32.8 ft) or less surrounded by extremely deep water of up to 4 km (2.5 mi). The Bahamas has control over an estimated 13 880 km² (5 359 mi²) of ocean, which contains a diverse aquatic ecosystem. The coastal areas of The Bahamas are subject to competing development demands, such as the hotel industry, which has put pressure on the marine and coastal environment. Environmental concerns include the destruction of coral reefs, degradation of mangrove habitats, and the depletion of sand and aggregate materials, used in the construction industry.

2.1.2 Freshwater Resources

All freshwater in The Bahamas originate from rainfall. Rainfall is unevenly distributed across The Bahamas. The northern Bahamas receives some 1 270 to 1 524 mm (50 to 60 in) of rainfall annually while the southern Bahamas receives some 914 mm (36 in) per annum. There is a distinct dry season (November to April) and a pronounced wet season (May to October).

During a rain event, the rainwater percolates through the ground and becomes trapped underground in three-dimensional lens-shaped bodies, which overlie brackish and saline waters at depth. These lens-shaped bodies are called Ghyben-Hertzberg lenses (see Figure 3). In excess of 90% of the Ghyben-Hertzberg lenses in The Bahamas are within 1.52 m (5 ft) of the surface. The size, shape and orientation of the island, the subsurface geology and the amount of rainfall control the shape, size and thickness of the freshwater bodies on each island. A groundwater lens of approximately 6.09 m (20 ft) is required to sustain abstraction for a public supply. For this reason, it is imperative that accurate rainfall records are kept for estimating the required annual recharge of the lenses from which freshwater is extracted.

Figure 3: The Ghyben-Hertzberg Lens



Source: BEST Commission

Table 1 compares the quantified freshwater resources throughout The Bahamas, based on the 2000 census data. The three islands with the largest quantities of freshwater are Abaco, Andros, and Grand Bahama. These islands are the three largest landmasses in the archipelago, and notably, they have the most acreage of pine forests.

Potable water in The Bahamas is produced primarily by extraction from these shallow freshwater lenses. Due to the shallow depth of the lenses, this resource is vulnerable to several environmental risks. Generally it is believed that groundwater in The Bahamas is safe from pathogens because of the filtering of the limestone rock. However, fissure flow plays an important part in the groundwater movement and no one can be sure that fissure flow is not linking a domestic source (private well) to contamination (septic tank).

The majority of the country's homes are not on a central sewerage handling system. Septic tanks, which discharge into the fresh water lens, predominate. This produces a constant sewerage loading into the lens. Furthermore it is thought that the higher the population density, the greater the impact on water quality by sewage effluent.

The results from previous groundwater pollution assessments indicated that significant nitrate, phosphate, and bacterial contamination affect the water quality in a large majority of the private water supply wells that were tested. Assessments further advise that the exposure of the very young, the old and persons with compromised immune systems to private water supply systems is not recommended due to the high incidence of sewage contamination identified. Additionally, the use of private wells interconnected to the public water supply is not recommended as the risk of cross connection and the resultant pumping of contaminated water into the public supply jeopardises the health and well being of all consumers. A programme to sewer all major settlements has been developed and funding is presently being sought.

The absence of a central sewerage system to handle liquid wastes requires light industrial and commercial establishments to utilise deep well injection for disposal. Historically, several of these wells were generally not well constructed, monitored, or maintained. Subsequently, they often leaked into the freshwater lens. Once groundwater is polluted it is extremely difficult and

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costly to clean up. Efforts have been ongoing to clean up one fuel spill in Nassau for more than 12 years, and there is still a significant volume of hydrocarbon in the substrate. Present technology exists for the remediation of contaminated groundwater, but this primarily relies on confining the contaminated water. Protection of the resources from contamination is still the best defence. The Water & Sewerage Corporation (WSC) addresses these challenges by overseeing the construction and testing of all disposal wells, reverse osmosis (RO) supply and the associated RO brine disposal wells.

Another source of groundwater contamination is run-off containing agro-chemical products. The Bahamas has recently moved into the improved production of agricultural products for export. Due to the poor quality of the soil, large amounts of agro-chemicals are needed to ensure adequate yields. The use of these chemicals poses a great threat to the groundwater, which will need constant monitoring and regulation. Current efforts focus on minimising freshwater use. Wherever possible, the utilisation of drip irrigation technology in agriculture is encouraged. With this technology, water is delivered directly to the crop by way of a drip line for efficient water and fertilising management. The uniform water distribution has resulted in higher crop yields than with traditional irrigation methods, such as flooding or furrows. Depending on the type of crop, either one or two dripper-lines per row are utilised.

In addition to farming, other sources of agro-chemical run-off are golf courses. Large quantities of agro-chemicals are used to maintain golf courses. Due to the porous nature of the soil and rock, significant amounts of these chemicals are penetrating to the groundwater and concentrations are increasing. Since golf is an importance component of the national tourism product, it is the policy of the Government, through The Bahamas Environment, Science Technology (BEST) Commission, to encourage the adoption, by developers of new or modified resort project proposals, of best management practices such as re-using water for irrigation, lining the lake hazards, and planting salt-resistant grasses that minimise the use of freshwater.

In addition to the threat of contamination by sewage and run-off, over-extraction of the groundwater lenses is an ongoing concern. In order to meet the water requirements of a growing population on the island of New Providence, the water lenses have been used beyond their sustainable or safe yields. This has caused a mixing of the fresh and brackish waters in the lenses, resulting in a steady rise in the salinity of the water supplied. Today, over 50% of the potable water demand of New Providence is met by barging freshwater extracted from wellfields in northern Andros.

Historical solid waste management practices also threaten freshwater resources. The predominant method for solid waste disposal in the country is via landfills. These are generally not lined and pose problems associated with leaching. Alternative disposal methods are being explored. As part of the Solid Waste Management Programme, funded by the Inter-American Development Bank, both a municipal and a construction and demolition landfill cell were completed in 2000 for the island of New Providence. Both cells are lined to protect the underlying water resources. In addition, 16 sanitary landfills are also proposed for Abaco, Andros, Bimini, Inagua, Long Island and San Salvador; some, such as those for Bimini and Long Island, have already been constructed.

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Another threat to freshwater resources is a rise in sea level. An increase in the sea level will bring the freshwater lens closer to the surface of the land. Inundation of land containing freshwater resources with seawater by storm surges will further decrease the freshwater quality.

From an international perspective, The Bahamas is now encouraged to prioritise its water sources to first utilise all natural sources (groundwater), prior to the implementation of alternative water sources (i.e. reverse osmosis). Where alternative sources are being used over the traditional abstraction areas, there is presently an appeal to protect such areas. In New Providence, an estimated 2 208 ha (5 455 acres) exist for well field utilisation. An estimated 137 018 ha (338 585 acres) exist on Andros, north from Morgan's Bluff and south to Behring Point. Although supplies produced by reverse osmosis are more reliable, the freshwater resource areas should be protected to maintain a diverse supply of potable water for the current and the next generation of Bahamians and to sustain the complexity of biodiversity.

Table 1: Comparison of the Quantified Freshwater Resources

Island	Daily Maximum Volume Available (million Imp. gal)	Water Available Daily per Person (Imp. gal) 2000 Census	Calculated Water Demand** (million Imp. gal)	Total Population 2000 Census
Abaco	79.1	6 004	0.66	13 174
Acklins	4.36	10 307	0.02	423
Andros	209.92	27 567	0.38	7 615
Bimini and the Berry Islands	0.17	74	0.12	2 308
Cat Island	6.8	4 393	0.08	1 548
Crooked Island	1.74	5 103	0.02	341
Eleuthera, Harbour Island, & Spanish Wells	8.13	721	0.56	11 269
Exuma & Cays	2.9	811	0.18	3 575
Grand Bahama	93.17	1 984	2.35	46 954
Great Inagua	0.86	822	0.05	1 046
Long Island	2.88	978	0.15	2 945
Mayaguana	0.65	2 481	0.01	262
New Providence	9.63	45	10.62	212 432
Ragged Island	0.01	145	0.00*	69
San Salvador, & Rum Cay	0.1	97	0.05	1 028
Total	420	61 532	15.25	304 989

Source: Mr. John Bowleg, Water and Sewerage Corporation

* actual calculated demand = 0.00345 Imp. gal

** based on standard water usage of 50 Imp. gal per person per day

2.1.3 Forests

More than 80% of the forestry resources are found on Crown Lands. While the market for timber products is estimated at US\$15 million per year, there are presently no locally based forest industries to exploit this resource. The Department of Lands and Surveys has the responsibility to manage and conserve these resources in The Bahamas, but presently there is no forestry management on Crown lands.

The forestry resources of The Bahamas are composed of pine, coppice and mangrove forests, and account for 15% of the total area of The Bahamas. Pine forests are considered the most productive of the three forest types. They occupy much of the landmasses of Andros, Abaco and Grand Bahama, and smaller areas of New Providence, and are largely a monoculture of self-regenerating Caribbean pine (*Pinus caribaea* var. *bahamensis*), occasionally interspersed with coppices of hardwoods such as mahogany. Timber license holders, who exploited the pine forests on these northern islands until the mid 1970s, left behind small areas of old growth and large areas of immature trees. Today, there are approximately 618 500 ha of pine forests. These areas are home to many avian species, some endemic and others migratory, as well as the rare atalia hairstreak butterfly and the endangered Bahama parrot. In addition, the ground cover these forests provide is essential for sustaining the underground freshwater reserves, the only natural source of freshwater in The Bahamas.

The second major type of forest is the coppice, which is confined mainly to the central and southeastern islands, and is characterised by many valuable hardwood trees such as mahogany (*Swietenia mahagoni*), cedar (*Cedrela odorata*), mastic (*Mastichodendron foetidissimum*) and horseflesh (*Lysiloma sabicu*). Under the shade of these tall trees grow a variety of shrubs that include many species of stoppers (*Eugenia* spp.), wild coffee (*Psychotria* spp.), satin leaf or saffron (*Chrysophyllum oliviforme*), Bahamas strongbark (*Bourreria ovata*), pigeon plum (*Coccoloba diversifolia*) and poisonwood (*Metopium toxiferum*). Coppice forests are the habitats for a variety of fauna, including the Bahamian boa constrictor, lizards and birds. The whiteland coppice is the habitat of a variety of land crabs, including the black crab, which is consumed by Bahamians.

Activities such as shifting cultivation, woodcarving and charcoal making have led to a reduction of the coppice area and have threatened many endemic plant species. Some of these trees are protected by law under the Conservation and Preservation of the Physical Landscape of The Bahamas Act (1997). Australian pine (*Casuarinas* spp.), an invasive plant species, has taken over large strands of coastal regions in The Bahamas that were previously cleared of endemic species.

The third type of vegetation is the mangrove forest, which is found along the coastal areas of The Bahamas and in the inland wetlands and salinas. Plant species include red (*Rhizophora mangle*), black (*Avicennia germinans*) and white (*Laguncularia racemosa*) mangroves and buttonwood (*Conocarpus erectus*). One of the largest areas of mangrove swamp can be found along the northern coast of Grand Bahama Island. Mangroves are important to the fisheries industry because they serve as nurseries for a variety of marine species. In addition, they are beneficial in flood management and protecting freshwater resources. Mangrove wetlands attenuate waves and flood peaks; they also control pollution by trapping sediment and removing excess nutrients found in run-off. As land builders and shoreline stabilizers, these forests offer coastal protection,

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which is the first line of defence in protecting the inland and the limited freshwater reserves of The Bahamas.

2.1.4 Aragonite

Aragonite, a pure form of calcium carbonate (or limestone), is a naturally occurring mineral formed from the shells and skeletal remains of marine creatures. The material has a consistent, round, small grain structure and is very low in iron and other impurities. The substance is tasteless, odorless, non-polluting, dustless, non-toxic and easy to handle. It is an extremely common rock in The Bahamas (Sealey, 1994).

Typical analysis of the aragonite sand produced in The Bahamas shows the Bahamian product compares favourably with quarried limestone from the mainland of North America (Sealey, 1994). Aragonite is an essential ingredient in many industries: manufacturing of iron and steel, glass, cement, fertilisers and chemicals, as well as the construction industry. The Great Bahama Bank is the source for millions of tonnes of this material. In the 1950s, four areas within the Great Bahama Bank were used for offshore aragonite mining. By the mid-1980s, offshore aragonite production had peaked and began to decline steadily. Today, only one of the four areas – deposits around the man-made island called Ocean Cay – is commercially mined.

Quarrying and sand mining are other activities that exploit the abundantly available Bahamian limestone. The various ridges found throughout the Bahama Islands consist of rock ideal for building stone, and sand is frequently mined for building purposes from various deposits found throughout the islands.

