FINAL REPORT

THE WETLANDS OF GRAEME HALL

AN INITIAL ASSESSMENT OF VALUE

BY

Dr. Allan N. Williams

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About the Author

Dr. Allan N. Williams is a Macro-Economist who has had in excess of thirty (30) years of experience in international consultancies dealing with Land Policy and Environmental Impact Assessment and Economic Development Planning in the Caribbean. He has performed the duties of Chief Technical Advisor and Project Team Coordinator for the Land Use Policy and Administration Project (LUPAP) and team leader of the IDB Preparatory Work on Economic Evaluation and Cost/Benefit Analysis of the proposed Land Adjudication and Registration Program in Trinidad & Tobago. Dr. Williams is a Vice-Chair (Caribbean) for the Commission on Environmental, Economic and Social Policy (CEESP) of the IUCN (World Conservation Union).

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0. EXECUTIVE SUMMARY

0.1. Introduction

The Graeme Hall Nature Sanctuary (GHNS) is a privately owned property whose primary mission is the conservation of the Wetlands of Graeme Hall. There are many features of this Wetlands that are worthy of conserving. These include being the last remaining mangrove forest of its kind in Barbados, a major roosting area for migratory and native water-birds, a "living laboratory" for researchers and scientists to examine native Barbados ecosystems and an opportunity to understand how changes in human population and the built environment in Barbados have influenced issues relating to aquifer and surface water management, drained wetlands, wetland recreation, coastal zone management, urban sprawl and agriculture.

Of more importance are the under-valued linkages between the ecological characteristic of the Graeme Hall Wetlands and its multiple roles in sustaining tourism activities in the south west coast; supporting the quality of life and maintaining open green spaces and lower population density in the Parish of Christ Church; and avoiding a major catastrophe of sewage contamination of the beaches and coastal zone of the most important location of stay-over accommodations in Barbados. To achieve such an understanding, this study has pursued a goal of assessing the value of this nature asset that the Graeme Hall Nature Sanctuary seeks to conserve.

0.2. Conservation Imperative

Conservation as a national endeavour is not new to Barbadian society, given the work done by The Barbados National Trust. What is new in the Graeme Hall case is a conservation drive that includes lands that have alternative and competing uses. The Graeme Hall Wetlands are surrounded by housing developments, commercial tourism establishments, Government owned lands and agricultural farms. The logical conclusion from this multiple tenure situation is that any covenants that would seek to protect the ecological character of the wetlands would have to extend to the owners and users of lands within the entire Watershed 100-year floodplain.

0.3. Land Designations

When a land asset is located within such a diversified land-use mosaic as the southwest coast of Barbados, land designations become a first line of defense against undesired changes in land use. There are four (4) land designations which have been applied to the Graeme Hall landscape, all of which tend to point to specific values of the area. The Graeme Hall Swamp was designated Ramsar Site no. 1591 on 12 April, 2006 providing the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The Physical Development Plan (Amended 2003) has identified the Graeme Hall Swamp as a Natural Heritage Conservation area implying a sensitive natural environment which requires protection from potentially incompatible development.

The designation of a National Park has been proposed but not acted upon. Such a designation would have the explicit intent of protecting this area and its surrounding upland buffers. Wetland management best practices encourage buffer lands on all sides of the wetlands. The Nature Sanctuary designation broadens the “conservation commitment” of GHNS and positions GHNS as a private investment that is creating public value.

0.4. Wetland Functions

Our analysis identifies 12 valuable functions of the wetlands at Graeme Hall. These include, Habitat, Refuge; Regulating Hydrological Flows; Storage and retention of water; Hosting unique biological material; Capacitance and absorption of pollutants; Removal or breakdown of excess compounds; Maintaining ecological characteristics of the landscape; Monitoring coastal zone changes; Impacting local community quality of life; Providing cultural attraction and Being a repository of scientific information.

0.5. Wetland Values

The chain of values produced by services from these functions includes the following:

- The infrastructure of GHNS which supports conservation efforts, facilitates non-intrusive visits of tourists and opportunities for educational and research activities;
- The lands in the buffer zone that can easily be re-assigned to residential or tourist facilities development, in unison with the characteristics of the mixed land use corridor between Bridgetown and Oistins;
- The use of the Graeme Hall Wetlands as an emergency dump for South coast sewage providing an insurance policy for protecting the coastal zone from possible contamination by a sewage outfall;
- The contribution of the wetlands to the tourist sector reflected in its impact on "long-stay" tourist arrivals
- The contribution to local community Quality of Life through the provision of open green space and a lower density per Km^2 in the Parish of Christ and its contribution to sustainability of economic life in the South coast communities

0.6. Total Value of Graeme Hall Wetlands

Using various valuation methods we have made an initial value of the Graeme Hall Wetlands at US$551,288,300.

