

WORKING DRAFT

Barbados National Action Programme to Combat Desertification and Land Degradation, and to Mitigate Against the Effects of Desertification, Land Degradation and Drought



**United Nations Convention to Combat Desertification in Those Countries
Experiencing Serious Drought and/ or Desertification, Particularly in Africa**

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**For: The Government of Barbados, Ministry of Physical Development and
Environment**

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Definition of Terms Used

Aquifer. A rock that will hold water. Bore holes can be drilled into the rock to access the water.

Biodiversity. The totality of genes, species and ecosystems in a region.

Buffer Zones. Vegetated strips of land that are intended to screen ecosystems from impacts.

Community. A geographical place where people live and work.

Conservation. The management of human use of the biosphere so that it may yield the greatest sustainable benefit to current generations while maintaining its potential to meet the needs and aspirations of future generations.

Desertification. The degradation of land in arid, semi-arid and dry sub-humid zones. Desertification is due to the combined effects of climatic variations and human activities.

Drought. A long, continuous period of dry weather. In Barbados a drought year is defined as a year in which the annual rainfall recorded is less than 42 inches (1100 mm).

Ecology. The scientific study of the interactions of living things and their environment.

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

Ecotourism. Travel undertaken to witness sites or regions of unique natural or ecological quality or the provision of services to facilitate such travel.

Environmental Impact Assessment. Process by which the potential benefits and negative impacts of proposed projects are evaluated as an integral part of planning the project, alternatives are analysed, mitigation measures identified and the general public is given opportunity to comment.

Fauna. All of the animals found in a given area.

Flora. All of the plants found in a given area.

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

Gully. An incised water-worn channel. Particularly common in sub-humid and semi-arid regions.

Habitat. The environment in which an organism lives. Habitat can also refer to organisms and physical environment in a particular place.

Indigenous/ Native Species. Plants, animals, fungi, and micro-organisms that occur naturally in a given area.

Intellectual Property Rights (IPR). A right enabling an inventor to exclude imitators from the market for a limited time.

Land Degradation. The wearing down of the land surface and an attendant loss of productivity as a result of natural or anthropogenic factors.

Non-governmental Organisation (NGO). A non-profit group or association organised outside of institutionalised political structures to realise particular social objectives (such

as environmental protection) or serve particular constituencies (such as indigenous people). NGO activities range from research, information distribution, training, local organisation and community service to legal advocacy, lobbying for legislative change, and civil disobedience. NGO's range in size from small groups within a particular community to huge membership groups with a national or international scope.

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

Saline Intrusion. The flow of salt or brackish water into areas previously occupied by freshwater. Generally as a result of over-abstraction of freshwater.

Sustainable Development. Development that meets the needs and aspirations of the current generation without compromising the ability of future generations to meet their own needs and aspirations.

1. Introduction

The global impacts of desertification and land degradation prompted the United Nations Organization to adopt the United Nations Convention to Combat Desertification (CCD) in 1994. Barbados ratified the CCD on May 14th, 1997. Under the CCD all parties to the Convention are expected to prepare and implement a National Action Programme (NAP).

Barbados is a small country with a high population density and a long history of combating land degradation. The natural vegetative cover of Barbados consisted primarily of tropical forests, with grassland areas in the northern and south-eastern regions of the island. The island was settled by Europeans in 1627 and by 1657 it was estimated that as much as 80% of the traditional vegetative cover was removed to facilitate large scale commercial agriculture.

Land degradation in Barbados has been accelerated by a number of natural and anthropogenic factors including geology, climate, agricultural practices and settlement patterns. Barbados has been tackling land degradation since the 1680's, with some success. The island is now taking a more holistic approach, founded upon the principles of sustainable development as Barbados has adopted sustainable development as the concept governing natural resource use. The NAP is being developed out of this multi-sectoral approach.

The NAP delineates the critical activities to comprehensively and holistically address land degradation in the Barbadian context. To facilitate a greater understanding of the situation the document presents a definition of key terms, an understanding of the Barbadian environment and land degradation and drought, the role of the CCD, an understanding of efforts to date, a look at some successes, a view of some of the challenges ahead and proposes a way forward.

2. The Barbadian Environment

2.1 Location and Land Area

Barbados is the most easterly of the islands of the Caribbean, located at 13 degrees north, 59 degrees west, approximately 100 miles from the nearest landmass, against prevailing winds and currents. The island is (34) km long and (23) km wide with a total land area of approximately (432) square kilometres and an Exclusive Economic Zone (EEZ) of 167, 000 square kilometres.



2.2 Climate

The climate is classified as dry sub-humid with temperatures between 20 and 30 degrees celsius. There is a distinct dry season from December to May and a wet season from June to November. The average annual rainfall is about 50 inches (1254 mm) in the lower elevations and about 66 inches (1650 mm) in higher elevations. Most locations receive between 56 and 60 inches of rainfall annually. The island lies on the edge of the Atlantic storm zone and apart from occasional coastal damage from storm systems, it has not been affected by a major hurricane system since Hurricane Allen in 1980, and has not been struck directly since Hurricane Janet struck the island in 1955.

2.3 Geologic Structure and Topography

The island is divided into two distinct geologic regions. Eighty-six percent of the island is made up of a karst landscape of deeply fractured and gullied limestone laid down in a series of limestone terraces, deeply incised by numerous gullies and underlain by a complex underground cave system. The remaining land area is comprised of the sedimentary deposits of the Scotland Series. These layers are highly folded and faulted and are very susceptible to erosion. Large scale land slippage is common in the Scotland District.

In spite of the above the island is relatively flat, with the highest point being Mount Hillaby at 336m (1,104 ft). There is little surface water on the island, with small surface streams found primarily in the Scotland District. The island is therefore almost completely dependent on groundwater abstracted from the aquifer underlying the island.