2.1.5 Salt

Great Inagua Island is the third largest of all the Bahama Islands. It is located at the southern tip of The Bahamas, in the major cargo-shipping lane between the Americas. Inagua is relatively at sea level, flat and arid. Its climate, coupled with the natural salt ponds and the surrounding seawater, makes it suitable for its principal industry – salt production.

In Inagua, salt production for export first began in 1849. The salt production industry has always consisted of a single salt plant. The plant has had three different operators over its 156-year history. Today, Morton Bahamas Limited (MBL), a subsidiary of Rohm and Haas Company operates the plant, which is now located at Man O' War Bay, on the northwest sector of Great Inagua Island. The entire operation uses 12 140 ha (30 000 acres), which is between 8 and 10% of the island, and produces approximately one million tonnes of salt, of various grades (chemical, fishery and extra-coarse grades), annually for export.

In the salt production process employed by the plant, seawater is pumped and channelled into a system of successive reservoirs. By solar evaporation, brine is produced and then pumped into a crystallizing pond. Over a period of 9 to 12 months, salt crystallizes to depths between 7.6 and 17.8 cm (3 and 7 in). The spent brine is drained and the crystallized salt is mechanically harvested (see Figure 4), then washed and stockpiled to await export to markets in North America, Europe and the Caribbean.

Figure 4: Harvesting Sea Salt in Inagua



Source: BEST Commission

CHAPTER III

LAND USE AND CLASSIFICATION

CHAPTER III – LAND USE AND CLASSIFICATION

3.1 LAND MANAGEMENT

The total land area of The Bahamas is 1.5 million ha (5 792 mi²). This very limited commodity mainly serves two purposes: agricultural production and urban development. Activities in both these areas occur predominantly in the northern Bahamas. Agricultural production is generally carried out throughout the Family Islands, with Andros and Grand Bahama being the major agricultural producers. Urban development has thrived in and around the two largest cities in the country: Nassau, on New Providence and Freeport, on Grand Bahama.

The management and monitoring of land use for agriculture and development is the responsibility of government. This responsibility is divided among separate government agencies depending on the purpose for which the land is being used. The land use and classification system is intended to encourage agricultural development in areas where it can best be supported and to manage urban development in those areas able to sustain such growth.

3.2 AGRICULTURAL LANDS

In 1992, recognising the need for self-sufficiency in food production, and to maximize land use, the government implemented the Agricultural Land Policy. A component of the policy includes leasing government-owned and Crown land, for agriculture.

Government owns 90% of the 95 000 ha (234 750 acres) of arable land available for farming in the country. The Agricultural Land Policy is designed to “foster the long term development and conservation of the national agricultural resources as well as to protect the country’s future capacity to produce.” Under this policy, Crown Land is leased for periods of twenty-one through forty years. This policy also allows for agricultural loans (through The Bahamas Development Bank), duty exemptions on farm equipment and credit to purchase inputs from a government supply store, and provides training and extension education programmes.

Despite these incentives, agriculture still shows little growth. It is estimated that merely 7 770 ha (19 200 acres), is presently under cultivation. Moreover, the agriculture sector employs only 5% of the total labour force.

3.3 CROWN LANDS

Crown lands refer to lands that are owned and managed by the Government of The Bahamas. Originally, all land in The Bahamas was Crown land (that is land held in trust by Her Majesty, Queen Elizabeth II on behalf of the Bahamian people), and remained as such until freehold grants to individuals were made. Those Crown lands that were not subject to freehold grants and were acquired by various government agencies, prior to the Constitution of 1973, are Government lands.

Approximately 70% or 1.0 million ha (2.6 million acres) of the land area comprising The Bahamas represents Crown land, and 15% of this land is leased for different uses, such as agricultural development and conservation. The Department of Lands and Surveys has the responsibility to manage and conserve the forest resources in The Bahamas, but presently there is no management on Crown lands.

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3.4 INDUSTRIAL LANDS

There are 51 ha of land on New Providence designated by Government for industrial use: 10.5 ha comprise the Soldier Road Industrial Park; the remaining 40.5 ha constitute the Agro Industrial Park. Permission to lease land in these parks is granted by The Bahamas Agricultural and Industrial Corporation. Leases are granted for periods of ten or more years.

Tenants of industrial land include various light manufacturing companies, as well as small to medium-sized agricultural, food processing, landscaping and construction/home improvement businesses.

3.5 PROTECTED AREAS

Protection and conservation of the country from over-development and over-exploitation of its natural resources are generally the responsibility of the government. For example, to date the Government has established four marine parks or reserves to maintain and protect marine biodiversity. Other government initiatives to protect the beauty, flora and fauna of the country are driven by the consideration of several draft policies including one on wetlands that is intended to promote conservation of areas such as the Inagua National Park.

Efforts to protect terrestrial biodiversity also include a draft Forest Act. This draft act is under consideration and it would provide “a legal framework for the long-term management of forests in The Bahamas through the establishment of a government forestry agency and a permanent forest estate that is subject to scientific management and the licensing of timber-cutting activities”. This act is in response to the increasing loss of local pine forests despite government attempts to regulate and limit the cutting down of native trees.

CHAPTER IV

EXISTING LEGAL FRAMEWORK

CHAPTER IV – EXISTING LEGAL FRAMEWORK

4.1 NATIONAL LEGISLATION AND POLICIES

Land and water resources can be safeguarded through the enactment of legislation and implementation of policies specifically for their protection. Existing legislation and policies may, in some cases, be adequate to protect land and water from some forms of abuse that might lead to their degradation, but in other cases the enactment and implementation of new laws and policies may be required. This may be true for meeting both national and international environmental obligations.

Current parliamentary acts of The Bahamas that relate to land management divide this responsibility among various public agencies such as: the Ministry of Works and Utilities; Ministry of Agriculture, Fisheries and Local Government; the Department of Environmental Health Services; the Water and Sewerage Corporation; and the Department of Lands and Surveys. The Ministry of Works and Utilities has the responsibility of monitoring and enforcing many aspects of urban development on New Providence. Enacted legislation, such as the Private Roads and Sub-divisions Act (1961), the Town Planning Act (1961) and the Buildings Regulation Act (1971), facilitates the ministry's mandate.

Another arm of Government that incorporates sustainable land management in its function is the portfolio of the Ministry of Health and Environment. The Minister of Health and Environment has wide-ranging powers to protect biodiversity as well as freshwater resources, which may both be negatively impacted by human action. Under the Environmental Health Services Act (1987), the Minister is responsible for regulating, monitoring and controlling the actual or likely contamination of the environment. This encompasses the discharge into the natural environment of any solid, liquid, gas, odour, heat, sound, vibration, radiation or combination thereof.

The Environmental Impact Assessment (EIA), which evaluates projects and their potential impacts on the environment, is a tool employed by the Bahamas Environment, Science and Technology (BEST) Commission, under the Ministry of Health and Environment, to promote biodiversity and sustainable development. The United Nations Principle 6 requires the review of an EIA by a third party. It also requires clear indication of the types of projects that require EIAs. Through the BEST Commission, the Government is adhering to this principle.

The Grand Bahama Port Authority controls issues affecting land and development in the Freeport Area of Grand Bahama; Local Government of each respective Family Island, controls those issues affecting land in Grand Bahama outside of the Freeport Area and land in the other Family Islands. Enacted legislation, such as the Freeport Bye-laws Act (1965) and the Private Roads and Sub-divisions (Out Islands) Act (1965), assist the Grand Bahama Port Authority and Local Governments in land management.

At present there is no single legislation relating to the development and management of land resources in The Bahamas. Legal provisions for the protection and sustainable use of land are found in various Acts and are implemented by a number of agencies (see Table 2, below). Laws related to land degradation, whether directly or indirectly, include:

- **Agriculture and Fisheries Act (1963)** – The Minister (responsible for Agriculture) may make rules to define areas (“protected areas”) within which is unlawful for any person except a licensee to plant, propagate, take, uproot or

destroy any species of plant; as well as rules to conserve, uproot, or destroy any specified kind of plant.

- **Bahamas National Trust Act (1959)** – The Bahamas National Trust was established by a special Act of Parliament. Operating under the official mandate of the Bahamas National Trust Act (1959), the Trust has the responsibility and authority to develop and manage the National Park System of The Bahamas. The Act also authorises the Trust to advise Government on policy relative to parks and protected areas, on candidates for inclusion in the park and protected area system, and on matters relating to wildlife conservation in general.
- **Coast Protection Act (1968)** – This Act provides for the execution of coast protection work to safeguard the coast against erosion and encroachment by the sea. Coast protection work includes any work of construction, alteration, improvement, repair, maintenance, demolition or removal for the purpose of the protection of any land, and includes the sowing or planting of vegetation for the said purpose.
- **Conservation and Protection of the Physical Landscape of The Bahamas Act (1997)** - This Act protects a list of trees considered to be rare or historically significant. It also provides for the improved regulation of the cutting or excavation of hills for fill, and the indiscriminate land clearing of virgin vegetation for development.
- **Environmental Health Services Act (1987)** – The Act provides the regulatory framework for solid waste management in The Bahamas. It promotes environmental protection in order to ensure human health. The Act has regulations related to emissions of contaminants to the air, water and soil, and provides for establishment of authorised dumps, but makes no provision for their design, siting and operation.
- **Plants Protection Act (1916)** – No plants shall be imported into The Bahamas, except with an import permit and subject to inspection or the provision of a phytosanitary certificate.
- **Private Roads and Subdivisions Act (1961)** – Provisions regarding the layout and construction of roads and subdivisions comprise the content of this Act. The Act also confers powers relating to road and subdivision development to the Minister responsible for public works and the Town Planning Committee.
- **Private Roads and Subdivisions (Out Islands) Act (1965)** – This Act provides better control over the layout and construction of roads and subdivisions in the Family Islands. It confers powers to the Minister responsible for private roads and subdivisions.

- **Reclamation and Drainage Act (1916)** – This Act provides for the grading, paving, clearing, filling in, drainage or any similar work having for its object the removal or abatement of any swamp or area of similar nature which is a breeding place or harbourage for insects or which is otherwise insanitary and injurious to health or comfort.
- **Town Planning Act (1961)** The Town Planning Committee, comprising of seven members, is established under the provisions of The Town Planning Act, to control the use of land for building purposes in New Providence. In the Family Islands, The Local Planning Boards and in smaller, less developed islands, The District Council, assume the powers of The Town Planning Committee under the provisions of The Local Government Act (1996). The Town Planning Act (1961) also authorises coastal development.
- **Water and Sewerage Corporation Act (1976)** – This Act establishes the Water and Sewerage Corporation for granting and controlling water rights, protecting water resources, regulating the extraction, use and supply of water, disposing of sewage and for connected purposes.

The triple responsibility of management, monitoring and enforcement remains a challenge to government because of the many agencies involved. In many cases legislation granting authority to government agencies and penalties imposed are outdated. The division of responsibilities has resulted in blurred jurisdictional lines and an overlapping of both duties and efforts.

Furthermore, these legal instruments are very general in nature and do not directly outline or encourage sustainable land use practices. Promotion of sustainable land management rests with several agencies responsible for implementing the various legislation affecting land management and/or encouraging sustainable development. For example, land use planning has become a priority issue for the Office of the Prime Minister, particularly with the recent growth in tourism development. New Providence and Grand Bahama have experienced growth for decades, and zoning orders have been in effect for some parts of New Providence and Freeport, Grand Bahama.

In comparison, the other islands, until recent times, saw limited growth, which implicitly meant sustainability. Major proposals are now being considered for Mayaguana, Grand Bahama and Long Cay. These proposals are coming under greater scrutiny, as regional plans are now required for the Family Islands. Plans are under development for Abaco, Eleuthera, Inagua, Long Cay and Mayaguana. Zoning orders are currently in effect for Matthew Town in Inagua and more recently, in Exuma.

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Table 2: Government Agencies with Direct Mandates Affecting Land Management

GOVERNMENT AGENCY	FUNCTIONS AFFECTING LAND DEGRADATION
Bahamas Environment, Science and Technology (BEST) Commission	- Act as the National Focal Point for the UNCCD and CBD. - Coordinate activities related to environmental management. - Coordinate the development of environmental policy, strategy, action programmes. - Develop EIA guidelines and procedures for various sectors. - Support efforts to combat land degradation.
Department of Agriculture	Implement policies to achieve sustainable growth and development of the agricultural sector through optimal use of land and freshwater resources.
Department of Environmental Health Services	- Monitor and enforce sustainable environmental practices adopted into law. - Regulate solid waste management and land use utilization for landfills.
Department of Lands & Surveys	Regulate and monitor land belonging to the Crown (land held in trust by Her Majesty, Queen Elizabeth II on behalf of the Bahamian people) including the seabed; this involves disposing and leasing of Crown Lands, including the seabed, while protecting Crown and Government interest and encouraging balanced use and preservation.
Department of Physical Planning	Regulate and monitor excavation activities in an effort to preserve the physical landscape.
Port Department	Regulate and monitor coastal and harbour/marina design requiring alteration to the physical landscape of the coastal zone and upland terrain.
Ministry of Works	- Regulate and monitor land-use, construction techniques, implementation of building codes and designs that alleviate any negative effects of land degradation. - Utilise best available technologies, including GIS, to achieve urban planning and sustainable development. - Regulate public utilities.
Water & Sewerage Corporation	- Manage the freshwater resources. - Formulate the standards for water resource development and wastewater treatment systems.