Table 0: Total Value of Graeme Hall Wetlands

WETLAND SERVICES	WETLAND VALUE	Value Method	ESTIMATE
Wetland Conservation Values	GHNS Replacement Value	Replacement Cost	$ 23,635,520
	Buffer Zone Value	Real Estate Market Prices	$ 6,048,000
Heritage Cultural Landscape Values	Tourism Sector Support	Proportionate Tourist Expenditure Estimates	$105,736,000
Wetland Emergency Avoidance	Risk Aversion	Avoidance Cost - Market Price	$173,000,000
CARICOMP Monitoring	Disaster Preparedness		
Bio Diversity	Quality of Life Support – South coast community	Shadow-value: Net Factor Income	$242,868,780
	Total Value Estimate		**$551,288,300**

The true meaning of the magnitude of these valuations is not simply that we are undervaluing natural resources like the Graeme Hall Wetlands. More importantly, they tell us that we must begin to give the Graeme Hall Wetlands that produce these services, adequate weight in the decision making process, otherwise current and continued future human welfare may drastically suffer.

1. INTRODUCTION

1.1. Background

The Graeme Hall Nature Sanctuary (GHNS) is a privately owned property comprising a well laid out eco-tourism establishment and a restored section of the Graeme Hall Wetlands. The property includes a visitor's centre, a man-made lake and a Mangrove Swamp which is the nesting ground for local and migratory species of birds. The owners of the Sanctuary have expressed the desire to access the value of this property in a manner that includes the social, economic and environmental benefits of the key resource, the Graeme Hall Wetlands otherwise referred to as the Graeme Hall Swamp (GHS)[1].

GHNS' property has two distinct characteristics. Located on the south coast of Barbados in Worthing, Christ Church, the entrance shares the same access route (Highway 7) with most of the major hotels and restaurants servicing Barbados' tourism sector. This location itself would give the Sanctuary a very high commercial value. However, its name, mission and the 18 acres of restored wetlands, being an inseparable part of the Graeme Hall Swamp, establishes the Sanctuary more importantly as an integral part of ecological landscape at Graeme Hall.

An assessment of the value of GHNS must of necessity follow two parallel streams. The more important being an assessment of the characteristics and functions of the 82.11 acres if wetlands internationally recognized as the last remaining complete ecosystem of its type in Barbados[2]. The second stream, which is more quantitative, looks at the value of the infrastructure that has been developed by GHNS to allow the Nature Sanctuary to pursue a public restoration, conservation, and education agenda to help visitors and citizens alike to appreciate the value of the Graeme Hall Swamp

1.2. Objectives

The purpose of the project is to conduct an initial assessment of the total value of the Graeme Hall Nature Sanctuary. The goal is to assess the value of GHNS in terms of its infrastructure, its services, its contribution to the conservation of the Wetlands and buffer zone and by extension the Southwest Coast community and the national economy.

The project objectives include:

a) A value assessment of the physical assets of the Graeme Hall Nature Sanctuary;
b) A Socio-economic assessment of the functions and uses of the wetlands landscape at Graeme Hall; and
c) A perspective on maintaining this natural asset as a legacy to future generations of Barbadians

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[1] We use the Terms "Graeme Hall Swamp" and "Graeme Hall Wetlands" interchangeably in this Report.

[2] This characterization is confirmed in the Master Plan for Graeme Hall Ecosystem, Coastal Zone Management Unit, Ministry of Energy and the Environment, September 2007. p.2

1.3. Methodology

The value assessment was designed as a non-intrusive inquiry into the characteristics and functions of the Graeme Hall Nature Sanctuary. It comprised predominantly of desk research and relied exclusively on data and information that already exists in the public domain. The activities include:

- Document Review
- Scoping Visit to GHNS
- Value Assessment of GHNS Infrastructure
- Assessment of Social and Economic Value of the Wetlands Landscape
- Projections of the potential Legacy Welfare benefits

1.4. The GHNS Mandate

The primary mission of the Graeme Hall Nature Sanctuary is **conservation**, supported with education and research. The Graeme Hall Wetlands have many features that are worthy of conserving. The most commonly recognized ones in the literature on Graeme Hall are:

a) It is the last remaining mangrove forest in Barbados
b) It is one of only three primary roost areas for migratory and native water-birds in Barbados within the Eastern Caribbean Flyway.
c) It is a "living laboratory" offering working opportunities to researchers and scientists to examine native Barbados ecosystems
d) It provides practical working knowledge of how changes in human population and the built environment in Barbados has influenced issues relating to aquifer and surface water management, drained wetlands, wetland recreation, coastal zone management, urban sprawl and agriculture.
e) The grounds of the GHNS are an excellent example of xeriscaping i.e. landscaping in a way that does not require supplemental irrigation.

The last one is an observation from the landscaping achieved in the visitors center of the Graeme Hall Nature Sanctuary. This system is promoted in areas that do not have easily accessible supplies of fresh water, and is catching on in other areas as climate patterns shift.