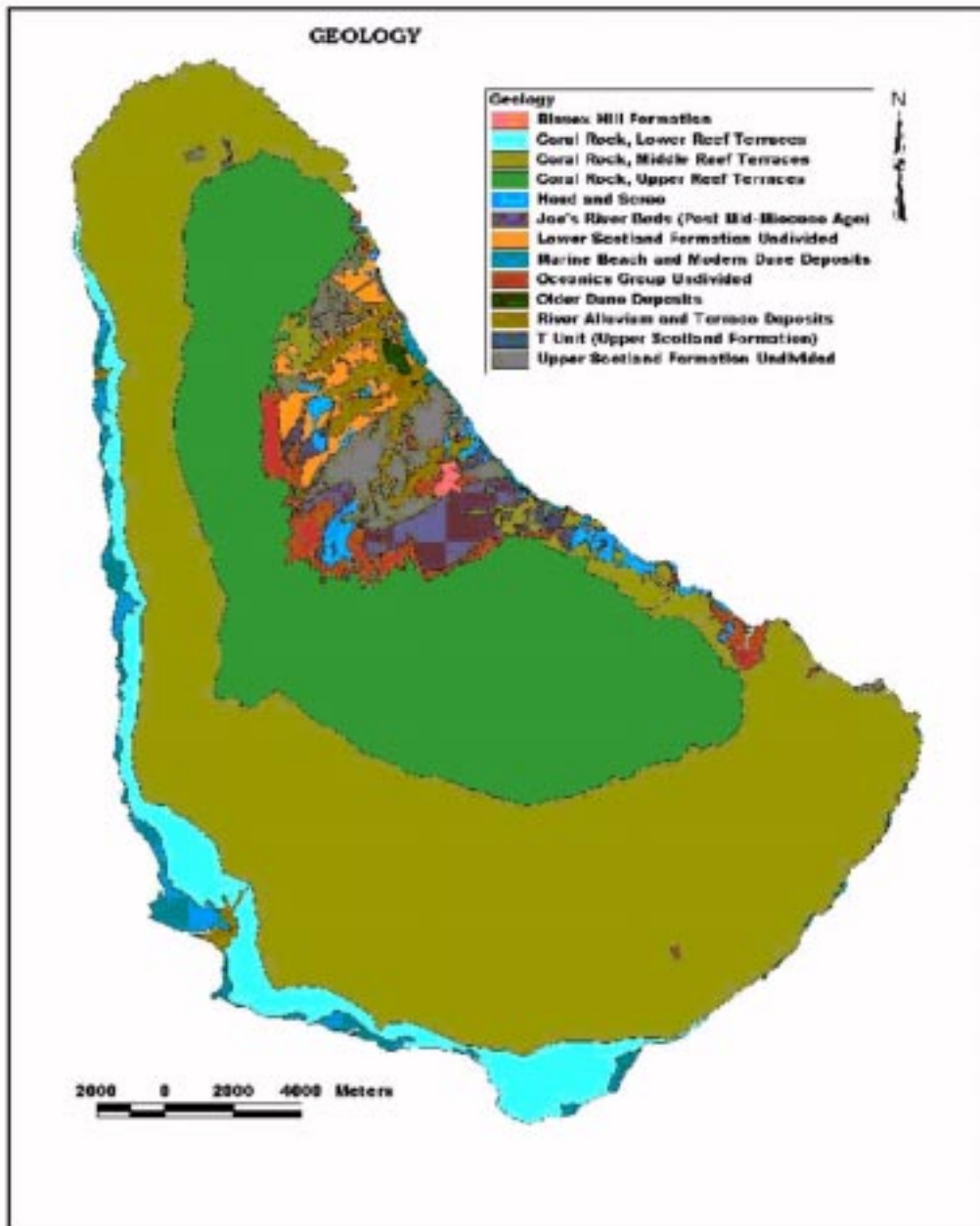


Figure 1. The Geology of Barbados

2.4 Human Settlement

Barbados has been settled by Amerindian peoples and subsequently by Europeans, who displaced the Amerindians and established a plantation agricultural system. The system was based on a slave labour system and peoples were brought from the African continent to work as slaves on the plantations of Barbados. Descendants of the former slaves continue to represent the predominant population of the country. In 1998 the population stood at approximately 266, 800 persons, comprising 48.1 percent males and 51.9 percent females. Life expectancy at birth for males and females in Barbados is 72.9 and 77.4 years, respectively. The average rate for population growth was 0.3% between 1980 and 1999.

The population density in the Scotland District has always been lower than in other parts of the country, and the population of the Scotland District has continued to decline steadily over the last decade. This trend is expected to continue over the foreseeable future.

Figure 2. Parish Population and Population Projections

Parish	Population				Change 1997-2010
	1990	1997	(by year) 2005	2010	
St. Michael	97, 516	95, 600	92, 300	87, 900	- 7, 700
Christ Church	47, 050	51, 300	55, 900	60, 000	8, 700
St. George	17, 905	18, 100	18, 100	17, 800	- 300
St. Philip	20, 540	21, 700	22, 800	23, 600	1, 900
* St. John	10, 206	9, 900	9, 400	8, 800	- 1, 100
St. James	21, 000	24, 200	28, 100	32, 100	7, 900
St. Thomas	11, 590	11, 800	11, 900	11, 800	0
* St. Joseph	7, 619	7, 400	7, 100	6, 700	- 700
* St. Andrew	6, 346	6, 000	5, 600	5, 100	- 900
St. Peter	11, 263	11, 300	11, 200	10, 900	- 400
St. Lucy	9, 455	9, 600	9, 600	9, 500	- 100
Barbados	260, 491	266, 900	272, 000	274, 200	7, 300

* Parish with a large portion of land area comprised of the Scotland Series

2.5 Potable Water

Barbados' freshwater supply is primarily a function of the climate and the physical conditions. Groundwater accounts for for the largest proportion of the island's water resources at 79% and for 98.6% of the public water supply.

Barbados has consistently been ranked among the ten most water scarce countries in the world. An analysis of 47 years of data has indicated that the annual renewable freshwater resources of Barbados stand at 225, 410 m³ or 49.59 mgd (million gallons per day). These figures fall well below the 1, 000 m³ per capita set internationally as the limit below which a country is classified as "water scarce". A 1978 study estimated that, under an average annual rainfall conditions of 60 inches, a total of 54.79 mgd is available and 34.37 mgd in a drought year.

Figure 3. Water Scarce Countries

COUNTRY	RENEWABLE WATER RESOURCE
Djibouti	23 m ³ / capita/ year
Kuwait	75 m ³ / capita/ year
Barbados	300 m ³ / capita/ year
Saudi Arabia	306 m ³ / capita/ year
Jordan	327 m ³ / capita/ year
Isreal	461 m ³ / capita/ year
Tunisia	540 m ³ / capita/ year
Kenya	636 m ³ / capita/ year
Algeria	689 m ³ / capita/ year
Somalia	980 m ³ / capita/ year

2.6 Socio-Economic Factors

Barbados boasts one of the highest levels of education in the world with an estimated literacy rate of 95 %. Primary and secondary education is mandatory and free. Tertiary education is not mandatory, but is free.

Barbados also boasts an excellent health care system based on the principal of universal access to health care by free delivery of services to all sectors of the population, covering medical, dental and ophthalmic care.

Barbados has an open economy with a very narrow range of exports, and a heavy dependence on imported goods. Even after the decline of the slave trade and the abolition of slavery agricultural production continued to dominate the economy of Barbados until well into the twentieth century. The importance of agriculture to the economy has however declined since the 1960's, but remains important. There is also a viable textile sector and the offshore sector continues to expand.

The expansion of the tourism sector has however been the primary engine of economic growth in Barbados over the last few decades. This trend is expected to continue over the foreseeable future. The recent worldwide growth in eco-tourism and the establishment of a Barbados National Park System would both seem to support a shift to a more sustainable paradigm with respect to further development of the tourism infrastructure on the island, but would also indicate more use of the more fragile ecosystems represented by the Scotland District and the gullies of Barbados.

3. The State of Land Degradation in Barbados

Structurally Barbados can be compared to a pie which has had a small portion of the crust removed. Over the majority of the island the coral limestone cap remains in tact, however over the Scotland District the limestone cap has been eroded away exposing the more unstable rocks and soils. The steep, highly folded and faulted slopes are comprised mainly of sandstones, shales and clays, with some occurrences of volcanic ash and Joes River muds, oil deposits and saline soils. The effects of the trade winds and the seasonal nature of the rainfall in the region combine to make the area highly unstable and susceptible to erosion and large scale land slippage.