4.2 INTERNATIONAL CONVENTIONS

In addition to the efforts made through the existing legal and policy framework, The Bahamas continues to combat land degradation and foster sustainable development through its commitment to various international conventions relating to the environment. The list of

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conventions to which The Bahamas is a contracting party includes, but is not limited to, those described in Table 3.

Table 3: Some International Conventions The Bahamas is a Contracting Party

The United Nations Convention to Combat Desertification (UNCCD) Concluded: Paris, 15 October 1994 Depositary: United Nations Signed: 10 November 2000 This Convention addresses the issue of land degradation as a result of unsustainable land management. Combating land degradation is a matter of addressing human well-being and preserving the environment. Social and economic issues, as well as environmental topics such as climate change and loss of biological diversity and freshwater supplies, are closely linked to land degradation. This Convention emphasizes the need to coordinate research efforts and (national, sub-regional and regional) action programmes for combating land degradation with these related issues and topics.
Convention on Biological Diversity (CBD) Concluded: Rio de Janeiro, 5 June 1992 Depositary: United Nations Signed: 12 June 1992 This Convention addresses the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. It recognizes ecosystems, species and genes must be used for the benefit of humans; however, this should be done in a way, and at a rate, that does not lead to the long-term decline of biological diversity. Furthermore, the lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize the reduction or loss of biological diversity.
United Nations Framework Convention on Climate Change (UNFCCC) Concluded: New York, 9 May 1992 Depositary: United Nations Signed: 29 March 1994 This Convention demonstrates the international commitment to consider what can be done to reduce global warming and cope with whatever temperature changes occur. The UNFCCC sets an overall framework for intergovernmental efforts to tackle the challenges posed by climate change. Article 4 of the Convention, states that Parties shall “adopt national policies and are to take corresponding measures on the mitigation of climate change...” and to “develop, periodically update, publish national inventories of anthropogenic emission sources...”. In response, The Bahamas has adopted a National Climate Change Policy and is also developing its Second National Communication.

Table 3: Some International Conventions The Bahamas is a Contracting Party

The Convention on Wetlands of International Importance (Ramsar Convention) Concluded: Ramsar, Iran, 2 February 1971 Depositary: United Nations Signed: 7 June 1997 The Convention provides the framework for national action and international cooperation in the conservation and sustainable use of wetland biodiversity and resources. Under the support of the 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.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Concluded: Washington, DC, 3 March 1973 Depositary: United Nations Signed: 20 March 1979 The Convention of International Trade in Endangered Species (CITES) establishes controls on the international trade and movement of animal and plant species that have been, or may be, threatened due to excessive commercial exploitation. In December 2004, the Wildlife Conservation and Trade Act (2004) was passed by Parliament to implement CITES in The Bahamas.
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel Convention) Concluded: Basel, 22 March 1989 Depositary: United Nations Signed: 12 August 1992 This Convention is the response of the international community to the problems caused by the annual worldwide production of hundreds of millions of tonnes of wastes. These wastes are hazardous to people or the environment because they are toxic, poisonous, explosive, corrosive, flammable, eco-toxic, or infectious. This global environmental treaty strictly regulates the transboundary movements of hazardous wastes and provides obligations to its Parties to ensure that such wastes are managed and disposed of in an environmentally sound manner.

The conventions considered most influential in combating land degradation other than the United Nations Convention to Combat Desertification (UNCCD), are the Convention on Biological Diversity (CBD), the United Nations Framework Convention on Climate Change (UNFCCC) and the Convention on Wetlands of International Importance (Ramsar Convention).

The objectives of the CBD are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits realized from using these resources (CBD Secretariat, 2004). Through this Convention, a programme of work was developed that attempts to reduce biodiversity loss through various efforts, such as the promotion of sustainable land management.

The UNFCCC also fosters synergy with the UNCCD objectives through its promotion of increased vegetative cover and the importance of coastal zone management, as well as its

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programme of work that supports efforts to identify various land areas vulnerable to hazards (e.g., flooding).

The Ramsar Convention focuses on the conservation and wise use of wetlands. The significance of this mandate with respect to combating land degradation and fostering sustainable land management is readily apparent upon consideration of the role wetlands play in land building, shoreline stabilization and protection of freshwater resources. Protecting wetlands is a key directive in national sustainable land management strategies, particularly those for island states such as The Bahamas.

CHAPTER V

LAND DEGRADATION IN THE BAHAMAS

5.1 FACTORS CONTRIBUTING TO LAND DEGRADATION

Economic development, particularly in the tourism sector, has led to an increase in the demand for land. Large tracts of land have been cleared for tourism and urban development projects (see Figure 5). Moreover, the requirement to provide the infrastructure, such as potable water supply and sewerage management, transportation and communication systems to service these new developments adds to the pressure on the relatively scarce land resources.

Other economic sectors, such as agriculture and construction have also increased the pressures on land, resulting in abuse and degradation that is often compounded by natural disasters, such as hurricanes.

Figure 5: Grading of Land within a Wetland System



Source: BEST Commission

5.1.1 Tourism and Development Pressures

The presence of large numbers of persons and activities can put pressure on sensitive areas. The growing demands for urban housing and the expanding tourism industry underscore the need for careful planning and development of land and water resources.

Urbanisation poses the most serious threat to biodiversity in New Providence. Before 1950, less than half of The Bahamas population was settled in New Providence. By 1963, an average of 63% of this total was settled on the capital island. The population of New Providence more than doubled during the period 1963-2000 from 80 907 to 210 832, reaching approximately 70% of the total population. Much of this urban growth has taken place in the eastern half of New Providence Island.

With only infill areas available in the east for urban expansion, the trend has shifted to the west where small and large-scale subdivisions have been approved for development. This trend has put increased pressure on the rich biodiversity of the western and southern ends of New Providence.

In tandem with regularised urban expansion, illegal squatter settlements have appeared in several of the Bahama Islands including New Providence, Grand Bahama, Eleuthera and Abaco. These areas of substandard housing do not have potable water supply and sewerage disposal systems. Moreover, proper drainage is often lacking and some of these dwelling units have been reported as erected on freshwater well fields. These settlements have not yet been studied to determine their impacts on the surrounding environments. It is also unclear how many of these settlements exist in the country. More investigative studies on this complex issue are required.

5.1.2 Sand Mining and Quarrying

The scenic beauty of the beaches and coastal zones of The Bahamas is an important tourism feature. The beaches and coastal zones also perform the important function of natural barriers during severe weather events. Sand mining can have a negative impact on beaches and coastal areas, reducing their ability to buffer against storms. Illegal mining occurs at unknown rates and uncertain amounts are removed. Of particular concern are activities that have destroyed sand dunes and scarred beaches. The negative effects of sand mining on coastlines and mangrove ecosystems are apparent in several islands of The Bahamas.

Figure 6: Unauthorised Quarry Site Infringing on Pine Forest



Source: BEST Commission

Illegal quarrying also has negative effects, specifically the defacing of hills and ridges that subsequently contribute to erosion and higher levels of surface run-off during storm events. In addition, illegal quarries usually form pools of stagnant water after a rain event (see Figure 6). These pools of water are breeding grounds for mosquitoes and other pests of concern to public health.

Both illegal sand mining and quarrying have become important issues, particularly in the Family Islands. Unfortunately, given the archipelagic nature and demographics of The Bahamas, regulation and enforcement against this activity is challenging and often hampered.

5.1.3 Agriculture

Historically, agricultural practices involved slash-and-burn (see Figure 7), inadequate crop rotation and intensive tillage of the soil. Some present-day practices are still of environmental concern. Those impacting adversely on agricultural lands include the mixing of chemicals close to wells, open trench wells for irrigation, open application of fertilisers to the ground and the indiscriminate application of fertilisers.

There are also several environmental considerations associated with commercial farming. Commercial farming involves large-scale water consumption. As a result the mismanagement of various factors, such as frequency of rainfall versus irrigation scheduling and water extraction versus recharge rate, has contributed to land degradation, and as a consequence, loss of agricultural productivity.

The Department of Agriculture, recognising the need for sustainable agricultural operations, has established a fee method, applicable to commercial agricultural lands. This method favours those commercial agricultural lands adopting conservation measures that preserve the land and soil quality. It sets a fee schedule in which commercial lands with conservation measures adopted pay between 10 and 30% of the fee per acre paid for commercial lands without conservation measures adopted (see Table 4). The fee schedule also depends upon the location of the land, whether in New Providence or the Family Islands, and the length of time the land is being used for agricultural purposes.

Figure 7: Slash-and-burn Method Employed to Clear Land for Subsistence Farming



Source: BEST Commission

Table 4: Fee Schedule for Tenure of Agricultural Land

Lease Year	Conservation Measures Adopted		Conservation Measures Not Adopted
	New Providence	Family Islands	
Year 1-3	US\$25 per acre	US\$10 per acre	US\$100 per acre
Year 4-6	US\$30 per acre	US\$15 per acre	US\$110 per acre
Year 7-9	US\$35 per acre	US\$20 per acre	US\$120 per acre
Year 10-12	US\$40 per acre	US\$25 per acre	US\$135 per acre
Year 13-14	US\$45 per acre	US\$30 per acre	US\$150 per acre
Year 15-18	US\$50 per acre	US\$35 per acre	US\$165 per acre
Year 19-21	US\$50 per acre	US\$35 per acre	US\$180 per acre

Source: Mr. Stan Smith, Department of Agriculture

5.1.4 Natural Disasters

The islands of The Bahamas are confronted with dangerous hazards from hurricanes and the associated consequences, such as storm surges and flooding. These consequences cause the salination of soils, which destroys crops and delays the planting season. They may also negatively impact freshwater resources.

In 2004 Hurricanes Frances and Jeanne, in addition to destroying properties valued over US\$200 million, severely compromised the freshwater reserves in Andros. The aquifers were inundated with salt water from the storm surges associated with these hurricanes. This resulted in water shortages in Nassau, as over 50% of the New Providence potable water is supplied by the freshwater well fields on Andros.

Other negative impacts from severe storms include leaching of chemical fertilisers from flooded soils and salt intrusion of agricultural lands. Pine forests are also affected by salt intrusion. Salt intrusion exasperates conditions of forest floors during the dry season. The forests essentially become dry, and many sometimes scorched. This, in turn, raises the risk of forest fires. During the first quarter of 2005, uncontrolled fires in several islands burned on a daily basis, causing damage to much of the pine and coppice vegetations (see Figure 8).

Figure 8: Pine Forest Devastated by Fire



Source: BEST Commission

5.1.5 Climate Change

Land degradation is a human-induced or natural process. Evidence strongly suggests that climate change is anthropogenic, but there is much argument for the natural process theory. Climate change is of concern to The Bahamas due to expected impacts, such as rise in sea level and increased frequency and intensity of tropical cyclones. Evidence suggesting climate change is a real phenomenon includes the increasing rainfall in the northwest region of The Bahamas and the decreasing rainfall in the central and southwest regions. In addition, fluctuations in rainfall patterns over the past few years, particularly in the southern islands have led to serious shortfalls in freshwater supplies. Other evidence includes the fact that there were five intense tropical cyclones in less than a decade; not since the late 1800s has such a statistic been recorded. Also, minimum temperatures have been increasing.

5.1.6 Lack of Education

In local communities there is some awareness of the impact certain activities have on the land. There are also others who may not fully recognise the harmful effects these activities have. Moreover, those who are poverty-stricken and lack the necessary resources to improve their condition are generally the least concerned about land degradation, as other issues take precedence. Illegal immigrants squatting on land reserved for freshwater extraction or conservation measures may not take any interest in protecting these natural resources due to the insecurity of their status and tenure on the land or the lack of understanding and appreciation of the land value to the host country.

Often the cultural activities of fishing communities also have negative impacts on the coastal environment. Problems associated with poor disposal practices, such as the dumping of conch shells and other waste material along the coasts not only lower the soil quality (see Figure 9), but also result in damage to coral reefs and death of marine life due to oxygen depletion. The use of harmful chemicals and other toxic substances to enhance fish catch is not permitted, but despite attempts to educate fishermen of the dangers, some have not abandoned these practices.