1.5. The Conservation Imperative

Conservation as a national endeavour is not new to Barbadian society. The Barbados National Trust (1960) has worked to preserve and protect the natural and artistic heritage of Barbados and to increase public awareness of the country's natural and artistic heritage. What is new in Graeme Hall is a conservation drive that includes land that has alternative and competing uses.

There are two challenges to the successful conservation of the wetlands at Graeme Hall. The first is that it will require the nation coming to the consensus that ***Wetlands have great value in the services they provide to the nation and economy***. This is actually the principle underlining the Ramsar Convention to which Barbados is a signatory, and which plays a significant role in our assessment of Graeme Hall Wetlands. The view of wetlands (read swamp) as wastelands arises from ignorance or misunderstanding of the value of the functions, services and linkages that these resources provide in the social and economic welfare of the adjoining community and the nation as

a whole. In the case of the Wetlands of Graeme Hall, it requires some metrics to demonstrate that these lands are of greater value to society as wetlands than in any other alternative use.

The second challenge is to identify Wetland preservation, restoration and maintenance as a legitimate "**land use issue**". To view wetlands as lands awaiting improvements on the drainage and irrigation technology to make them useful is to deny the natural evolution of that landscape and the surrounding geographical space. These wetlands have been providing these services in a natural setting.

However, with wetlands, we are usually forced to operate in a "less than full-knowledge situation" in respect to assessing the costs and benefits of their multiple functions. The dilemma is that we may be forced to conserve a natural asset even if at the present time we do not know all of the risks or the potential loss from doing otherwise. This is known as the *precautionary principle*.[3] Thanks to the mission and activities of the Graeme Hall Nature Sanctuary, we are able to observe and study the significance of the Graeme Hall Wetlands as defined by its spatial, cultural and historical location.

The Graeme Hall Master Plan has observed that "once the Graeme Hall Nature Sanctuary began its restoration and development of the western section in the early 1990s, indiscriminate use of the swamp was severely curtailed."[4] Conservation of this landscape, therefore, would require measures to counter any indiscriminate land use practices in the protective zone as well. However, given the multiple owners in the influencing zone around the wetlands, a serious commitment to wetland conservation would require a policy on compatible land use within the wetlands as well as in the buffer zone that influences the wetlands

1.6. The Policy Imperative

Wetlands have been identified by many studies including the *World Conservation Strategy* as one of the key life support systems on this planet, in concert with agricultural lands and forests. If we were to transfer this level of importance to the Graeme Hall Wetlands, then we would need both a Policy and the legal framework to support its management and preservation into the future. Such a policy is implied in the National Strategic Plan of Barbados, 2005 – 2025, Strategy 1.4 of Goal 4 which calls for measures to ensure that the integrity of natural features, wildlife habitats, significant flora and fauna and important landscape and seascape features and protected areas are maintained during the process of development[5].

There are many needs that require an explicit policy in support of conservation in the Graeme Hall Wetlands. The current and proposed land use intentions of the existing multiple land owners of both the Wetlands and the buffer zone must be compatible with the conservation imperative. Coordinating the land use intentions of these multiple owners suggests a policy that would focus on

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[3] The precautionary principle is evident in such international agreements as the Montreal Protocol on substances "likely" to damage the ozone layer. See Economic Valuation of Wetlands: A Guide for Policy Makers and Planners, The Ramsar Library, 1997, Box 3.1 p.18.

[4] Master Plan for the Graeme Hall Coastal Ecosystem, Coastal Zone Management Unit, Ministry of Energy and the Environment. September 2007, p.3.

[5] The National Strategic Plan of Barbados, 2005 – 2025, Goal Four: Strengthening the physical infrastructure and preserving the environment. P. 65

achieving a high degree of **co-stewardship** of this important resource. But co-stewardship can only be achieved when the common obligations are established in a legal framework governing the resource. Such common obligations must include, among others:

a) Ramsar obligation - Maintenance of the functions and values derived from wetlands;
b) Conservation – No net loss of wetland functions;
c) Restoration - Enhancement and rehabilitation of wetlands in areas where the continuing loss or degradation of wetlands or their functions have reached critical levels;
d) Physical Planning - Recognition of wetland functions in resource planning, management and economic decision-making with regard to all programs, policies and activities in all sectors including Agriculture, Tourism and commercial land development;
e) Land use planning - sustainable management practices in sectors such as forestry, and agriculture that make a positive contribution to wetland conservation while also achieving wise use of wetland resources;
f) Legacy preservation - utilization of wetlands in a manner that enhances prospects for their sustained and productive use by future generations.