Figure 4. Soil Erosion in The Scotland District
(tons/ ha/ year) (24 m³ plots)

Bare Plots				
Year	Clays	Loams	Muds	Sands
1985-1986	436.1	89.56	26.86	9.51
1986-1987	760.07	359.65	94.01	97.20
1987-1988	223.13	175.24	39.24	22.28
1988-1989	158.6	158.2	130.51	46.12
1989-1990	20.05	101.46	3.3	2.43
Grassed Plots				
1985-1986	67.19	33.63	0.06	0.01
1986-1987	7.45	2.2	0.58	2.35
1987-1988	10.18	0.84	0.05	0.53
1988-1989	42.63	1.63	0.67	1.56
1989-1990	3.19	0.18	0.26	1.05

The large scale clearance of the natural vegetation, abstraction of mineral resources and poor farming practices have along with settlements served only to exacerbate the problem of land degradation experienced in the area. Land degradation in Barbados has

been recorded since the 1600's and is contributed to by the natural and anthropogenic factors referred to. These include:-

1) Natural

- a) Geology
 - i. Soils
 - ii. Slopes
 - iii. Strata Orientation

- b) Climate
 - i. Rainfall

2) Anthropogenic

- a) Mining
- b) Culture
- c) National Economy
- d) Settlement
- e) Deforestation
- f) Agriculture
- g) Grazing/ Animal husbandry
- h) Fire

Over the last 350 years efforts to combat land degradation have centred on the Scotland District, however in recent years more focus has been brought to bear on the issue of soil loss and land degradation in the limestone areas of the country as well. Changing land use practices and the application of inappropriate agricultural techniques have also resulted in significant and visible loss of soils in the limestone areas of the country.

The National Action Programme will initially focus on addressing land degradation in the Scotland District as the most critically affected area, before expanding to offer full island

coverage. This decision does not preclude the pursuit of preventative and mitigative measures outside of the Scotland District at any stage.

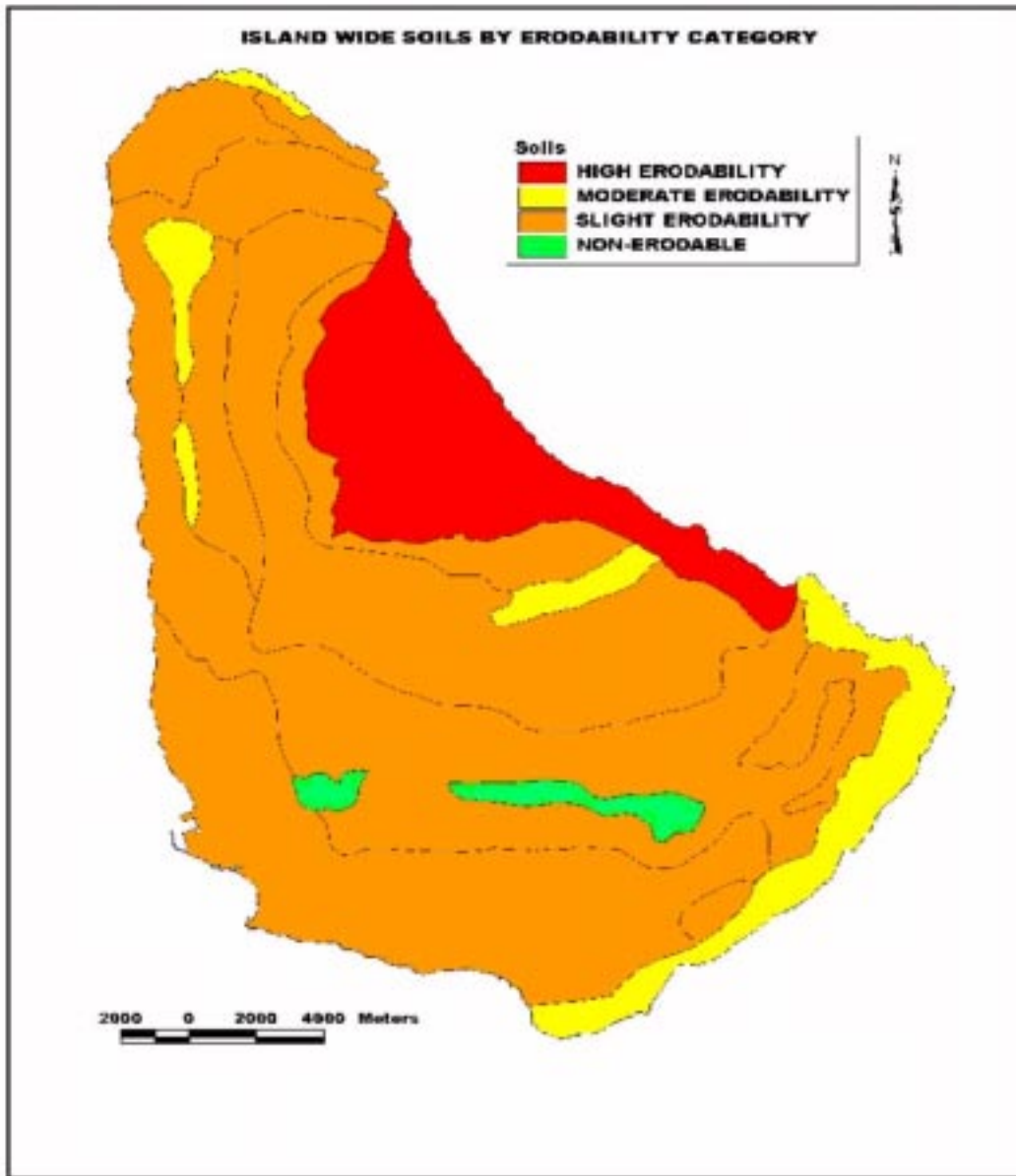


Figure 5. Soil Erodability in Barbados

4. The State of Drought in Barbados

Barbados is among one of the ten most water scarce countries in the world, and as a result has a long history of dealing with drought conditions. The frequency of drought in Barbados is about 3 in 10 years and has been related to El Nino occurrences. In recent years drought has been recorded in 1982, 1986, 1993, 1994 and 1997.

In Barbados domestic fresh water, which is pumped from underground aquifers, is dependent on rainfall recharge to those aquifers. Rainfall for one rainy season becomes available for abstraction the following year. Drought and prolonged over-abstraction reduces the amount available for the next year and increases the chances of saline intrusion.