Figure 9: Illegal Dumping and Burning of Solid Waste within the Coastal Zone



Source: BEST Commission

5.2 NATURAL RESOURCES IMPACTED BY UNSUSTAINABLE LAND USE PRACTICES

Unsustainable land use practices, such as land clearing for construction and development activities, continue to threaten the scarce and fragile freshwater reserves, as well as the complexity of biological diversity in the Bahama Islands. Many times, these activities are indiscriminate and unmonitored; therefore, redress is required to protect the natural resources, which are both significant and limited.

5.2.1 Freshwater Resources

Three main vulnerability factors affecting the freshwater lens are the scarcity of freshwater, vulnerability to overexploitation and ease of access by excavation. Of the 700 islands and cays comprising The Bahamas, only three islands have good supplies of freshwater. These islands are located in the northern Bahamas; they are Andros, Abaco and Grand Bahama. The groundwater in many of the central and southern islands is brackish, and some islands do not have freshwater.

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As described in earlier chapters, the freshwater lenses of The Bahamas are quite shallow; therefore, they may be threatened by overexploitation, particularly in the northern islands, which are more populous. In addition, the rock formations that entrap the freshwater are porous. As a result, quarrying and other excavation activities also pose a threat to these lenses.

Urban sprawl is another threat to freshwater reserves. Several hectares of land are required to provide an adequate fresh water supply. The practice of preserving large tracts of pristine land, in the interest of maintaining freshwater reserves, is under pressure from the demand for housing and other development projects.

Regulation of water supply and environmental regulation are needed, as are public awareness campaigns and research on the Bahamian environment.

Guidelines for conservation measures include the creation and maintenance of buffer zones and habitats. Buffer zones assist in controlling the spread of fertilisers and pesticides, while the creation of habitats helps to promote natural pollination and can protect the hydrological regime through protection of watersheds. These, in turn, can enhance agricultural productivity, increase food security and improve livelihoods.

5.2.2 Biodiversity

Anthropogenic activities constitute the most serious threat to biological diversity. Of these, the most critical are habitat destruction and the introduction of invasive alien species. Habitat destruction mainly occurs due to land clearing for development. With the growth in the tourism sector, coupled with an increasing population, available lands, including wetlands, have been cleared to meet the growing demand. It is not uncommon to find wetlands that were filled or bisected by causeways in the interest of meeting development needs (see Figure 10).

Figure 10: Roadway Built Through a Wetland



Photo 1: Roadway cutting through the wetlands



Photo 2: North side of the bisected wetland



Photo 3: Southern end of the bisected wetland

Loss of habitat includes the destruction of wetlands for development, dredging of the sea floor, sand mining and the clearing of natural vegetation for housing development. Notably, the destruction of wetlands in the interest of urban development also contributes to damages and losses incurred during flood events.

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Invasive alien species represent a serious threat to biodiversity. The Bahamas is vulnerable to invasion and the rate of extermination of native species can be rapid because of the small size of the population.

CHAPTER VI

THE NATIONAL ACTION PROGRAMME (NAP)

CHAPTER VI – THE NATIONAL ACTION PROGRAMME (NAP)

6.1 THE NATIONAL AWARENESS SEMINAR

An important component of the NAP process is the participation of stakeholders to ensure ownership through sharing of information and addressing their particular concerns. This consultative approach to the formulation, implementation and evaluation of the NAP also improves its effectiveness and sustainability.

During the initial stage of formulating the NAP process, the BEST Commission, the national focal point for the UNCCD, organised the two-day National Awareness Seminar on Land Degradation in The Bahamas. It was held 23 and 24 November 2004, and featured guest speakers who provided insight into various local issues that either contribute to or exist because of land degradation (see Appendix A). Representatives from the relevant government ministries and departments, public corporations, non-governmental organisations and the private sector made valuable contributions to the discussions that followed the presentations.

The main objective of the seminar was to educate local stakeholders on the objectives of the UNCCD and the issues of land degradation as they relate to The Bahamas. Through this seminar, the country will be able to develop a NAP, which will be the mechanism for addressing land degradation.

Participants in the national awareness seminar identified the following as the main causes of land degradation in The Bahamas:

- improper farming methods;
- inappropriate fires;
- sand mining and quarrying;
- deforestation;
- inadequate land-use planning; and,
- invasive alien species.

During the seminar, the participants also identified indirect causes of land degradation in The Bahamas:

- poverty;
- lack of education;
- lack of legislation on development;
- illegal squatting; and,
- illegal dumping

The contributions made by the participants during this consultative exercise will prove useful for developing the NAP. Thoughts and ideas shared during the seminar are summarised in Appendix B.

6.2 THE NATIONAL ACTION PROGRAMME (NAP)

The stakeholder participation during the awareness seminar of November 2004 has provided the Government with some indication of the main causes of land degradation in The Bahamas. The outcomes from the various discussions provide direction for developing the NAP. It is clear from the participants that an effective NAP requires a national commitment to address land degradation and its causes. Furthermore, the NAP must recognise the geophysical and socio-

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economic characteristics of The Bahamas. This exercise therefore requires a structured programme consisting of various land management, development and agricultural initiatives that involve local communities and agencies.

The NAP, as proposed, is a dynamic initiative designed to morph in order to effectively meet the requirements of The Bahamas, while hopefully incorporating the latest developments in technology and practices. Although the specific goals and targets may vary dramatically over time, the vision and strategic goal and objectives of the NAP are unlikely to change significantly, if at all.

6.2.1 Rationale for the NAP

As a signatory to the United Nations Convention to Combat Desertification, The Bahamas is obligated to develop and implement a NAP to mitigate the effects of land degradation. The NAP will address the issues raised as priority areas during the National Awareness Seminar on Land Degradation in The Bahamas. These issues included indiscriminate land clearing; the use of exotic rather than native species; invasive alien species; pollution and contamination of freshwater resources; cultural practices of farmers; inappropriate building methods; wetland destruction; review and amendment of existing legislation; the enforcement of existing legislation; education and public relations; sustainable development; development of land-use plans; identify sensitive areas and restore protected areas and strengthening of research capacity.

The NAP will further seek to improve the implementation of existing policies, coordination among stakeholders and participation by stakeholders in the formulation and implementation of land management procedures and sustainable development programmes.

6.2.2 Vision for the NAP

The overall vision of the NAP is to set The Bahamas on a course of sustainable growth and development, through the responsible use of its land, coastal, marine and freshwater resources, in an effort to secure prosperity for present and future generations.

In order to achieve this end, certain key elements (or milestones) must be achieved:

- creation of a national coordinating body to oversee the NAP process;
- identification and re-evaluation of initial stakeholders and resources;
- development of science-based assessments of land conditions;
- research of existing programmes, policies and legislation;
- development and implementation of benchmarks and indicators; and,
- periodic monitoring and evaluation of land conditions and the NAP process.

Establishing a methodology that involves careful planning and execution of strategic goals and objectives will attain these elements. The following section outlines the goal and objectives of the NAP.

6.2.3 Strategic Goal and Objectives of the NAP

The overall goal of the NAP is to mitigate, and wherever possible reverse, the effects of land degradation by adopting measures to effectively preserve and manage the limited land resources of The Bahamas, through the participation and partnership of the various stakeholders.

This involves identifying the underlying factors that contribute to land degradation, preferably through science-based assessment of conditions, and devising and executing practical solutions to mitigate the negative effects associated with these factors.

This may be achieved through a three-tier approach, in which tier activities (Table 5) may be conducted concurrently. Tier 1 consists of preparatory activities, Tier 2 is the development and implementation stage and Tier 3 involves programme evaluation:

❖ *Tier 1 – Programme Planning*

The limited resources available demand careful planning of the NAP. Tier 1 is designed to build on the outcome of the national awareness seminar. The activities identified in this planning stage are intended to better comprehend land conditions, promote the importance of addressing land degradation and foster momentum for the programme. Tier 1 activities include the following tasks:

- identification of initial stakeholders (establishment of a national coordinating body, consisting of representatives from relevant government and non-government partners, as well as the general public);
- identification of resources (legal, financial, and human);
- development of science-based assessments of land conditions in The Bahamas;
- formalisation of the exchange of information between stakeholders to ensure better understanding of those conditions leading to land degradation in The Bahamas, as well as to identify existing data gaps;
- promotion of awareness of the causes and effects of land degradation;
- assessment of pressures and driving forces leading to land degradation;
- conducting of research on existing programmes (local, sub-regional, regional, international), policies and legislation.

Many, if not all, of the Tier 1 activities will continue during the next tier. Tier 1 sets the stage for developing the core mechanisms of the NAP. It is anticipated that during the planning exercise, various changes will likely be required. These changes will influence NAP development and implementation.

❖ *Tier 2 – Programme Development & Implementation*

Tier 2 activities are intended to create various networks and initiatives for addressing land degradation through sustainable practices and partnerships among the stakeholders. In addition to developing action plans, these activities also include provisions for implementation of the various initiatives. The Tier 2 activities include the following tasks:

- re-evaluation of stakeholders (after Tier 1 assessments);
- facilitation of capacity-building initiatives for stakeholders;
- re-evaluation of resources (legal, financial, and human);
- resource mobilisation from national and international sources;

- development and implementation of mechanisms to evaluate existing programmes and possible opportunities for synergies;
- development and implementation of strategic framework, policies and legislation;
- development of projects and programmes (public awareness programmes, reforestation, land use planning, water resource management, cultivation techniques, innovative technological applications etc.); and,
- development of benchmarks and indicators.

❖ *Tier 3 – Programme Evaluation*

It is anticipated that land conditions in The Bahamas will not remain stagnant, but either show signs of improvement or decline. The NAP requires elements designed to continually monitor the effectiveness of its initiatives. As conditions and demands change, the NAP requires tools to evaluate the inevitable influences and effect any necessary corrective action. Tier 3 is intended to provide the NAP with the flexibility needed to self-monitor and adapt. Tasks identified for this tier include:

- creation of stakeholder subcommittees for implementation of programme audit activities;
- implementation of benchmarks and indicators to measure the effectiveness of projects and programmes;
- evaluation of programmes, policies and legislation developed to combat land degradation.

These objectives will address the priority issues raised by the various stakeholders during the national awareness seminar, as well as incorporate many of their suggestions and concerns.

Table 5: List of Activities under the Three-tier Approach to the NAP

Tier 1 Programme Planning	Tier 2 Programme Development & Implementation	Tier 3 Programme Evaluation
▪ identification of initial stakeholders (establishment of a national coordinating body, consisting of representatives from relevant government and non-government partners, as well as the general public); ▪ identification of resources (legal, financial and human); ▪ development of science-based assessments of land conditions in The Bahamas; ▪ formalisation of the exchange of information between stakeholders to ensure better understanding of those conditions leading to land degradation in The Bahamas, as well as to identify existing data gaps; ▪ promotion of awareness of the causes and effects of land degradation; ▪ conducting of research on existing programmes (local, sub-regional, regional, international), policies and legislation.	▪ development of projects and programmes (public awareness programmes, reforestation, land use planning, water resource management, cultivation techniques, innovative technological applications, etc.); ▪ facilitation of capacity-building initiatives for stakeholders; ▪ resource mobilisation from national and international sources; ▪ re-evaluation of resources (legal, financial, and human); ▪ development and implementation of mechanisms to evaluate existing programmes and possible opportunities for synergies; ▪ re-evaluation of stakeholders (after Tier 1 assessments); ▪ development and implementation of strategic framework, policies and legislation; ▪ development of benchmarks and indicators.	▪ creation of stakeholder subcommittees for implementation of programme audit activities; ▪ implementation of benchmarks and indicators to measure the effectiveness of projects and programmes; ▪ evaluation of programmes, policies and legislation developed to combat land degradation.