The Canadian Wetland Policy is a very good example of a Commonwealth Government taking actions to reclaim degraded sites and protect wetlands of international important through a cooperative, national approach.[6]

[6] The Federal Policy on Wetland Conservation, Ministry of the Environment, Government of Canada, 1991

2. SCOPE OF THE ASSESSMENT

2.1. Geographic Boundaries

The geographic boundary of the Wetlands at Graeme Hall is not simply a matter of opinion. It is the definition of the area that would comprise a complete control unit to monitor and maintain changes within the wetlands. The inter-locking boundaries are as follows. The Graeme Hall Nature Sanctuary comprises 34.25 acres of wetlands, built infrastructure and some buffer zone. This area is fully contained within the 81.11 acres (33 hectares) recognized by the Government of Barbados area as the Graeme Hall Swamp.

The Reference Guide of the Friends of Graeme Hall suggests an even larger area. It quotes an ARA Study in 1997 suggesting the incorporation of the 100-year floodplain, consisting of approximately 91 acres plus an 18.13-acre buffer zone, roughly bounded by Highway 7 on the south, Rendezvous Road on the west, the escarpment containing the old plantation property (Ministry of Agriculture) on the north, and the extension of the Harmony Hall Road to the Sewerage Treatment Plant on the east.[7]

Finally the Graeme Hall National Park Watershed Management Plan targets the entire 1,158 acre Graeme Hall Watershed as the point source for preservation and protection. This watershed is located within one of the largest of nineteen (19) Water-Catchment Areas in Barbados.

"There are no other watersheds in Barbados with such recognized diversity, where a mangrove wetland, a seagrass bed, and a shallow nearshore hard coral reef can be found in close proximity and this makes this Watershed unique in Barbados and therefore it is necessary to ensure that it be preserved without any further ecological damage"[8].

While we do recognize these varying geographic boundaries as defining the "ecological character"[9] of the Graeme Hall wetlands, our assessment is limited in general to the 81.11 acres of designated Ramsar site and in specific to the 34.25 acres of the Graeme Hall Nature Sanctuary. We do make reference to the watershed area because of the importance of buffer zones to the maintenance of wetlands.

2.2. Ecological Characteristics

The Graeme Hall Wetlands is located on the South Coast of Barbados. The Wetlands have undergone significant man-made modifications of its original characteristics. It consists of a man-made lake and an extensive wetland area that was originally part of a 373 acre Graeme Hall plantation. A footpath/road dissects the area into a western quadrant (owned by GHNS) and an eastern quadrant owned by the Government of Barbados. The entire Wetlands are surrounded by housing developments, commercial tourism establishments and agricultural lands. The

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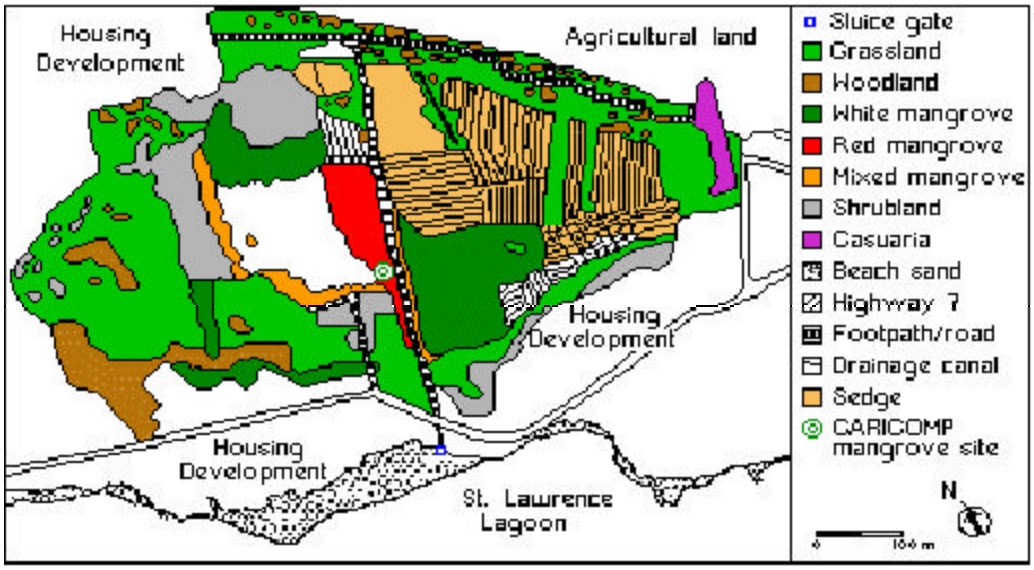
[7] The Graeme Hall National Park: Reference Guide 2: Maps and Boundaries, Note.

[8] Graeme Hall National Park Watershed Management Plan, Barbados, West Indies, Executive Summary.

[9] The "ecological character" is defined as the structure and inter-relationships between the biological, chemical, and physical components of the wetlands, which are. derived from the interactions of individual processes, functions, attributes and values of the ecosystem(s). "Change in ecological character" of a wetland is the impairment or imbalance in any of those processes and functions which maintain the wetland and its products, attributes and values. Resolution VI.1 On Working Definitions of Ecological Character, Ramsar Convention, Brisbane Australia, 1996.

development of Highway 7, the major South Coast traffic artery, on the coastal sand bar has effectively eliminated any direct natural connection between the Wetlands and the sea. A sluice gate is currently the only exit to the sea. These developments notwithstanding, the Graeme Hall Wetlands are recognized as a coastal ecosystem.