Figure 6. Available Water Resources

Source	1978 Study				1996 Study	
	Average Rainfall Conditions (60")		1 in 15 Design Drought Year		Average Rainfall Conditions (56")	
	m3 / day	(Mgd)	m3 / day	(Mgd)	m3 / day	(Mgd)
Groundwater	205, 773	45.27	137, 183	30.18	202, 591	44.57
Surfacewater	32, 682	7.19	13, 136	2.89	15, 909	3.50
Springwater	8, 182	1.80	5, 909	1.30	5, 455	1.20
Wastewater*					30, 018	6.60
Runoff	2, 409	0.53	0.00	0.00	1, 455	0.32
Total	249, 046	54.79	156, 227	34.37	225, 410	49.59

Mgd = Imperial million gallons per day

* = From Sewerage Systems. Not considered in the 1978 Study

Domestic Users (including unaccounted-for-water) account for more than 60% of the total water abstracted. Drought therefore impacts on these users first.

Figure 7. Water Usage (1996) and Projected Water Demand for 2016

Use by Category	Consumption 1996			Demand 2016	
	m3 / day	(Mgd)	%	m3 / day	(Mgd)
Domestic (metered & unmetered)	48, 681	10.71	22.00	51, 337	11.29
Industrial and Commercial	16, 955	3.73	7.66	17, 460	3.84
Hotels and Ships	5, 200	1.14	2.34	10, 821	2.38
Agriculture	52, 091	11.46	23.54	63, 545	13.98
Golf Course Irrigation	2, 458	0.54	1.11	14, 182	3.12
Unaccounted-for-water	95, 973	21.11	43.35	30, 282	6.66
Total Consumption	221, 358	48.69	100.00	187, 627	41.27

5. Rationale for Barbados' Commitment to the United Nations Convention to Combat Desertification

On May 14th, 1997 Barbados signed the United Nations Convention to Combat Desertification. The Convention came into force for Barbados on 14th August, 1997.

The reasons for Barbados taking the step to sign the Convention are laid out below:

- i. To support other countries, especially those in Africa experiencing the effects of severe drought and desertification.
- ii. To participate in the development of technologies to address land degradation and mitigate against the impacts of land degradation and drought. It is anticipated that Barbados would share experiences and technological advancements with other affected countries for the benefit of all.
- iii. To increase global awareness of the threat which desertification poses to Small Island Developing States (SIDS).
- iv. To access funding to assist with efforts at the national, local and community level to address desertification, land degradation and drought.
- v. Increase local awareness of the problems of desertification, land degradation and drought.

As a result of a long history of combatting land degradation as a nation, Barbados has a clear understanding of the need for the CCD and remains committed to the process at the national, regional and international level.

At the National level policies and programmes continue to be put in place to address desertification, land degradation and drought issues. The activities go well beyond what is required by the Convention. The addressing of these issues are seen as critical as Barbados continues along the path to sustainability. In addition Barbados has convened a

National Consultation on Desertification, Land Degradation and Drought, the proceedings of which have informed the development of the National Action Programme.

At the Sub-Regional level Barbados has signed on to participate in the project for Conserving Biodiversity and Preventing Land Degradation in Small Island Developing States. Barbados also continues to be involved in the development of an agreement between the Secretariat of the United Nations Convention to Combat Desertification and the Secretariat of the Caribbean Community (CARICOM). At the Regional level Barbados continues to contribute at regional meetings and twice has made presentations at the Regional Meetings of the Latin America and Caribbean region.

At the International level Barbados continues to represent the issues of SIDS and those of the Latin America and Caribbean region, and to be involved in activities under the Convention.

6. Commitments to Other International Conventions of Relevance to the Fight to Combat Desertification and Land Degradation

Barbados has signed and ratified a number of multi-lateral environmental agreements of relevance to the fight to combat land degradation. These are outlined in the table below

Figure 8. Commitments to Related Multi-Lateral Environmental Agreements

Convention	Date Signed	Responsible Ministry & Executing Agency
United Nations Convention on Biological Diversity (CBD)	Adopted 5 th June 1992, Rio de Janeiro Entered into force 29 th December 1993 Barbados became a party 10 December 1993	Ministry of Physical Development and the Environment
The Convention on International Trade in Endangered Species of Flora and Fauna (CITES)	Adopted 3 rd March 1973, Washington Entered into force on 1 st July 1975 Barbados became a party 9 th December 1992	Ministry of Physical Development and the Environment
United Nations Framework Convention on Climate Change (UNFCCC)	Adopted 9 th May 1992, New York Barbados became a party 23 rd March 1994	Ministry of Physical Development and the Environment
The Vienna Convention for the Protection of the Ozone Layer	Barbados acceded on 20 th July 1994	Ministry of Physical Development and the Environment
Food and Agriculture Organization (FAO) Compliance Agreement	Barbados became a party on October 26, 2000	Ministry of Agriculture and Rural Development

7. Existing Legislation

Barbados has no current legislation designed to specifically address commitments under the Convention to Combat Desertification, however a number of articles of legislation exist which directly or indirectly address land degradation. The most significant pieces of legislation providing statutory protection and provision for mitigating activities to combat land degradation are described in the following section.

The Constitution provides for the protection from deprivation of private property. The imposition of planning restrictions that deprive land of its value could result in claims for compensation. However, **Section 16** of the Constitution allows for the confiscation of property in circumstances where the environment is threatened.

The Land Acquisition Act (cap. 228) makes provision for the acquisition of land for public purposes, such as the development of parks and caves.

The Prevention of Floods Act (cap. 235) provides for flood prevention works and the designation of special flood areas.

The Town and Country Planning Act (cap. 240) makes provision for the orderly and progressive development of land. The Act provides for the preparation of a Physical Development Plan which allows for the allocation of land for parks and open spaces; the preservation of places of archaeological, architecture, artistic and/ or historical interest; preservation and/ or protection of forests, woods, trees, shrubs, plants and flowers; regulation and control of the deposition of materials on the land or into the sea. The Act also has provisions that influence land use relative to agriculture and forestry.

The Barbados Agricultural Development and Marketing Corporation Act (cap. 254) establishes the BADMC with responsibility for the stimulation and development of agriculture on lands vested in the Corporation. A large proportion of the lands vested in the BADMC lie in the Scotland District.

The Petroleum Winning Operations Act (cap. 281) regulates the exploration and exploitation of oil resources.

The Mines Regulation Act (cap. 350) regulates the operation of mines.

The Quarries Act (cap. 353) regulates the operation of quarries.

The Irrigation Act (cap. 263) provides for the development of irrigation systems on land and related purposes.

The Cultivation of Trees Act (cap. 390) promotes the cultivation of specific species of trees through the financial incentive of receiving a tax contribution payment equivalent to the amount of taxes payable in respect of the land so cultivated, the payment of a fruit tree subsidy or subsidy payment.

The National Conservation Commission Act (cap. 393) establishes the National Conservation Commission and provides for the maintenance of parks, beaches and open spaces.

The Soil Conservation (Scotland District) Act (cap. 396) restricts the use to which land can be put in the Scotland District.

The Preservation of Trees Act (cap. 397) makes the killing of any tree one metre or more in circumference an offence unless a permit has been obtained from the Chief Town Planner. The Act also allows the Chief Town Planner to require the owner of vacant land

or land adjoining or near a public road to plant or replant trees and to clear land of weeds or overgrown grass.