6.2.4 Strategy for the Development and Implementation of the NAP

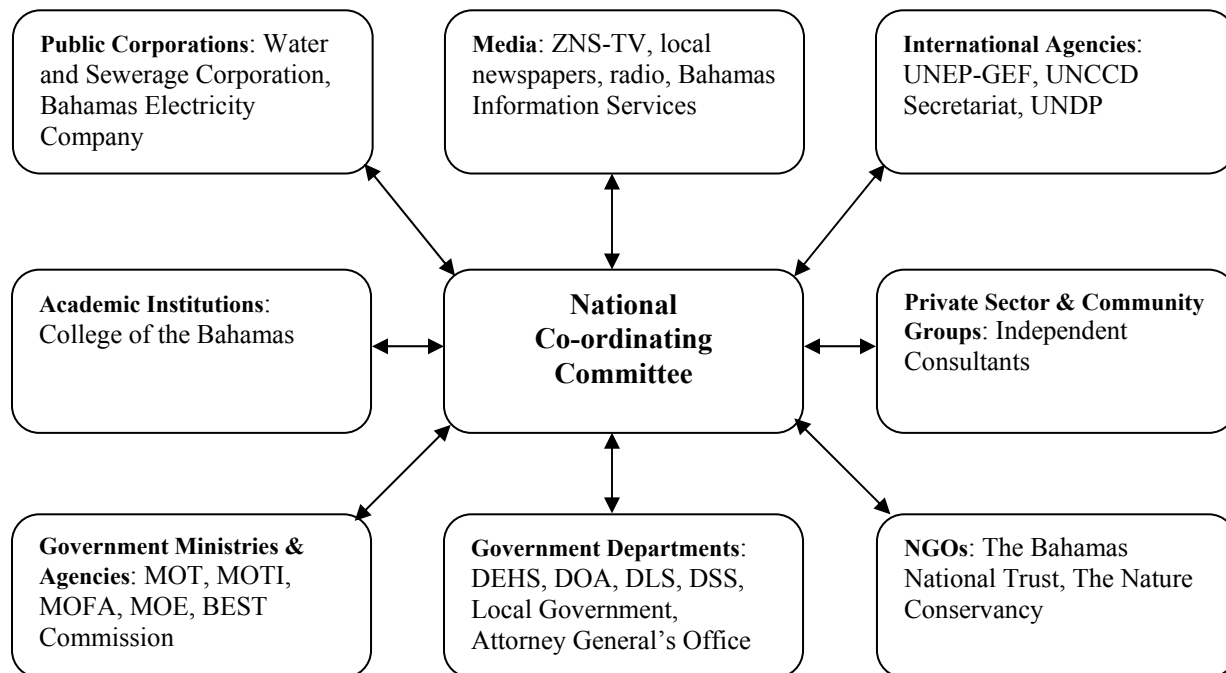
The three-tiered approach is very structured and its success hinges on the effective participation of the various stakeholders at all three tiers. Given this fact, the following major development objectives are proposed:

- establishment of a National Co-ordinating Committee (NCC); and,
- establishment of secured funding.

The principal function of the NCC will be to coordinate the implementation of the Convention as appropriate for The Bahamas, and serve as a focal point for the coordination of the NAP and

other related programmes (e.g., CBD and UNFCCC programmes). Efforts should be made to utilise the existing institutions to the maximum extent possible; this includes maximising opportunities for sharing services and expertise among the various government and non-government agencies (Figure 11).

Figure 11: Proposed Stakeholder Network for the NAP Process



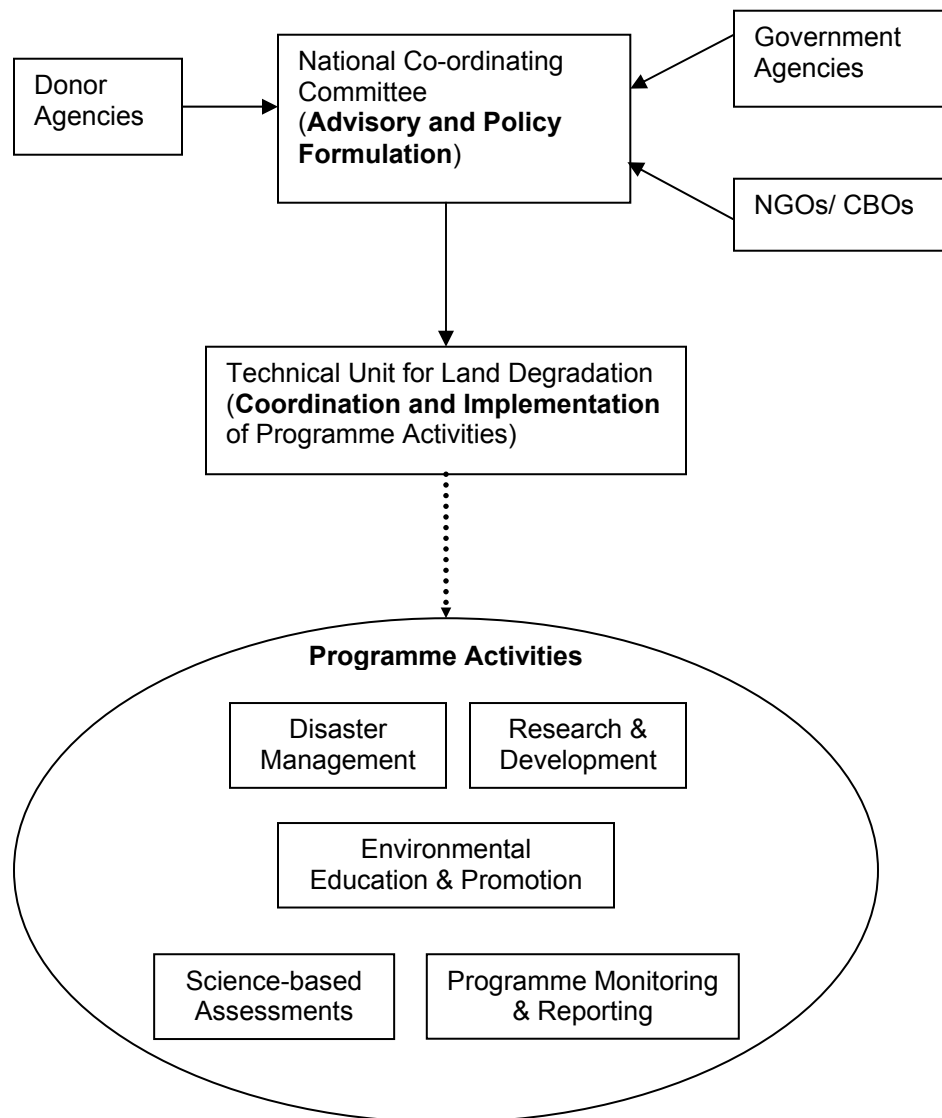
The responsibilities of the NCC will be largely decision-making and affecting policy on land degradation issues. It will also oversee the creation and operation of a technical unit. This technical unit will manage projects and initiatives that address land degradation issues. To realise this objective, meetings and communications will be required to identify the appropriate representation of each agency. Commitment from the senior management of each agency must also be secured. (Refer to Table 6 for a listing of potential government agencies.)

Institutional strengthening of the government, private and non-governmental sectors through various capacity-building initiatives will also be required. For the technical unit to function well, the existing coordination and reporting mechanisms among the agencies must be made effective. Operational effectiveness will also require high calibre managers and practitioners at all levels, with appropriate support, training and ongoing development. Figure 12 depicts a possible structure of the NCC and its technical operating unit.

The second main strategic objective for implementing the NAP is securing monetary funds. Funding is usually the major constraint to developing and implementing national initiatives in The Bahamas. In order to implement the NAP, the NCC will need a mandate and funding to coordinate and execute all initiatives to combat land degradation. The successful implementation of the NAP depends on sufficient resource allocation; therefore, one of the main orders of business for the committee will be securing funds from both national and international

sources. The NCC must also establish an operating budget that will facilitate both national and island-specific initiatives. A mechanism for facilitating Family Island activities, while minimising the bureaucracy, must also be established.

Figure 12: Proposed Organisational Structure for Implementing the NAP



6.2.5 Strategy for Monitoring and Evaluation of the NAP

With the accomplishment of the major developmental objectives (i.e., forming the NCC and securing operational funds), it is possible to establish more specific goals for the NAP. These will form the basis of operation for the technical unit. Key goals for the technical unit include the following:

- evaluation of existing projects and programmes and the synergies that may exist between them;
- establishment of priorities and action plans through the active involvement of the local community and other stakeholder groups;
- development of benchmarks and indicators; and,
- utilisation of best practices as well as traditional knowledge in planning, implementation, monitoring and evaluation strategies for the various projects and programmes.

The expected outcomes from implementing the NAP, as guided by the major objectives and goals, are as follows:

- improved stakeholder participation;
- training and capacity-building;
- tabling of innovative projects to restore degraded lands;
- availability of resources for the implementation of projects;
- identification of source funding and support for projects;
- development of collaborative research efforts;
- coordination of activities and programmes;
- more efficient land use management;
- improved agricultural productivity;
- increased awareness of the causes and effects of land degradation; and,
- increased participation by a well-informed public.

Monitoring and evaluation of the various initiatives and the functioning of the NCC and its technical unit should be carried out at regular intervals to ensure that the Government's position on land degradation issues is keeping pace with development trends. This will also ensure that the needs identified by the stakeholders are met, taking into consideration newly emerging issues at the local, national and global level. The NCC will also encourage project-planning committees to monitor and evaluate their projects. (A list of proposed projects that should be monitored and evaluated under this NAP review strategy appears in Appendix C.)

Assessing the effectiveness of the NAP will be achieved through the development of benchmarks and indicators. This activity will likely require the active participation of the NCC and international stakeholders to establish effective and practical tools for measuring performance. Preferably, these tools will also be used for statistical purposes.

Table 6: Potential Government Stakeholders in the NAP Process

GOVERNMENT AGENCY	IDENTIFIED FUNCTION AFFECTING LAND DEGRADATION
Attorney-General's Office	▪ To facilitate the drafting and amending of legislation [to protect against land degradation]
Bahamas Environment, Science and Technology (BEST) Commission	▪ To coordinate activities related to environmental management ▪ To coordinate the development of environmental policy, strategy, action programmes ▪ To develop EIA guidelines and procedures ▪ To support efforts to combat land degradation ▪ To act as the National Focal Point for the UNCCD
Bahamas Information Services	▪ To facilitate public awareness and education through media coverage (such as documentaries, articles, factoids, etc.) of the issue of land degradation and how the public could assist in eradicating unsustainable land-use practices.
Bahamas National Geographical Information Systems Centre	▪ To act as the central repository of spatial data ▪ To facilitate the planning process through management of geo-referenced data
The College of The Bahamas	▪ To conduct research and participate in collaborative efforts with government agencies, local communities, and international institutions, in the areas of urban planning, sustainable agriculture practices, land management and use initiatives.
Cabinet Office (including NEMA)	▪ To demonstrate national commitment to the fight against land degradation and implementation of sustainable land management practices. ▪ To integrate into national emergency action plan land degradation to prepare or promote relevant options for mitigation.
Department of Agriculture	▪ To implement policies to achieve sustainable growth and development of the agricultural sector through optimal use of land and freshwater resources.
Department of Environmental Health Services	▪ To monitor and enforce disposal of waste ensuring sustainable environmental practices. ▪ To promote parks and roadside beautification and clean-up.
Department of Lands & Surveys	▪ To promote the preservation of Crown Land, particularly those rich in biodiversity. ▪ To monitor and enforce the preservation of forest areas or pristine sites that requires protection.
Department of Meteorology	▪ To complete storm surge atlas and vulnerability mapping for the entire Bahamas to assist in land use planning.
Department of Physical Planning	▪ To regulate and monitor excavation and filling-in of wetland activities in an effort to preserve the physical landscape.

CHAPTER VI – THE NATIONAL ACTION PROGRAMME (NAP)

Table 6: Potential Government Stakeholders in the NAP Process

GOVERNMENT AGENCY	IDENTIFIED FUNCTION AFFECTING LAND DEGRADATION
Ministry of Education	▪ To develop diverse and exciting curriculum, which motivate students to seek professions in areas such as urban planning, forestry, environmental resource management, landscape architecture etc.
Ministry of Financial Services & Investments	▪ To promote environmentally friendly and sustainable investments to The Bahamas.
Ministry of Foreign Affairs	▪ To facilitate appropriate national representation at regional and international meetings and other gatherings, including those linked to land degradation.
Ministry of Housing	▪ To promote environmentally friendly land-use, construction techniques and designs that alleviate any negative effects of land degradation, while providing affordable housing for Bahamians.
Ministry of Social Services	▪ To address issues of poverty, crime and other social ills that may contribute to or result from land degradation.
Ministry of Tourism	▪ To promote sustainable tourism and ecotourism development policies. ▪ To move from a mass tourism to a sustainable tourism model.
Ministry of Trade and Industry	▪ To promote and facilitate industrial growth and innovation through use of best available technologies, conducive to the Bahamian environment.
Port Department	▪ To promote coastal and harbour design that will ensure protection and management of coastal zones and upland terrains.
Ministry of Works	▪ To promote and facilitate sustainable development in The Bahamas that protects against land degradation. ▪ To promote environmentally friendly land-use, construction techniques and designs that alleviate any negative effects of land degradation. ▪ To utilise best available technologies, including GIS, to achieve urban planning and sustainable development.
Water & Sewerage Corporation	▪ To manage the freshwater resources ▪ To formulate the standards for water resource development and wastewater treatment systems

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APPENDIX A

THE NATIONAL AWARENESS SEMINAR (NAS) SUMMARY REPORT

(Please note that the annexes are not included.)