Figure 1: Habitat Map of the Graeme Hall Swamp [10]



Source: UNESCO Public Papers

Figure 1 indicates the ecological features of the Graeme Hall Wetlands inclusive of grasslands, woodlands, white and red mangrove and the inland lake. In the western quadrant lies the property of the Graeme Hall Nature Sanctuary. GHNS has expended significant resources in restoring the vegetation, the lake and shallow ponds of the Wetlands in this area. The current vegetation provides roosting and breeding areas for red seal coots, sand pipers and egrets, as well as a stop-off point for many migratory birds. The saline waters of the open water area provide habitat for a variety of fresh and salt water fish – many of which were intentionally or accidentally introduced, and some of which made their way into the lake by way of the sluice gate.

2.3. Multiple Land Ownership

Once we have recognized the Graeme Hall Wetlands as a legitimate land use issue, then by extension, we are obligated to take note of the tenure systems within the Graeme Hall watershed. This would include the land use patterns in the buffer zones. The activities in the buffer zones surrounding the Graeme Hall Wetlands are critical to both the management of upland drainage into the wetlands as well as the limitation of human influence on ecologically valuable areas. Standing in the way of this is the ownership pattern in this buffer zone. It is as follows:

Within the Graeme Hall Watershed 100-year floodplain we have:

- The Graeme Hall Nature Sanctuary owned by GHNS Inc.,
- Private pasture lands, west of the GHNS, partially owned by Southdowns Enterprises, Inc., CLICO and various other landowners.

[10] Adopted from "Environment and development in coastal regions and in small islands" by Christoph Parker and Hazel A. Oxenford. www.unesco.org/csi/pub/papers/parker.htm

- Agricultural Lands held by the Ministry of Agriculture and Rural Development/ Barbados Agricultural Development and Marketing Corporation *inclusive* of the South Coast Sewage Treatment Facility.

To the North of the Graeme Hall Watershed 100-year floodplain

- Environmental Buffer along Escarpment, Rendezvous Ridge (as noted by the 1997 ARA Study) held by the Ministry of Agriculture and Rural Development/Barbados Agricultural Development and Marketing Corporation
- Agricultural Lands adjoining the ABC Highway that have been conditionally defined as an Urban Corridor.
- Ministry of Agriculture and Rural Development Complex and farm lands, east of the residential communities of Rendezvous and Amity Lodge and west of the Hwy 7 Roundabout at Graeme Hall.

The logical conclusion from this multiple tenure situation is that any covenants that would seek to protect the ecological character of the wetlands would have to extend to the owners within the Watershed 100-year floodplain. The model of co-stewardship or co-management has been suggested in our introduction.

2.4. Graeme Hall Land Designations

Land designations are based on specific characteristics of the landscape which the owners or decision makers wish to protect. Real estate agents tend to regard land designations as having the effect of immediately and permanently reducing the market value of the land as well as restricting the current use of the land. Our approach is to regard land designations as a reflection of official and non-official intentions to place on a national agenda the values of the designated landscape that require preservation.

When a land asset is located within such a diversified land-use mosaic as the southwest coast of Barbados, land designations become a first line of defense against undesired changes in land use. There are four (4) land designations which have been applied to the Graeme Hall landscape, all of which tend to point to specific values of the area.

2.4.1. The Ramsar Site

The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an intergovernmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The Convention promotes the conservation of wetlands and their resources through the concept of "wise use". Wise use basically means making use of a wetland in a sustainable way so that it may yield the greatest continuous benefit to present and future generations.

The Graeme Hall Swamp was designated Ramsar Site no. 1591 on 12 April, 2006. This designation sets out the landscape characteristics that recommend the elevation of its status to that of "International Importance" for wildlife.[11] This recognition automatically positions the Graeme Hall Swamp as a positive focal point for new education, tourism and environmental initiatives.