The Coastal Zone Management Act (cap. Not yet assigned) provides for the more effective management of the coastal resources of Barbados and for the conservation and enhancement of those resources, and matters related thereto.

In addition the proposed **Environmental Management Act** will provide for the wise and sustainable use of the natural environment and resources of Barbados by making provision for the management and protection of the water resources, the natural heritage and the development of the Barbados National Park System.

There is still however a clear need for a review and rationalisation of all relevant legislation to ensure complete and complementary coverage of land degradation issues.

8. The National Action Programme

8.1 Background

The United Nations Convention to Combat Desertification sets out a number of clear procedures for elaborating commitments, both by countries experiencing serious drought and/ or desertification, in the form of national, regional and/ or sub-regional action programmes. The basic strategy for the action programmes flow from the objectives of the Convention.

The methodology for National Preparatory Activities calls for a phased approach as outlined as follows.

- Phase 1 Collection of basic information at the local level

- Phase 2 Consultation and Strategy Identification

- Phase 3 Preliminary Action Programme/ National Roundtable

- Phase 4 Preparation of final action programme and report to the INCD

In the Barbadian context a wealth of information exist at the local and national levels. This information has been collected and analysed by a variety of groups and individuals including government agencies, quasi-government agencies, private sector organisations, NGOs and CBOs, research/ educational institutions, regional and international organisations.

The Government of Barbados through a Cabinet decision established the National Committee on Desertification and Drought. The Committee established in 1997 is comprised of representatives of the following agencies:

Environmental Unit, Ministry of Physical Development and Environment (MPE)

National Conservation Commission, MPE

Coastal Zone Management Unit, MPE

Ministry of Agriculture and Rural Development (MARD)

Soil Conservation Unit, MARD

Ministry of Foreign Affairs

The Meteorological Department

The Barbados Water Authority; And

The Barbados Agricultural Society

In May – June 1999, the Government of Barbados in association with the UNCCD Secretariat convened a National Consultation on Land Degradation, Desertification and Drought. The Consultation allowed for a coming together of all interested stakeholders in the development of a Strategy and the elaboration of Action Plans to address land degradation in Barbados.

Three thematic areas were identified which were to develop action plans (agriculture, settlement and resource use and conservation). The plans would then be combined to form a comprehensive Strategy and Action Plan. Each sector plan was presented in plenary and discussed extensively. It was felt that due to the interconnectivity of the issues that full coverage would be provided for all issues.

Each group was required to develop a strategy and action plan that included coverage of the following:

- The Vision, Aims and Objectives
- Identification of Key Actions
- Identification of Key Agencies, Stakeholders and Individuals; and
- A Proposed Timeframe for Implementation

A preliminary presentation session presented up to date information and resource materials on Macro-Environmental Policy for the Scotland District, Historical and Current Assessment of Land Degradation in the Scotland District, Current Land Use – Specific Focus on Agriculture, Water Resources Issues, Climatic Variations and Drought, Community Involvement in Habitat Rehabilitation Activities.

The Action Plans for each thematic area (Agriculture, Settlement, Resource Use and Conservation) are delineated below.

8.2 Agriculture

8.2.1 Vision

Agriculture remain a vital part of the development of the Scotland District, thus contributing to the reduction in loss of top soil and the prevention of land degradation.

8.2.2 Aim

To promote economic activity through agriculture, to benefit the people of the area.

Proposed initiative: The creation of **agro-zones** (agriculture under zones). The existing farming groups are the most appropriate means of undertaking agriculture in the Scotland District area. The suggested produce is as follows:

- Crops – Fruit trees, Cash crops, Grasses
- Livestock – Sheep farming

It is envisaged that the existing eco-tourism activities would continue in the area as well and therefore there will be the need for strict management to prevent degradation of the area.

8.2.3 Stakeholders

- Plantation Owners
- The Government
- The BADMC
- Small Land Holders
- Cooperatives
- NGOs
- Communities

8.2.4 Key Actions

1. The development of an inventory of resources inclusive of;
 - Soil type & Location
 - Volume of water resources
 - Available technical resources

It was recognised that the necessary information already existed and what was needed was the compilation and augmentation of the information into one comprehensive database.

2. Development of Programmes to meet the needs of the farmers:
 - Education
 - Cultivation services
 - Access to water
 - Access to roads
 - Terracing programmes

8.2.5 Recommendations

- i. Establishment of a performance criteria for land owners to reduce the burden of management on the Government
- ii. The strengthening of the Soil Conservation Unit (Ministry of Agriculture and Rural Development)
- iii. Further augmentation of water resources
- iv. Re-education of farmers utilizing farming organisations already active in the areas; and
- v. Development of high value/ exotic agriculture where possible through farm cooperatives (Value Added Products)

8.3 Settlement

8.3.1 Aim

To effect the management of settlements and associated activities, both present and future, as they relate to land degradation within the Scotland District.

8.3.2 Specific Objectives

1. Improved management of existing settlements – lowland, highland and roads.
2. Combating degradation associated with settlements
3. Rationalising and planning for present and future settlements

8.3.3 Key Actions

Three scenarios were presented:

Scenario 1:

Removal of all settlements (socio-politically not feasible).

Scenario 2:

Development of a comprehensive and integrated land use management plan for the Scotland District. This should review and include the policy recommendations of the Environmental Management for Land Use Planning Project and the revised Physical Development Plan, which has at its base three (3) designated areas for future settlement development. It should also be comprised of:

- An institutional framework enacted for the appropriate management of the settlement plan; and
- As a component of the institutional framework, the establishment of a planning committee with appropriate stakeholder representation.

Scenario 3:

The establishment of demonstration project(s). While striving to put in place systems to effect Scenario 2, to conduct one or two pilot projects which demonstrate objectives on a small scale. The project outputs would be used as a basis for decision making with respect to the larger and more capital intensive Scenario 2.

8.3.4 Components of the Management Plan

1. Screening of the designated areas with regards to carrying capacity and settlement density in relation to available infrastructure.
2. The development of a database of information on existing settlements in the Scotland District.

3. Cost – benefit analysis of the availability of resources and the provision of infrastructure in the Scotland District and the determination of the level of economic activity which should be sustained in the area.
4. Development of a zoning policy for designation of areas of non-use, restricted use and conditional use.
5. The following should be reviewed:
 - Where existing settlement remains what mitigative measures need to be put in place;
 - Where there is removal of settlement with continued economic activity (agriculture) permitted;
 - Where there is removal of settlement with no activities being permitted;
 - Issues of property rights, land tenure and ownership especially as they relate to settlement relocation;
 - Use of the Physical Development Plan to identify areas which can support economic activity for persons who have been displaced;
 - Rehabilitation and stabilization of unstable/ degraded lands after settlement removal.

8.3.5 Stakeholders

- Existing land owners
- Utility companies
- Transportation agencies
- Waste disposal operators
- Community groups
- Scotland District Association
- St Andrew Independence Committee
- Ministry of Education
- Soil Conservation Unit

- Scotland Beef Project
- Ministry of Agriculture and Rural Development
- Water Resources Unit
- Town and Country Planning Office
- Coastal Zone Management Unit
- Public Works
- Mining/ quarrying companies
- Construction Companies
- Drainage Unit
- Environmental Unit

8.3.6 Timeframe

Pilot Project – Five (5) years

Full Implementation (Scenario 2) – Ten (10) years

8.4 Resource Use & Conservation

8.4.1 Vision

The conservation and appropriate use of water, arable land, sand, clay, oil, flora, fauna and people.