**REPORT ON THE FIRST NATIONAL AWARENESS SEMINAR ON
LAND DEGRADATION IN THE BAHAMAS**

November 23rd - 24th, 2004

SuperClubs Breezes, Nassau, The Bahamas

The Bahamas Environment, Science and Technology (BEST) Commission convened a national awareness seminar on land degradation in The Bahamas on November 23rd and 24th, 2004 at SuperClubs Breezes. Representatives of Government, academia and non-government organizations participated (see Annex 1).

Opening Remarks:

Mr. Livingston Hepburn, Deputy Permanent Secretary, Ministry of Health and Environment/BEST Commission made opening remarks. Mr. Hepburn emphasized the importance of land degradation, by both natural and unnatural forces, on the sustainable development of The Bahamas. Internationally, desertification, which includes land degradation, is viewed as a global problem, having complex socio-economic implications that can lead to poverty and deterioration in the overall well-being of a people. Mr. Hepburn stressed the fragility of Bahamian ecosystems and our limited land resources – two attributes common to all small island developing states (SIDS). Due to our vulnerability, SIDS have adopted an action plan of early detection, preservation and management to combat land degradation. In The Bahamas, the two significant industries that directly impacted by land degradation are agriculture and tourism. Natural forces, such as hurricanes and tidal surges have caused beach erosion and degradation of soil quality by salt intrusion. In addition, improper land clearing for urban development has also contributed to land degradation. As a result, proactive measures must be taken to effectively preserve and manage the limited land resources of The Bahamas, for this and future generations.

Mr. Hepburn stated that through this national awareness seminar (NAS), The Bahamas would be in a position to develop its National Action Programme (NAP), which will be the mechanism for addressing land degradation. He expressed his hope that the NAP, developed through contributions made by the NAS participants, will add to the success of the national sustainable development goals of The Bahamas.

APPENDIX A – THE NAS SUMMARY REPORT

Presentations:

The seminar proceeded according to the agenda (see Annex 2); however, questions were fielded after each presentation. Please refer to Annex 3 for the presentation slides. Annex 4 contains a summary of the question and answer sessions, which followed each presentation.

DAY 1

Presentation 1 – NAS Purpose & Objectives

Ms. Loraine Cox proceeded to define land degradation, which is the reduction or loss of the biological or economic productivity and complexity by land uses or by a process or combination of processes (including human activities and natural forces). Globally, land degradation has negatively impacted food security, biodiversity, freshwater resources, human health and well-being, and it has caused mass migration and coastal erosion. These consequences have affected approximately 250 million people worldwide, and globally it has resulted in lost annual income of approximately US\$ 42 billion. In response to this problem, the international community developed the United Nations Convention to Combat Desertification (UNCCD). The intent of the UNCCD is to effectively combat desertification, including land degradation, and mitigate its effects through active and effective action at all levels of society. This is achieved through national action programmes (NAPs). NAPs require national commitment; they are characterized as programmes that facilitate access to information and technology, assist local communities manage local resources, promote synergies with other sustainable development programmes, and promote participation. Ms. Cox stated that The Bahamas needed a NAP and that the purpose of this two-day national awareness seminar is to illicit thoughts, opinions and ideas from Bahamians that will be used to create a framework for developing The Bahamas NAP. (Refer to Annex 3A for the slides.)

Presentation 2 - UNCCD Overview

Mr. Deon Stewart discussed the UNCCD. He stated that the UNCCD entered into force on December 26th, 1996. Currently, there are 191 parties of the convention, with funding provided through the Global Environment Facility. The Bahamas became a signatory to the UNCCD on November 10th, 2000, and the convention came into force in The Bahamas on February 8th, 2001. As a signatory, the first obligation of The Bahamas is to increase awareness of land degradation and to develop and implement a NAP. The UNCCD stresses full participation and has enshrined a bottom-up approach in achieving its goals. It also emphasizes the important role of women and non-government organizations in ensuring the successful implementation of NAPs. Mr. Stewart also stated that through the UNCCD, The Bahamas could benefit from cooperation with other affected countries and with developed countries in developing its programme. He also stated that The Bahamas could improve access to relevant technology and data, and The Bahamas could increase the quality of its human resources by participating in the work of the Committee on Science and Technology. Mr. Stewart stated that the UN General Assembly declared 2006 as the Year of Deserts and Desertification, so he encouraged the participants to do their part by contributing through this national awareness seminar. (Refer to Annex 3B for the slides.)

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Presentation 3 - Land Use Planning in The Bahamas

Mr. Malcolm Martini discussed past and present land-use planning in The Bahamas. He stated that effective land-use planning and sustainable development are interconnected. In essence, a land use is sustainable if that particular application can continue throughout the generations and the environment can survive (with mitigation). Proper planning requires an understanding of our future direction and challenges, including growth, land requirements, soft infrastructure and needed facilities. We must understand the implications of growth on our community, our mobility, our environment and ourselves as a people. In The Bahamas, there has been some land use planning: there are zoning orders for some parts of New Providence, Freeport in Grand Bahama, Matthew Town in Inagua and recently in Exuma. However regionally, the planning has been ad hoc; for example, work is currently being done to correct problems in New Providence. Today, New Providence is wrestling with major problems: inadequate roads, inadequate water supply, a sewerage system that is only partially working and only has limited treatment of sewerage, very little public beach remaining and deteriorating park areas. The existing condition of New Providence is not sustainable. To address the situation in New Providence, Mr. Martini mentioned that master plans are under development for downtown, the harbour and the port location; these are expected by winter 2005. Components of the New Providence plan include land use, open space and environment, housing, transportation, utilities, social services, appearance and aesthetics. Until recently, the Family Islands saw limited growth, which implicitly meant sustainability. Major proposals are being considered for Mayaguana, Grand Bahama and Long Cay. These proposals are getting more attention, as regional plans are now required for the Family Islands. Family Island plans are currently under development for Abaco, Eleuthera, Exuma, Inagua, Long Cay and Mayaguana. Mr. Martini also mentioned ten requirements of a land-use plan at the national level: environmental policies, roles for each island, use of Crown Land, timing and Bahamian control, commonage and generation, infrastructure policies, development financing, planning controls and Local Government, capital works planning and monitoring. In closing, Mr. Martini stated that The Bahamas is a success, having the third largest GDP per capita and not having any political or social unrest; however, the environment still must be protected and the Government is apparently taking steps in that direction. (Refer to Annex 3C for the slides.)

Presentation 4 – Land Degradation in The Bahamas

Mr. Stan Smith discussed agricultural land uses in The Bahamas. Historically, agricultural practices involved slash-and-burn land clearing, poor crop rotation and intensive tillage. Some present practices are still of environmental concern, including open application of fertilizers and indiscriminate spraying of pesticides. Mr. Smith discussed various environmental considerations associated with commercial farming. Commercial farming involves large-scale water consumption and irrigation. As a result mismanagement of various factors, such as frequency of rainfall versus irrigation scheduling and (water) pumping versus recharge rate, causes land degradation, and subsequently, leads to lost agricultural productivity. The Department of Agriculture recognizes the need for sustainable agricultural operations, and has established a fee method, applicable to commercial agricultural lands, that favours commercial agricultural lands that adopt conservation measures to preserve the land and soil quality. This fee method sets a fee schedule in which commercial lands with conservation measures adopted pay between 10% and 30% of the fee per acre paid for commercial lands without conservation measures adopted, depending on whether the lands are located on New Providence or the Family Islands and the duration the land is used for agricultural purposes. Examples of conservation measures include

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the creation and maintenance of buffer zones and the creation and maintenance of habitat. Buffer zones assist in controlling the spread of fertilizers and pesticides. Creation and maintenance of habitats help promote natural pollination and can protect the hydrological regime through protection of watersheds. These, in turn, can enhance agricultural productivity, improve food security and improve livelihoods. (Refer to Annex 3D for the slides.)

DAY2

Presentation 5 - Land Degradation, Biodiversity and Bahamian Law

Mr. Romauld Ferreira began his discussion noting that frequently endemic species are not used in plantings for new developments. He also stated that the ratio of land for tourist development to land for agricultural uses is large and very disproportionate. These factors negatively impact biodiversity. Mr. Ferreira stated that under the Department of Environmental Health Services Act, the Minister has broad powers, including the power to levy fines, which could be used to protect biodiversity. He also mentioned that the environmental impact assessment (EIA), which evaluate projects [and their potential impacts on the environment], is another tool that could be used to promote biodiversity and sustainable development. The United Nations Principle 6 requires review of an EIA by a third party. It also requires clear indication of the types of projects that require EIAs. In his opinion, we need a regulatory framework that establishes targets and contains checks and balances to enhance the existing regulatory conditions. In addition, fines should be levied to encourage behavioural compliance with the principles of sustainable development. Environmental liability is required. Mr. Ferreira stated there are common law tools that could be used to address environmental liability: nuisance (both private and public), negligence and case law decision (Ryland v. Fletcher). The Ryland v. Fletcher decision is particularly powerful. In that case, an individual allowed a non-natural substance to be released off his property. The substance, in that case, was water. Mr. Ferreira concluded by stating the way forward must involve a framework, as applicable existing laws are not contained under one umbrella, and in his opinion, the largest threat to biodiversity is tourist development and agriculture.

Presentation 6 - Freshwater Resources and Land Degradation in The Bahamas

Dr. Richard Cant stated that the Water and Sewerage Corporation Act (1976) established ownership of water resources to the Government (i.e., the Bahamian people). He followed by describing freshwater resources. Freshwater, in The Bahamas, is actually trapped rainfall. The rainwater slowly travels through soils to the rock. The rock traps the rainwater and a freshwater lens results. The freshwater lens is very small (1:1). Some islands have brackish water; others essentially have no freshwater. Dr. Cant mentioned that the United States Army Corps of Engineers (USACE) conducted a water resource assessment of The Bahamas. The report is open to the public, and it is available online for download from the USACE ftp server: <ftp://ftp.sam.usace.army.mil/pub/ENGG/FOR%20DR%20CANT,%20BAHAMAS%20WRA,%2030%20JULY%202004/>. Dr. Cant mentioned that there are 3 isles that have a good freshwater supply: Andros, Abaco and Grand Bahama. In the wells of Grand Bahama, salt is hit around 65ft; in Nassau, it is hit around 30ft. There are 3 main vulnerability factors: scarcity of freshwater, vulnerability to overexploitation and ease of access by excavation (exposure of the lens facilitates evaporation). Case in point, Grand Bahama has a projection plan for 600,000 people; the only problem is the freshwater resources cannot support the populace. Dr. Cant also mentioned that quarrying rock could threaten natural barriers that entrap freshwater. Hurricanes can threaten resources, through saltwater intrusion. A sea level rise of 2ft will contaminate the

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freshwater wells in our (3) isles of freshwater supply. He explained that the water table is high and the rock is porous; therefore, disposal of wastes and wastewater can impact the freshwater supply as well. Several acres are required to provide freshwater supply, and this conflicts with other activities, such as urban development and agriculture. For an example, the ‘ring around the island’ in the Abacos is due to sewage discharging into the sea -- sewage that was released due to improper septic systems. Dr. Cant explained what he refers to as the stages or phases of water supply: 1) get freshwater to survive; 2) try to develop enough freshwater to supply; and 3) move to technology to generate supply (i.e., desalination). He stated that regulation on water supply and environmental regulation are needed. In his opinion, WSC should be regulated. In closing, Dr. Cant stated that public awareness campaigns and ongoing research on the Bahamian environment are also needed. Furthermore, to support that, incentives to entice trained researchers to continue doing the research for life are needed.

Presentation 7 - Climate Change, Land Degradation and Desertification

Mr. Arthur Rolle mentioned that the United Nations Framework Convention on Climate Change (UNFCCC), United Nations Convention to Combat Desertification (UNCCD) and the Convention on Biological Diversity (CBD) share similar goals regarding sustainable development and similar challenges. For example, land degradation impacts the health of terrestrial ecosystems, which in turn impacts the complexity (or biological diversity) of the affected terrain. Furthermore, there is strong evidence that climate change is both a natural and unnatural phenomenon, and land degradation is both a human-induced and natural process. In The Bahamas, many tracts of land have been cleared due to tourism development and urbanization. The loss of forested areas, i.e., deforestation, is a form of land degradation that reduces the water retention capacity of the soil and increases susceptibility to soil erosion and flooding of low-lying areas. Mr. Rolle also described global warming, which is the entrapment of infrared radiation in the lower atmosphere due to the presence of trace gases (such as carbon dioxide) in the lower atmosphere. Global warming is believed to result in climate change, and climate change is a concern to The Bahamas due to expected impacts such as sea level rise and increased frequency and intensity of tropical cyclones. Mr. Rolle explained that forests absorb carbon dioxide, a compound that contributes to global warming. Consequently, forests are important for preventing land degradation, and they are important “sinks” for mitigating global warming (and climate change). (Refer to Annex 3E for the slides.)