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[11] "**Graeme Hall Swamp**. *12/12/05*; 33 ha; 13°04'N 059°35'W. A naturally created coastal wetland area with mangrove forests, a seagrass bed, and a shallow nearshore coral reef, which includes a 12-acre artificially-created lake that constitutes the largest body of inland water on the island. Ecotourism and environmental educational and research

There are 21 such designations within the Caribbean. Annex 1 lists the Ramsar Sites in full detail within the Caribbean basin (CARIFORUM countries)

Table 1: Ramsar Sites in the Wider Caribbean

Country (# Sites)	Size (Hectares)	Country (# Sites)	Size (Hectares)
ANTIGUA & BARBUDA (1)	3,600	DOMINICAN REPUBLIC (1)	20,000
BAHAMAS (1)	32,600	JAMAICA (3)	37,765
BARBADOS (1)	33	SAINT LUCIA (2)	85
BELIZE (2)	23,592	SURINAME (1)	12,000
CUBA (6)	1,188,411	TRINIDAD & TOBAGO (3)	15,919

Source: Ramsar Website: Listing of Important Wetlands

The landscape features of this site include the following:

- The largest remaining areas of red (Rhizophora mangle) and white (Avicennia racemosa) mangroves;
  - Red mangroves dominate much of the lake shoreline, although white mangroves dominate the northeastern shore.
- The largest body of inland water in Barbados;
- The swamp serves as a central drainage point of a 1,158 acre watershed area.
- In previous times, the mangrove wetland, seagrass bed and shallow nearshore hard coral reef ecosystems interacted with each other as one large ecosystem;
  - Currently a narrow sluice gate connects the Swamp to the marine area
  - A network of man-made drainage canals have been constructed, where the banks of these canals support a dense growth of sedges and strips of grasslands

The Biotic and non-Biotic features include the following:

- At least 44 bird species including locally threatened species such as Caribbean coot (*Fulica caribaea*) and Yellow warbler (*Dendroica petechia*),
- Roost area for migratory and native water birds, one of only three primary roost areas in Barbados within the Eastern Caribbean Flyway
- The oldest nesting colony for the snowy egret (*Egretta thula)* is at the swamp, as is the first known breeding colony of Little Egret (*Egretta garzetta*) to become established in the Americas.
- A wide variety of fish, crustacean, bird and mammalian species inhabit the swamp.
- More than 20 fresh and brackish water fish species, among the most interesting of which are those marine species that have become isolated from the sea and become breeding residents of the lake.
- Other species include the green monkey (Chlorocebus aethiops), mongoose (Herpestes javanicus), fisherman bat (Noctilio leporinus), several herpetile species, a wide diversity of invertebrate life and aquatic life

As a signatory to the Ramsar Convention, the Government of Barbados accedes to four main obligations set within the community of sovereign states. These are:

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activities are the chief human uses of the site, which has been proposed as a National Heritage Site". See *The Annotated Ramsar List: Barbados.*

1. Maintain the ecological character of the Site (Article 2);
2. Include wetland conservation considerations within the national land-use planning so as to promote, as far as possible, the wise use of wetlands (Article 3);
3. Promote the conservation of wetlands in their territory through the establishment of nature reserves on wetlands (Article 4);
4. International cooperation in support of the preservation of wetlands that transcend national boundaries (Article 5).

2.4.2. The Natural Heritage Conservation Area

Natural Heritage Conservation areas are sensitive natural environments which require protection from potentially incompatible development. The Physical Development Plan (Amended 2003) has identified the Graeme Hall Swamp as one of such areas. The purpose of this designation[12] is to:

- conserve and enhance the environmental quality and visual integrity of sites of ecological and geological importance;
- ensure that new development is compatible with the natural heritage and landscape qualities of these areas;
- define and protect a functionally connected natural heritage system based on an ecosystem approach.

The designation established the importance of the Graeme Hall Ecosystem in the social and economic life of Barbados. The Physical Development Plan (Amended 2003) recognizes that "*Barbados near-shore marine ecosystem is one of its most important natural resources and provides the major tourism and recreational attraction for the island*."[13]

2.4.3. The National Park (designate)

The designation of a National Park has been proposed but not acted upon. Such a designation would have the explicit intent of protecting this area and its surrounding upland buffers. Wetland management best practices encourage buffer lands on all sides of the wetlands. Thus, besides providing a more credible management structure (the present dependent on the cooperation of the individual land owners), such a designation would control the undesirable uses of the watershed area (dumping) as well as provide a wider range of recreational facilities within the buffer.

2.4.4. The Nature Sanctuary

The "Nature Sanctuary" is an owner-applied designation that signals the purpose of the acquisitions and infrastructure work conducted by the Graeme Hall Nature Sanctuary Inc., namely the conservation of the Wetlands of Graeme Hall.

> *"As part of its mission in the Caribbean, GHNS is facilitating the preservation of 34.25 acres of Graeme Hall Swamp in one of the most densely populated areas of the island. Residential and commercial tourism development surrounds the swamp along the southern, eastern, western and northwestern boundaries, a main coastal*

[12] Physical Development Plan (Amended 2003) Government of Barbados, Natural Heritage Conservation Areas. Sec:4.3.3.3
[13] Ibid., at 4.3.3 OS2

road (Hwy 7) runs between the swamp and the sea on the south side, and agricultural lands border the swamp along the northeastern side"[14]

The restoration of the area includes carefully designed walk-ways, aviaries, observation points and open space, constructed in a manner that brings about the least impact on the nesting activity of the birds. The Sanctuary creates an oasis of natural heritage within a continuum of built tourism related facilities all along the south coast of Barbados.