8.4.2 Aim

To utilize an integrated approach based on the available body of knowledge in conjunction with consultation with stakeholders, for use in an integrated management system to:

- i. Preserve and enhance existing flora and fauna
- ii. Sustainably utilize mineral resources; and

- iii. Preserve and foster the socio-economic and cultural activity of the area, to the benefit of Barbados as a whole.

8.4.3 Stakeholder Groups

- Residents/ Landowners
- Businesses
- Horticultural site operators
- Historical site operators
- Tour companies
- Guest house owners/ Hoteliers
- Fishermen
- Recreationalist
- Government agencies
- Key research institutions (UWI, Bellairs Research Institute)

8.4.4 Key Representatives within Stakeholder Groups

1) Residents/ Landowners

- i. Broad, community based committee/ association (needs to be formed)
- ii. Scotland District Association
- iii. St. Andrew Independence Committee
- iv. Small Farmers Cooperative of St. Andrew
- v. Bawdens Environmental Group
- vi. The Codrington Trust
- vii. The Churchical Order of the Nayabinghi

2) Businesses

- i. Claytone (clay based tile producer)
- ii. Sand-Ben (sand mining operation)

- iii. Walkers Sand Quarry
- iv. Springfield Mining
 - v. Barclays' Park Restaurant, and other restaurateurs
- vi. Caribbean Riding Institute
- vii. Richard Hoad Farms
- viii. Highland Outdoor Tours
 - ix. Safari Tours
 - x. Operators of the National Landfill and Greenland
 - xi. Shell Gas Station
 - xii. Richard Goddard Farms
- xiii. Scotland Beef Project
- xiv. Arawak Cement Plant
- xv. Barbados National Trust
- xvi. Other business owners and commercial farmers

3) Horticultural/ Historical Sites and Visitor Attractions

- i. Barbados National Trust
- ii. National Conservation Commission
- iii. The Flower Forest
- iv. The Barbados Wildlife Reserve
 - v. St. Nicholas Abbey
- vi. Churches
- vii. Other land owners with attractions on their lands

4) Hoteliers

- i. Edgewater
- ii. Atlantis hotel
- iii. Roundhouse
- iv. Sand Dunes
 - v. Bonito
- vi. Guest house owners

5) Fishermen

- i. Consett
- ii. Tent Bay
- iii. Martin's Bay
- iv. Sea Egg Fishers Association
- v. Sea Moss Growers

6) Recreation Providers

- i. Mountain Bikers
- ii. 4 x 4 Tour Operators
- iii. Hikers and trailers
- iv. Trail Friends Inc.
- v. Barbados National Trust
- vi. Bawdens Environmental Group
- vii. St. Andrew Independence Committee
- viii. Surfers

7) Government Agencies

- i. Ministry of Physical Development and the Environment
- ii. Ministry of Agriculture and Rural Development
- iii. Ministry of Health
- iv. Ministry of Tourism
- v. Ministry of Public Works and Transport
- vi. Ministry of Finance
- vii. Ministry of Education, Youth Affairs and Sports
- viii. Ministry of Social Transformation

8) Research Institutions

- i. University of the West Indies
- ii. Bellairs Research Institute

8.4.5 Key Actions

1. There will be overall sensitisation and education of all key groups in the Scotland District through consultation and information exchange between the various groups. Such consultations will identify activities within the district, provide historical information, list problems encountered and provide an overall vision through the combined visions of the interest groups.
2. The information from the consultations along with that amassed from studies by the Government and private agencies over the years will be used to guide the development of a Scotland District Environmental Standards Certification Programme for all activities within the area. There would be special emphasis placed on the need for Environmental Impact Assessment with a primary focus on the impact of activities on the availability, quality and distribution of water, and on drainage as well as on recommendations to minimise impacts that could result in land degradation.
3. All agencies/ organisations with operations in the Scotland District will be encouraged to develop corporate environmental policies to pursue economic and development activities under a sustainable development ethos.
4. The visitor attraction sites will be developed as models for the proposed environmental standards programme and will play a key role in the dissemination of information.
5. Government agencies active in the district will carry responsibility for:
 - i. Coordination of the public awareness and education program and organisation and facilitation of consultations as necessary.
 - ii. Development and enforcement of legislation to promote sustainable activity and prevent and mitigate against land degradation in the Scotland District.

- iii. Development of the Scotland District Environmental Standards Certification Programme.
- iv. Development and facilitation of projects to address the priorities identified.
- v. Provision of funding and assistance in sourcing funds to assist in the fight to combat desertification, land degradation and drought. It should be noted that NGOs, CBOs and private sector entities should also try to identify and provide funding for such activities.
- vi. Expansion of the programme to combat desertification, land degradation and drought to provide full national coverage, and to push the issue as an important one in the regional and international fora.
- vii. Development of an early warning system for extreme climatic events such as storms and drought.

9. The Response to Drought

Even in a water scarce country such as Barbados the perception still persist that citizens are entitled to as much water as they want. There is reluctance to accept that water is a scarce resource.

This has led to the development of a Sustainable Water Management Strategy and Action Plan by the Barbados Water Authority (BWA). The strategy and action plan are based on the recommendations out of the Water Resources Management and Water Loss Studies (1997).

The main elements of the strategy include:

- Demand Reduction
- Supply Augmentation
- Water Quality Protection
- Public Education
- Capacity Building and Networking

9.1 Demand Reduction

The Barbados Water Authority (BWA) is responsible for the abstraction of groundwater for public supply. Currently the BWA abstracts in excess of 35.0 million gallons per day. In addition there has historically been private abstraction, controlled by a system of licences. There are currently an estimated one hundred and eleven (111) private wells in use, abstracting approximately 11.8 million gallons per day.

In order to address demand reduction a number of policies have been implemented. These include:

- a) Metering: Historically all commercial, hotel and industrial customers are metered. A programme has been instituted for the metering of domestic customers. To date over (70) percent of the distribution is metered.
- b) Water Saving Devices: The Barbados Water Authority (BWA) has to date distributed over 30, 000 low flow shower heads and 30, 000 tap aerators and has promoted the wider use of water-saving Water Closets.
- c) Agricultural Practices: The Government of Barbados has put an incentive scheme in place which provides a rebate of eighteen (18) percent of the cost of new irrigation equipment for non-sugar agriculture utilizing drip irrigation.
- d) Roof Catchments: The Town and Country Planning Office now requires that dwellings with 3,000 ft² or more of roof area must have rainwater storage corresponding to at least 2.0 gallons per square foot of floor area. For the commercial sector the requirement is that they must provide at least (4) gallons per square foot of floor area once the building has a roof area of 1,000 ft² or more. As a result of sometimes questionable water quality, the water collected is recommended for non-potable uses only.
- e) Reduction in Unaccounted-for-water: The BWA has put in place a programme to more effectively identify and address leaks.
- f) Tarif Structure: The Government is currently looking at the possibility of amending the tarif structure of charging for water. This would also result in a review of the licencing system for the operators of private wells.