Presentation 8 - Coastal Zone Management in The Bahamas

Ms. Rochelle Newbold explained the intent of coastal zone management, which is to preserve the integrity of the coastal zone in a manner that achieves the social, economic and environmental priorities of the coastal state. This involves zoning, development planning, conservation and protection measures, research and management through monitoring and enforcement. Ms. Newbold discussed various legislation that affect the coastal zones of The Bahamas, as well as their effectiveness in protecting the coastal zones. Finally, Ms. Newbold advised of the impacts of mismanaging the coastal zone and suggested some possible solutions for further consideration by the NAS participants. (Refer to Annex 3F for the slides.)

Presentation 9 - Integrated Land Use Management in the Gottlieb Region in Dresden, Germany

Regrettably, Ms. Roberta Quant was unable to give her presentation, due to time constraints. It was imperative that sufficient time was allotted for the working group sessions. Please refer to Annex 3G for an overview of Ms. Quant’s presentation.

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Working Group Sessions:

Ms. Cox divided the participants into three working groups. A series of questions were given to each group, and each group was directed to select a scribe, who would record the group's thoughts and ideas on each question, as well as a rapporteur, who would present a summary of the group's discussions to all seminar participants. Details on the outcome of the working group sessions are available in Annex 5.

Way Forward and Closing:

Ms. Newbold mentioned that all ideas, thoughts and comments made by the participants, over the past two days, would be considered in creating the framework for developing the National Action Programme for The Bahamas.

Ms. Newbold extended her appreciation to all the participants for their commitment and invaluable contributions during the seminar. Special thanks were also extended to the seminar presenters, who took time out of their busy schedules to share their knowledge and respond to our questions on their areas of expertise. Their contributions triggered much of the dynamic discussions that took place, and added to the success of this seminar.

APPENDIX B

DISCUSSION SUMMARY FROM THE NAS

APPENDIX B – DISCUSSION SUMMARY FROM THE NAS

<i>National Awareness Seminar – Land Degradation in The Bahamas</i> Working Group Discussion Summary			
Day 1 WG Session Questions	Group 1 Responses	Group 2 Responses	Group 3 Responses
1. In your opinion, what are the major causes of land degradation in The Bahamas?	▪ Improper farming methods ▪ Hurricanes ▪ Pollution ▪ Excavation ▪ Deforestation ▪ Erosion ▪ Improper development ▪ Invasive species	▪ Improper development ▪ Lack of monitoring and enforcement ▪ Lack of legislation on development ▪ Excavation ▪ No land-use planning ▪ Lack of political will ▪ Social issues (squatting) ▪ Invasive species (lack of proper management and eradication) ▪ Agriculture & farming (soil run-off, inappropriate fires, slash-and-burn)	▪ Economic gain ▪ Urbanization ▪ Quarrying ▪ Land-filling ▪ Population growth ▪ Lack of planning & organization ▪ Lack of ingenuity & innovation ▪ Overgrazing ▪ Lack of education ▪ Dumping ▪ Poverty

APPENDIX B – DISCUSSION SUMMARY FROM THE NAS

<i>National Awareness Seminar – Land Degradation in The Bahamas</i> Working Group Discussion Summary			
Day 1 WG Session Questions	Group 1 Responses	Group 2 Responses	Group 3 Responses
2. How should we classify land in The Bahamas?	▪ Agriculture (livestock, food products) ▪ Conservation areas ▪ Urban ▪ Tourism/resort areas ▪ Recreational ▪ Industrial ▪ Airport ▪ Seaport	▪ Developed land (including brownfields) ▪ Undeveloped land (pristine) ▪ Recommend use of brownfields first, before consideration of developing undeveloped land ▪ Agriculture land ▪ Industrial lands ▪ Housing/urban ▪ Protected areas/special areas (wetlands, forests, water reserves)	▪ Protected areas (well fields/water reserves) ▪ Recreational ▪ Industrial ▪ Coastal zones ▪ Mining zones (including quarrying areas) ▪ Commercial ▪ Residential

APPENDIX B – DISCUSSION SUMMARY FROM THE NAS

<i>National Awareness Seminar – Land Degradation in The Bahamas</i> Working Group Discussion Summary			
Day 1 WG Session Questions	Group 1 Responses	Group 2 Responses	Group 3 Responses
3. Is deforestation a serious concern for The Bahamas?	▪ Yes, it is a serious concern. ▪ Basically, it is caused by two things: one, in which we have very little control over, natural disasters (hurricanes); the other is development. ▪ There are areas where trees can be saved; but we are not doing enough to protect them. ▪ We need controls over development and cutting down trees. For example, in Inagua, a tree cannot be cut down without permission. This is the type of control that's needed to avoid a desert situation. If you remove a tree, for example, you must plant another somewhere else. ▪ This type of legislation (removal and transplantation of trees) could be put in place right away.	▪ Yes, it is a concern for The Bahamas. ▪ Population growth will cause a need for the use of more land for housing, commuting and work. ▪ There are social and health implications. We need to consider having recreational areas (green spaces). ▪ There is a lack of legislation to protect forestry. We need a forestry act or an act to protect watersheds.	▪ Bahamians do not have an appreciation for trees and their importance, as it relates to land. ▪ Some of the problems can be addressed through education. ▪ Education of land developers, contractors and possible landowners is needed.

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<i>National Awareness Seminar – Land Degradation in The Bahamas</i> Working Group Discussion Summary			
Day 1 WG Session Questions	Group 1 Responses	Group 2 Responses	Group 3 Responses
4. What are some of the obstacles to land reform?	▪ Political will ▪ Nepotism ▪ Lack of education ▪ (Weak) legislation ▪ Resources and accessibility ▪ Right of ownership	▪ Political will ▪ Clarification of land ownership or tenure	▪ Lack of planning and enforcement ▪ Corruption ▪ Political interference ▪ Political will

APPENDIX B – DISCUSSION SUMMARY FROM THE NAS

<i>National Awareness Seminar – Land Degradation in The Bahamas</i> Working Group Discussion Summary			
Day 1 WG Session Questions	Group 1 Responses	Group 2 Responses	Group 3 Responses
5. Have farming practices changed to meet the changing environment of The Bahamas?	▪ No, farming practices have not changed. ▪ The northern Bahamas has improved technology; the southern Bahamas is more antiquated. ▪ Island-specific farming would be effective. Certain islands focus on specific crops, according to their climate and situation. ▪ There is a difference in climate between the north and south. ▪ The north gets more rainfall, they have more freshwater reserves, and the soils differ from the soils in the south. ▪ The northern islands are also closer to the major markets. ▪ One thing that would be useful is the use of organics for compost, for example chicken manure, seaweed. The cost factor would be favourable, only need someplace to process it. In the long-term organics would get better, while the synthetics would be put into the ground and eaten away.	▪ In the Southern Bahamas, there has been no change. ▪ In the Northern Bahamas, there has been incorporation of modern technology and, in some cases, more environmentally friendly. ▪ The geographical difference is due to economics. The northern islands are stronger economically and have the resources. ▪ The northern farmers are more educated and versed in modern methods. The southern farmers are more set in the old, traditional ways of farming.	▪ Yes and no – in the northern Bahamas, there is more mechanized farming and introduction of new technologies; however, in New Providence land is being diverted from agricultural uses to residential use. ▪ Some felt that there was change to mechanized farming in the northern Bahamas; in the southern Bahamas there has not been any change and agriculture has declined. ▪ The north and west Bahamas has more of an infusion of foreign money and expertise. Foreign farmers are connected to/develop an affinity with Bahamian farmers and bringing additional markets as incentives.

APPENDIX B – DISCUSSION SUMMARY FROM THE NAS

<i>National Awareness Seminar – Land Degradation in The Bahamas</i> Working Group Discussion Summary			
Day 1 WG Session Questions	Group 1 Responses	Group 2 Responses	Group 3 Responses
6. Is food security a concern for Bahamians?	▪ Yes, we should definitely be concerned about food security. The latest hurricane was an example of a disaster of a scale that put us in a position where food cannot come into the country. We don't grow or produce enough to sustain ourselves; this is a major concern. For some people in Freeport, money was not a concern. They had money to buy food, but there was no food to buy. ▪ The way the world is now, who knows the way things will go. In times of disaster, developed countries tend to look after their own, leaving developing countries like ours on our own.	▪ Food security is a concern for Bahamians, although awareness is not high. ▪ People on a daily basis are concerned about the security of their food, in terms of whether there is enough in case of a disaster. ▪ Genetically modified foods could be a food security concern. ▪ The lack of support for agriculture in this country (\$1M is dedicated to agriculture, while \$1M is required to run a single farm), demonstrates that nationally, there is no (perceived) concern.	▪ Disasters cause us to be concerned about food. ▪ No real concern for providing food for ourselves.

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<i>National Awareness Seminar – Land Degradation in The Bahamas</i> Working Group Discussion Summary			
Day 1 WG Session Questions	Group 1 Responses	Group 2 Responses	Group 3 Responses
7. In general, are Bahamians aware of land degradation and are Bahamians willing to pay to address the problem?	▪ No, we are not aware of land degradation; nor are we willing to pay to address it because Bahamians do not see the benefits or the problems that it brings in the future. ▪ If we could show them, then maybe they (Bahamians) would be willing.	▪ No, we are not aware; however it is in the back of our conscious. ▪ Bahamians are definitely not willing to pay to address the problem.	▪ No, we are not aware and we are not willing to pay. We do not believe Bahamians are willing to pay taxes for land reform.
8. Is there a need for new legislation or can policy alone address these issues? 9. If new legislation is required, specify what it should address?	▪ There is a need for new legislation. ▪ We also need stiffer enforcement of the new legislation. ▪ We also need education that showed people incentives and benefits. ▪ Giving people a sense of ownership, responsibility and sense of pride, with regards to the environment, is important. ▪ If all else fails, issue stiff fines.	▪ There needs to be a review of existing legislation. Amendments may be needed. ▪ There is also a need for new legislation, such as water resources act, forestry act. ▪ We also need some policies to deal with poor management, enforcement and land-use planning. ▪ We need more substantial penalties.	▪ There is a need for binding legislation, education of the population and enforcement. ▪ We need comprehensive laws that deal with land degradation. ▪ Education to address principles of protection and control (i.e., legislation has to address principles of the NAP, with protections put in place on how laws will be enforced, as well as penalties). ▪ We need the political will to enforce the legislation.

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<i>National Awareness Seminar – Land Degradation in The Bahamas</i> Working Group Discussion Summary			
Day 2 WG Session 1 Questions	Group 1 Responses	Group 2 Responses	Group 3 Responses
1. How would you define drought in The Bahamas?	Drought is the lack of rainfall necessary to sustain the water demands of the country.	Drought is absence of rainfall over a period of time.	A definition for drought should include these factors: effects (of drought), change in water supply, time, change in environment.
2. Is climate change or development having the greatest impact on water availability?	Development has a greater impact because (impacts of) climate change in some cases is a result of development.	Development, more so than climate change has the greatest impact on water availability. Climate change takes place over a period of thousands of years. Saltwater intrusion, poor construction, etc., as a result of development, degrades the land.	Climate change has long-term impacts; intermediate and short-term impacts are due to development. Variability exists between the northern and southern islands, when considering the impacts of climate change and development.
3. Are Bahamians making wise consumer choices (landscaping/ construction/ choice of land for homes/drought)?	No. This is apparent due to the inadequate homes constructed, frequent use of exotics in landscaping (rather than native species), construction of homes in wetland and beach areas, water consumption and (lack of) water conservation.	No. Poor choices are made due to lack of awareness or education.	No, for example, downtown Abaco is a concrete city, lacking guidelines or legislation to guide Bahamians. Guidelines such as appropriate landscaping, energy-saving technology, water-saving technology, green-space design, duty-free option (as incentive) are needed.