This designation broadens the "conservation commitment" of GHNS to the wider ecosystem. It is this definition more than any other that justifies our conclusion that GHNS is a private investment that is creating public value.

2.5. Conclusion

There are four main land designations of Graeme Hall that effectively define the character and importance of this natural asset. The designations have established the Graeme Hall Wetlands as a resource of such international importance that its ecological character is being promoted by an international convention. Furthermore, the Barbadian development planning model has recognized its role in tourism and recreational attraction to the island. In pursuit of the preservation of this resource, there are those who have invested millions of dollars to restore its features, educate the public and establish its pre-eminence in the south coast community. There are also those who would seek to require the lands in the buffer zone of the wetlands to be included in a comprehensive plan of compatible land use. Rather than restricting the value-in-use of this landscape, these land designations have confirmed the need to accentuate the value of its most precious character, the wetlands.

[14] Mimeo, "The Graeme Hall Environmental Heritage Site and Graeme Hall Nature Sanctuary", by Stuart Heaslet, 8, May 2006. p.4.

3. WETLAND FUNCTIONS AND USES

3.1. Definitions

Wetland functions are defined as physical, chemical, and/or biological processes that occur within the wetland systems[15]. These are the ecological characteristics of the resource that define both the landscape and the continuous changes in its structure. The concept of Wetland services is used to make the linkage between the dynamic, ever changing attributes of wetland functions and human welfare. Wetland services can stand apart from the uses of these services. In other words the wetlands may provide a service that is not explicitly captured and used by humans but nevertheless is a critical component of the complex set of determinants of human welfare.

Wetlands are multi-functional resources *par excellence*. They supply us with a number of important resource outputs, perform functions that support human life and welfare and allow us to utilize various aspects in order to create ecological, socio-cultural and economic value. The Graeme Hall wetlands capture all three of these roles. The functions and the uses made of the resultant services that attribute value to the Graeme Hall Wetlands are listed as below.

3.2. Eco-System Uses

Habitat Preservation

The Graeme Hall wetlands are home to 40 resident / seasonally resident bird species as well as a great many more migratory species. In recent years several new species have become established as breeding residents through the intervention of the Graeme Hall Nature Sanctuary. The restoration of the Lake, shallow freshwater ponds to attract migratory birds as well as a minimum intrusion of human activities have contributed to maintaining the quality habitat for fishery, birds and other wildlife species. The Graeme Hall Nature Sanctuary also hosts a wealth of socio-cultural history through its exhibitions of the fauna and flora present within the site.

Scientific Monitoring

Established within the Graeme Hall Swamp is one of two CARICOMP[16] monitoring sites in Barbados. This one monitors the mangrove wetland at Graeme Hall in conjunction with the nearly adjoining coastal seagrass bed at St. Lawrence Lagoon. This is part of a network of 25 institutions in 16 countries in the Caribbean basin established in 1990. Water quality is monitored directly by GHNS in relation to the activities of its designated Sanctuary. Being the lowest point of the wetlands, the GHNS also attempts to identify pollution source points from elsewhere in the 1,158-acre Graeme Hall Swamp Watershed, and compares data with known mangrove swamp ecosystems. A monitoring programme for the Biotic environment was established in October 2000.

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[15] See Measuring the Benefits of Federal Wetlands Programs, Paul F. Scodari, Environmental Law Institute, 1997

[16] The Caribbean Coastal Marine Productivity (CARICOMP) programme is a research and monitoring network of marine laboratories, parks and reserves in the Caribbean Basin. The principal goals of the program are to determine the dominant influences on coastal productivity and to discriminate human disturbance from long-term natural variation in coastal systems.

3.3. Non-Consumptive Uses

Visitation

The Visitation function connects the existence of the Sanctuary to the economic and social life of south coast communities in particular and Barbadians in general. The nature trail through the Sanctuary has been designed to allow close access and excellent viewing along the edges of the main lake, ponds and shallow feeding trays, dense mangroves and other native vegetation areas. This network of walk-ways serves as a buffer to human intrusion into the landscape with the minimum of impact on wildlife or the aesthetic value. The breathtaking lake side view also provides the perfect backdrop for special events

Educational

Public value can be described as the widely held perceptions of the public regarding the function and service contributions of any public entity[17]. One of the tasks of stewards of a nature ecosystem is to strive to increase the public perception of the value of this nature asset. Education becomes the most valuable function in influencing public perception of the Graeme Hall Swamp.

The GHNS provides guided educational tours by a qualified Biologist or educational officer to organized school groups. As a free service, GHNS is providing site-based and classroom curricula to all schools in Barbados, and is promoting teacher education curricula for environmental education. The resources in the GHNS are well established to allow the institution to aggressively expand a public conservation education agenda, helping citizens and visitors to Barbados to appreciate the Graeme Hall Swamp as a major Barbados National Heritage Site.