9.2 Supply Augmentation

Several supply augmentation alternatives are available to Barbados. These include surface water impoundment in the Scotland District, reuse of wastewater, desalination, construction of check dams through the gully system and even importation.

To date only the option of desalination has been advanced. The construction of a desalination plant has served to increase water supply by 10 %. The water produced

through the desalination process is mixed with the abstracted groundwater to ensure that there is no real discernable change in taste of the water supplied to customers.

The Government of Barbados continues to examine the issue of wastewater reuse, especially for golf course application. In addition the issue of the development and re-development of a check dam system is being studied to address both flood mitigation and groundwater recharge.

9.3 Water Quality Protection

Given the scarcity of water in Barbados the issue of water quality protection is critical. Since 1963 a groundwater protection zoning system has been in place. The zoning system gives considerable protection from biological pollution sources but gives little protection against chemical pollution.

It is against this background that a long term strategy is being developed for protecting the water resources of Barbados. The study calls for:

- Amended Zoning Regulations
- Containment Data Base
- Import Controls of Contaminants
- Long-term Water Quality Monitoring

Discussions are currently underway amongst the relevant agencies for the implementation of the components of the strategy outlined.

9.4 Public Education

In recognition of a need for widespread public support the BWA has sought to implement a multi-media and multi-sectoral public awareness and education programme. The programme components implemented to date have included:

- Facility Tours
- Visits to Schools and Social Clubs
- Radio and Television Programmes

With the advent of National Strategic Planning (NSP) related sectors will assist the BWA in public awareness and education. In addition it is proposed that water resources management issues be included in a comprehensive education programme addressing desertification, land degradation and drought to be addressed through the National Action Programme (NAP).

9.5 Capacity Building and Networking

This is an ongoing concern that is being addressed partially through the implementation of the recommendations of the 1997 Water Resources Management and Water Loss Study and partially through the National Strategic Planning process. It is anticipated that the United Nations Convention to Combat Desertification can provide considerable assistance in the area of Capacity Building and Networking.

9.6 Emergency Drought Management Plan

In addition to the development of a Sustainable Water Management Strategy the Barbados Water Authority has also pursued the development and the implementation (as necessary) of an Emergency Drought Management Plan.

The plan includes Short, Medium and Long Term Activities. These are summarised below:

9.6.1 Short Term (0 to 6 months)

1. Establishment of a Multi-Agency Task Force

The task force will facilitate liaising between agencies and will have an advisory and policy coordinating role.

2. Call to Order of the BWA Task Force

This task force will be responsible for the execution and administration of the plan.

3. Use of Drought Indicators to Inform Action

The drought indicators to be used are:

- Rainfall
- Reservoir levels
- Well measurements
 - Output from sources
 - Groundwater table levels
 - Salinity (sheetwater wells)

4. Response Stages

The water shortage response plan has 3 stages:

Stage 1	Voluntary Conservation Measures
Stage 2	Mandatory Water Use Restrictions
Stage 3	More Stringent Mandatory Restrictions

5. Financial/ Administrative Activities for the Plan

These include water and human resources and addressing financial, legal and technical constraints.

6. Technical Activities for the Plan

These include:

- Management
 - Distribution management system
 - Tanker management plan
 - Shut-off/ rationing plan
- Water Resources/ Supply
 - BWA Wells
 - Private Wells
 - Desalination
- Distribution System Activities

9.6.2 Medium Term (6 to 12 months)

The medium term strategy address administrative and technical components and can be summarised as follows:

Administrative

Encourage existing residences to install tanks to harvest rainfall for non-potable uses.

Review and modify BWA Act as necessitated.

Institute legislation to ensure that developments are approved with minimum dead-end lines.

Technical

Reorganise superintendent distribution regions.

Investigate the possibility of importation of water from other Caribbean islands.

9.6.3 Long Term (over one year)

These components of the plan reflect the long term goals of the BWA and include:

1. Reduction in unaccounted-for-water in the distribution system to 30% or less.
2. Implementation of a broader desalination plan.
3. Implementation of a Supervisory Control and Data Acquisition System.
4. Use of the Hydraulic Network Model in other distribution systems.
5. Incorporation of the use of dual reticulation systems into the building code.
6. Encouragement of the reuse of wastewater for appropriate non-potable purposes.
7. Encouragement of blending for agricultural purposes.
8. Fast track ban on the importation of all non low flow water use fixtures.

10. Major Initiatives in Planning for a Sustainable Strategy to Combat Land Degradation and Drought

- National Strategic Planning
- The Coastal Zone Management Plan
- The Environmental Management and Natural Resources Management Plan
- The National Commission on Sustainable Development
- The Physical Development Plan
- The Soil Conservation Unit
- The Sustainable Tourism Policy
- The Water Resources Development & Management Policy

10.1 National Strategic Plan

The use of national strategic planning is based on the need to respond to rapid changes in a more dynamic way. This approach reduces duplication of effort across government departments and because the National Strategic Plan (NSP) is developed from sectoral strategic plans results in greater support for the overall sustainable development process. It therefore results in the incorporation of social, economic and environmental issues into national development planning.

10.2 The Coastal Zone Management Plan

Provides for the more effective management and regulation of the coastal resources of Barbados and for the conservation and enhancement of those resources. Addresses the linking of ecologically sensitive coastal and marine areas and the governing of activities in these areas.

10.3 The Environmental Management and Natural Resources Management Plan

Provides the framework and policy for the protection, regulation of use and the monitoring of the health of Barbados' environment and natural resources. Includes a National Park plan to guide the development of a National Park System, including the National Park Area (Scotland District and other significant natural heritage features) and the development of additional Natural Heritage Conservation Areas and related buffer zones.

10.4 The National Commission on Sustainable Development

In keeping with the recommendations of the United Nations Conference on Environment and Development (UNCED) Barbados established a Cabinet-appointed National Commission on Sustainable Development. The Commission is broad based with representatives from government agencies and all major groups including Non-Governmental Organisations (NGOs), Community-Based Organisations (CBOs), Trade Unions, Women Organisations, the Academic Community and Private Sector entities.

The NCSD advises government, facilitates coordination on sustainable development issues at the national level, promotes greater understanding on the principles and opportunities with respect to sustainable development and reviews and advises on actions in pursuit of sustainable development.

10.5 The Physical Development Plan

The Physical Development Plan (PDP) encapsulates the principles of sustainable development to guide land resource management. The PDP provides policies to govern land use and the criteria and controls over types of developments allowed in discrete areas. It provides island wide coverage.

10.6 The Soil Conservation Unit

Since its establishment in 1957 the Soil Conservation Unit has undertaken extensive slope rehabilitation works in the Scotland District. The Unit also reviews all development proposals involving permanent structures in the Scotland District, with the view to preventing activities in areas prone to erosion and land slippage, and the prevention of activities that might cause or exacerbate land degradation.