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<i>National Awareness Seminar – Land Degradation in The Bahamas</i> Working Group Discussion Summary			
Day 2 WG Session 1 Questions	Group 1 Responses	Group 2 Responses	Group 3 Responses
4. How are we contributing to biodiversity loss and the effects of climate change?	Activities affecting biodiversity include alteration of natural habitats (both aquatic and terrestrial), pollution of the environment (e.g., carbon dioxide, corrosives, water, pesticides), inappropriate/bad agricultural practices.	We contribute by clearing land, deforestation, uncontrolled development, etc.	- We contribute through the importation of non-native species (invasive species), massive land clearing, no fruit-bearing trees (food for wildlife), genetically/chemically-modified plants (e.g., pigmy hibiscus). - Also, biodiversity (in wellfield areas) is maintained through the protection of wellfield areas.
5. In general, are Bahamians aware of biodiversity loss/ climate change/ water shortage issues? Are they willing to pay to address these issues?	No, however they are inconvenienced by the present water shortage. There is a need for more education and community awareness.	Generally, they may be aware of the changes or symptoms, but ignorant of the causes. We think they would not be willing to pay (depending on level of knowledge).	- No. More intense educational programmes, with more media coverage, are needed. - Bahamians are not willing to pay to address the issues.
6. Are Bahamians willing to make the necessary changes to address these issues?	No. Bahamians are not willing to give up/ change habits or lifestyle.	Yes, if they have the knowledge (recommend that a survey be done).	Currently no, however, if information was provided, Bahamians may be willing to change.

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<i>National Awareness Seminar – Land Degradation in The Bahamas</i> Working Group Discussion Summary			
Day 2 WG Session 1 Questions	Group 1 Responses	Group 2 Responses	Group 3 Responses
7. Is there a need for new legislation or can policy alone address these issues? 8. If new legislation is required, what should it address?	- There is a need for some new legislation, but this and previous legislation must be enforced. - There is a need to bring legislation under one umbrella, and enforcement of legislation.	- Yes. They should be made specific. Legislation will enhance the importance of these issues. There is a need for firm policies. All policies should be underpinned by legislation. The policies should be firm and followed. - It should address climate change (already drafted and addresses issues, including land degradation). The National Action Programme should help frame legislation.	Amalgamation and revision of existing laws all under a central agency or department is needed.
9. Is there a link between standard of living and land degradation/ drought in The Bahamas?	- Yes. Demands are not met during drought. - No. Standard of living is linked to ability to provide necessary subsistence. This is not linked to land degradation/ drought, in The Bahamas.	Yes, there are linkages. If land degradation is high, it reflects a lower standard of living.	No. People are not leaving the islands as a result of land degradation; they are migrating to New Providence because the economic opportunities are better.

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<i>National Awareness Seminar – Land Degradation in The Bahamas</i> Working Group Discussion Summary			
Day 2 WG Session 2 Questions	Group 1 Responses	Group 2 Responses	Group 3 Responses
1. Who should be involved in combating drought and land degradation? 2. Identify possible roles and responsibilities of these stakeholders.	▪ Everybody should be working together to make the NAP work. ▪ Industrialists should be responsible for implementing best environmental practices. Educators should disseminate information and awareness. Unions, church groups, NGOs, community leaders, civil society, etc. should build awareness. Government, parliamentarians create legislation. Civil servants should enforce the legislation. Environmental officers should carry out inspections and issue warrants. “The man on the street” should abide by the legislation. Farmers and fishermen should comply and inform of non-compliance.	▪ Government, educators, media, civic groups, land developers, enforcement agencies, farmers, utilities, engineers, all citizens, environmental health services should be involved. ▪ Government bureaucracy should enact laws and policy. The political administration should create the law. Educators and media should create awareness. Civic groups should be activists, create awareness and participate in monitoring. Land developers should obey the laws, cooperate with the Government, partner with the Government, and act as environmental stewards. Enforcement agencies will enforce, without prejudice.	▪ Those who should be involved include Met Office, DEHS, WSC, NGOs, the public (which includes farmers, teachers, local government, news media), Dept. of Agriculture, BEST Commission, Ministry of Tourism, Dept. Lands & Surveys, AG Office, Ministry of Works, BNGIS, Ministry of Education. ▪ Those responsible for education include NGOs, ZNS, Ministry of Education, teachers, Ministry of Tourism. ▪ Those responsible for policy include Ministers and Local Government. ▪ Those responsible for information include Met Office, WSC, BNGIS, Dept. of Lands & Surveys, BEST Commission, Ministry of Agriculture, Fisheries & Local Government, AG Office.

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<i>National Awareness Seminar – Land Degradation in The Bahamas</i> Working Group Discussion Summary			
Day 2 WG Session 2 Questions	Group 1 Responses	Group 2 Responses	Group 3 Responses
3. What should be the main focus of the NAP? Identify the issues and priorities of The Bahamas NAP.	▪ The main focus of the NAP should be to reverse the present trends and to implement, monitor, evaluate and move toward practices that are beneficial to the environment. ▪ The issues to address include indiscriminate land clearing, use of exotic rather than native species, invasive species, pollution and contamination of water resources, slash-and-burn farming method, inappropriate building locations, lack of crop rotation, wetland destruction. ▪ The priorities should include the review and amendment of existing legislation, the enforcement of legislation, education and public relations.	▪ Education, legislation and research should be the main focus. The NAP should identify sensitive areas and restore protected areas. (A survey should be done.)	▪ The priorities of the NAP should be to identify and classify land, develop a land-use plan, develop educational tools (books, guidelines, help kits), develop restoration activities and mitigation, develop implementation time line. ▪ The main focus should be sustainable development (economic, social and environmental), avoidance of impacted resources (water, biodiversity), identification of suitable developable areas, agricultural practices, enforcement of existing legislation.

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<i>National Awareness Seminar – Land Degradation in The Bahamas</i> Working Group Discussion Summary			
Day 2 WG Session 2 Questions	Group 1 Responses	Group 2 Responses	Group 3 Responses
4. How should the issues and priorities be addressed in the NAP? Identify possible mechanisms and instruments of implementation.	- Form a stakeholders committee, which is paid to fulfill its mandate. - The mandate would include development of school programmes, print and electronic media.	They should be addressed through new agencies and partnerships. Possible instruments include public forums, mass media and incentives/ penalties.	- Possible instruments of implementation through education include television programmes, radio talk shows, national days. - Other mechanisms include public input/ consultation, policy/ legislation, enforcement, change in revenue system.
5. What mechanisms should be implemented to ensure public participation? What forms of public awareness programs should be in the NAP?	Possible mechanisms include town meetings and incentive programmes.	Possible mechanisms include seminars, symposiums, town meetings, publications/ periodicals.	- Possible mechanisms for public participation include public meetings, public commercials, email options. - Possible forms of public awareness programmes include television, radio, national paper section (rotation of articles from different government agencies).

APPENDIX C

PROJECT PROPOSALS

APPENDIX C – PROJECT PROPOSALS

Project 1 – Freshwater Resource National Project Proposal

Project name:	Vulnerability Study of Critical Freshwater Resources in North Andros and New Providence						
Project location:	North Andros Well fields, 2 New Providence Area Well fields						
Project linkage to national priorities, action plans, and programmes	After storm surge associated with Hurricane Frances in 2004, chlorides increase in the North Andros Well fields (from 1 300 to 15 000 mg/L chlorides). This affected water supplies in Andros and on New Providence. Understanding the extent of the vulnerability facilitates establishing preparatory and protection measures. It also establishes a methodology that may be adaptable to analysing conditions in the Family Islands.						
Project rationale and objectives:	To evaluate the overall impact to the freshwater resources that are subject to seawater inundation and their sustainability						
Expected duration of project:	6 months to 2 years						
Expected outcomes:	Create areas for research and monitoring of freshwater resources while duly protecting plant and animal habitats; Recharge of freshwater resource areas						
Planned activities to achieve outcomes:	South – south cooperation of study of groundwater areas; Protection of areas from potential development						
Planned monitoring programs to measure activities/outcomes:	IWCAM Project; GEF PDFA Project; Water Level Monitoring; Recharge and Water Quality						
Potential stakeholders:	BEST Commission; Water and Sewerage Corporation; Lands and Survey Department; Department of Agriculture (Forestry Unit); Bahamas National Trust; The Nature Conservancy						
Information on proposed executing agency:	BEST Commission – environmental agency, under the Ministry of Health and Environment Water and Sewerage Corporation – public utility corporation						
Estimated budget:	<table> <tr> <td>GEF</td><td>\$ 50,000</td></tr> <tr> <td>Government</td><td>\$ 50,000</td></tr> <tr> <td>Total</td><td>\$ 100,000</td></tr> </table>	GEF	\$ 50,000	Government	\$ 50,000	Total	\$ 100,000
GEF	\$ 50,000						
Government	\$ 50,000						
Total	\$ 100,000						

APPENDIX C – PROJECT PROPOSALS

Project 2 – Freshwater Resource Sub-regional Project Proposal

Project name: Management of Risks to Sustainability of Coastal Aquifers in the Caribbean SIDS (MoRSCA)	
Information on project proponents: Governments of Antigua & Barbuda, The Bahamas, Barbados, Belize, Cuba, Jamaica, Trinidad & Tobago; UNEP	
Project linkage to national priorities, action plans, and programmes: By identifying risk management options, The Bahamas is better equipped to protect its most vulnerable coastal areas, which is a major step towards preventing degradation of its limited resources. The execution of this project will also identify provisions needed by the National Co-ordinating Committee in executing its duties.	
Project rationale and objectives: Developing methodologies to identify the risks to the environmental integrity of coastal aquifer systems; Delivering tools to monitor the hazards associated with those risks in selected aquifer types; Building stakeholder capacity and disseminating knowledge to better manage the risks, at economically viable levels for the Caribbean SIDS.	
Duration of Project: 4 months	
Expected Outcomes: Establishment of a collaborating network of institutions with the capacity to assess the risks to their coastal aquifer systems and ecosystems; Identification of key stakeholders and the technical tools and policy instruments needed for sound management of threats and building resilience to these threats; Development of investment strategies to counteract those environmental threats that affect the sustainability of the natural resources.	
Planned activities to achieve outcome: Macro level inventory of the Caribbean coastal aquifers would be conducted, including classification and susceptibility to impacts of risks and analysis of other volcanic islands; Risk analysis for those coast aquifer systems perceived to be at threat and a consequent series of management tools and investment strategies would be developed for those systems; Establishment of a jointly operated monitoring network through the involvement of the key stakeholders in the process, specifically, those institutions concerned with the use of the resources in the aquifer system would be networked; Development of locally relevant, but regionally replicable, coastal aquifer system management and operational guidelines. Under the MSP either the most appropriate single activity or a combination of complementary activities within a key coastal aquifer system would be developed and implemented.	
Planned monitoring programmes to measure activities/outcomes: IWCAM Program; GEO Regional Program	
Potential Stakeholders: Antigua & Barbuda; The Bahamas; Barbados; Belize; Cuba; Jamaica; Trinidad & Tobago.	
Information on proposed executing agency: UNEP and representatives identified by the governments of the participating Caribbean SIDS	
Estimated budget:	
GEF:	\$ 50,000
Government:	\$ 50,000
Total	\$100,000

APPENDIX C – PROJECT PROPOSALS

Project 3 – Sustainable Tourism Project Proposal

Project name: Development of “Green Space”
Information on project proponents: The Sustainable Tourism Development Unit, The Bahamas Ministry of Tourism
Project linkage to national priorities, action plans, and programmes: The Bahamas is committed to the sustainable development of its major industry – tourism. As a coastal destination, The Bahamas undertook a national initiative in April 2005 to educate all stakeholders of the importance of our coastal resources to the socio-economic development of our nation. In the public awareness campaign that was developed, five threats to the integrity of our coastal zones were identified. The issue of “land degradation” was among one of the five threats identified. Moreover, The Bahamas recognises and is committed to protecting its biological diversity through sustainable land use.
Project rationale and objectives: The objective is to increase awareness of the challenges The Bahamas faces with respect to the issues of land degradation and biological diversity loss, and their consequences to sustainable development. This includes encouraging and securing commitment from developers that a certain percentage of the physical land area of their development is maintained as “green space”, specifically an area of indigenous flora and fauna.
Duration of Project: 1 year
Expected Outcomes: Clear recommendations to achieve the stated objectives; Enhanced awareness among stakeholders and the public of land degradation; Recognition and appreciation of the value of biodiversity sustainable land use to socio-economic development; Reduction in imported flora to replace indigenous species; Increase in the percentage of “green space” in all tourism development sites.
Planned activities to achieve outcome: National workshops to discuss challenges and possible solutions; Outlining of recommendations and action plan to promote green spaces in tourism development proposals, as well as urban development projects; Development and launch of an awareness campaign to sensitize the general public and potential investors to the issues.
Planned monitoring programmes to measure activities/outcomes:
Potential Stakeholders: Department of Physical Planning; Ministry of Works, Building Control; Ministry of Tourism, Sustainable Tourism Development Unit; Bahamas Real Estate Association; Ministry of Financial Services and Investment; BEST Commission; Bahamas National Trust.
Information on proposed executing agency: The Sustainable Tourism Development Unit, The Bahamas Ministry of Tourism
Estimated budget: \$ 50,000



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