10.7 The Sustainable Tourism Policy

The Sustainable Tourism Policy recognises that tourism can not succeed without a healthy physical and social environment. The policy represents the first attempt for Barbados in the development of a tourism policy in a participatory manner. It stresses the importance of sustainable development and has a special focus on community tourism, cultural heritage and nature based tourism.

10.8 The Water Resources Development & Management Policy

Provides for the comprehensive management of water resources until 2016 through a series of strategies in the areas of demand management, supply management and augmentation, institutional capacity building, and legislation.

11. Other Relevant Programmes, Projects and Activities

Agro-Eco-Tourism Project was a joint initiative of the Inter American Institute for Cooperation on Agriculture and the Ministries of Agriculture and Rural Development, Physical Development and the Environment, Social Transformation and Tourism to promote the development of sustainable projects at the community level in the Scotland District. The project offered training, prizes and incentives and sought funding for the projects submitted under the programme. The capacity building component included workshops on the development of project proposals.

Community Redevelopment Projects represented an offshoot of the Coastal Conservation Programme under the Coastal Zone Management Plan. The projects were community driven, with technical and financial support from various government agencies and the private sector, and saw the development of a Dune Rehabilitation Programme and a Coastal Revegetation Project at Walkers, St. Andrew.

Area Development Plan informs agricultural land use policies under the Physical Development Plan.

Agricultural Sector Plan was prepared to ensure that practices within the agricultural sector serve to maximise productivity and ensure optimal use of land available for agriculture, promote the adoption of farming systems that are environmentally friendly, and ensure preservation of adequate areas of arable land for future generations.

Tourism Development Programme Sub-program C suggests various ways to diversify the tourism product and has a special focus on community tourism, cultural heritage and nature based tourism. The TDP C forms a critical component of the Tourism Plan for Barbados.

Poverty Alleviation. A poverty alleviation programme is being implemented islandwide through the Ministry of Social Transformation. This will assist in dealing with the issues of poverty and illegal settlements in the Scotland District, and as genuine cases of poverty are addressed the attendant land use and degradation associated with such illegal settlements should also be addressed.

Land for the Landless. A land for the landless programme has been instituted by the Ministry of Agriculture and Rural Development through the Barbados Agricultural Development and Marketing Corporation. The programme provides land, mostly in the Scotland District, for lease at very low rates to landless farmers. In many ways this programme represents a challenge as it brings new persons into the Scotland District who now have to be educated on the special nature of the area and on acceptable farming and animal husbandry practices in the area.

Bawdens Demonstration Project is a working display established by the Bawdens Environmental Group, a local NGO, to show persons in a practical way the benefits of utilizing renewable energy, organic farming and living lightly on the land. The work of the group is all the more important as the group represents one of very few examples in Barbados of a functional NGO that combines grass roots environmentalist, farmers and academics.

Barbados National Report to Habitat II provides an assessment of percentage land for residential and business development relative to agriculture islandwide. Provides good baseline data for analysis purposes.

National Biodiversity Strategy and Action Plan provides for the integration of the conservation and sustainable use of biological resources into the relevant sectoral and cross-sectoral plans, programmes and national policies.

Caribbean Planning for Adaptation to Climate Change. Barbados houses the CPACC project office and is the site of the pilot study on Coastal Vulnerability & Risk

Assessment. This is seen as critical as due to the small size of Barbados the entire island is seen as a coastal zone.

Representation on the Intergovernmental Panel on Climate Change (IPCC). At the international level, Barbados has ratified the United Nations Framework Convention on Climate Change, and is an active member of the Intergovernmental Panel on Climate Change, thus ensuring that the issues of Small Island Developing States are fully discussed in such fora and that the necessary links are made between combating climate change and sea level rise, biodiversity resource protection and the fight against desertification.

Conserving Biodiversity and Preventing Land Degradation in Small Island Ecosystems of the Caribbean. The Government of Barbados signed on in support of the proposed project for the Caribbean sub-region. The project is intended to develop programmes, strategies and mechanisms on sustainable land management for the protection of the biodiversity of the Caribbean Region. The project will take the form of demonstration projects to be set up in each of the territories of the Caribbean sub-region.

Disaster Recovery and Proactive Actions have included the relocation of (160) households from the White Hill community of St. Andrew by the Ministry of Housing and Lands. The households had to be relocated as they were in danger due to severe land slippage in the area. The persons were relocated at no cost to themselves. Another (43) households have been identified for relocation.

Engineering Works. In addition to the activities outlined above the Government of Barbados continues to spend millions of dollars every year in the Scotland District for road and bridge construction and stabilisation and on prevenative and mitigative engineering works to address land degradation through the works of the Soil Conservation Unit, Ministry of Agriculture and Rural Development and the Ministry of Public Works and Transport.

12. The Way Forward

There are a number of clear steps still to be taken to advance the strategy and action plan to combat land degradation and drought in Barbados. These include:

- (i) Formulation of a full public awareness and education programme, informed by a Knowledge, Attitudes and Perceptions Study (KAP). The programme should target specific publics as well as the general public and should take a multi-sectoral, multi-media approach. This is key as success can only be achieved if concepts and practices are accepted and adopted on an individual basis.
- (ii) Procurement and expansion of financial, human and technological resources. The need for institutional strengthening and capacity building cannot be ignored. The need for data collection and analysis, and the use of data in decision-making is also critical. Oftentimes when funding is low data collection is the first component cut from the budget, however if land degradation and drought are to be combated effectively data collection at the primary and secondary level are components that must be supported.
- (iii) Development, implementation and maintenance of a programme for monitoring and mitigating the effects of land degradation and drought. An early warning system should be built in. This would allow for both pro-active and reactive actions and would bring a more holistic approach to combating land degradation and mitigating against the impacts of land degradation and drought.
- (iv) Development, documentation and protection of local, knowledge and practices with respect to hard and soft engineering solutions and other approaches to address land degradation and mitigate against the impacts of land degradation and drought. While experiences with respect to addressing desertification should be shared intellectual property rights issues be addressed in this regard.

- (v) Support and strengthen mechanisms for stakeholder participation in the implementation of the actions outlined in the National Action Programme. The participation of communities and stakeholders identified in the planning process is critical, as the programme cannot be implemented successfully at the Government level alone.
- (vi) Implementation and amendment of appropriate legislation to effectively support the NAP and related policies affecting land degradation and drought prevention and mitigation.
- (vii) The integration of climate change and biodiversity concerns with desertification.

13. Concluding Statement

It is clear from the information presented in this report that a number of forward looking initiatives have been implemented, are being implemented or are in train in Barbados to address and mitigate against the effects of desertification, land degradation and drought. It is also clear however that a great deal of work still needs to be done. The role of the UNCCD is critical in this regard.

To date Barbados has sought to approach the issues related to desertification, land degradation and drought through a proactive and integrated approach, stressing inclusiveness and shared responsibility. Barbados will continue to be committed to the process at the National, Regional and International level and continue to represent the issues of SIDS as we move towards a more sustainable ethos.

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