Diversification of Tourism Product

Barbados is a mature tourism destination that needs to continuously rejuvenate itself to be competitive in the global market. In a 2004 article, Potter and Phillips used the Butler model of cyclical tourism development (exploration, involvement, development, consolidation, stagnation, and either rejuvenation, stability, or decline) to argue the case for the rejuvenation of tourism in Barbados.[18] As the global market takes a strong turn towards tourism as an environmental-friendly activity, the Graeme Hall Wetlands, can become a full representation of the Eco-tourism approach in practice.

Eco-tourism typically involves travel to destinations where flora, fauna, and cultural heritage are the primary attractions. Ideally, the Graeme Hall wetlands satisfy several general criteria associated with Eco-tourism, including the conservation of biological diversity and cultural diversity through ecosystem protection, promotion of sustainable use of biodiversity, share of socio-economic benefits with local communities through informed consent and participation, increase in environmental and cultural knowledge, affordability and reduced waste, and minimization of its own environmental impact.

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[17] See **"Public Value of Nature: Economics of Urban Trees, Parks and Open Spac**e" by Kathleen L. Wolf; *University of Washington, College of Forest Resources,* In Miller, D. & J. A. Wise (eds.). 2004. *Design with Spirit: Proceedings of the 35th Annual Conference of the Environmental Design Research Association***.**

[18] **Rejuvenation of Tourism in Barbados 1993-2003: Reflections on the Butler model",** Robert B. Potter and Joan Phillips, Journal of the Geographical Association, 2004.

Validation of International Obligations

The legal obligations to conservation are registered in Barbados' acedence to international conventions as well as its own development plans. These include the following:

- ***Ramsar Convention*** – A designation that makes Barbados eligible to access and receive some of the financial and non-financial benefits from accession to the Convention[19];
- ***Convention on Biological Diversity*** (CBD) emphasizing conservation and sustainable use;
- ***Convention on International Trade in Endangered Species*** (CITES) which ensures that such trade does not threaten the survival of the species;
- ***Protocol on Specially Protected Areas and Wildlife*** (SPAW) assist Caribbean Governments in protecting rare and fragile ecosystems within the implementation of the CBD;
- ***Protocol on Land-based Sources of Marine Pollution*** (LBS) directed at (among other) domestic waste water point source of marine pollution and its impact on fisheries and tourism;
- ***Barbados National Physical Development Plan*** which designated Graeme Hall as a Natural Heritage Conservation Area;
- ***National Biodiversity Strategy and Action Plan*** (NBSAP) which specifically mentions the Graeme Hall Swamp and its environs;
- ***Coastal Zone Management Act and Plan*** (CZMA & CZMP) which seeks to establish the Graeme Hall Swamp as a Biodiversity Reference Area;
- ***Marine Pollution Control Act*** (MPCA) enacted to prevent reduce and control pollution of the marine environment from whatever source.

The protection of habitat, monitoring of changes in coastal zone, the preservation of wetlands are all activities undertaken by the Graeme Hall Nature Sanctuary which can be used by Government as evidence of it's intention to honor its international obligations.

3.4. Consumptive Uses

Agricultural Activities

The Ministry of Agriculture and Rural Development/Barbados Agricultural Development and Marketing Corporation provide supporting infrastructure for farming in the upland areas between the 100-year floodplain and ABC Highway/Rendezvous Ridge/Harmony Hall. The Research station of the Ministry of Agriculture is responsible for the cultivation of about 97 acres of land to produce such crops as potatoes, corn, cassava, pumpkin, sweet/hot peppers, onions, beans, cotton and carrots. The conflict in agricultural uses in the wetlands flood plain arises more from the potential pollution from chemicals used in agriculture than from the activity of farming itself. The potential remains for the use of less polluting inputs and the development of a more eco-friendly but complex farming systems in response to unique physical conditions. Cultural landscapes rich in agro-biodiversity[20] are currently being recognized as being ecologically stable and sustainable processes in food security.

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[19] Master Plan op. cit., "Ramsar Convention in the Barbadian Context".

[20] Protecting Landscapes and biodiversity values: an overview, by Adrian Phillips and Sue Stolton in Protected Landscapes and Agrobiodiversity Values eds Thora Amend, Jessica Brown et al., IUCN Commission on Protected Areas. 2008

3.5. Destructive Uses

Sewage Discharge

Most human activities (e.g. cultivation, habitation, transportation) require space and a suitable substrate (soil) or medium (water, air) to recycle the "waste" material produced. Wetlands have traditionally supported this role. However, the installation of the South Coast Sewerage Treatment Plant within the Graeme Hall Swamp has raised the issue of the emergency discharge of overflow directly into the wetlands. If the Plant has to stop for any reason, its existing sewer lines have the capacity to store sewage for a period of about eight (8) hours before the sewage starts to overflow out of the sewer manholes onto the ground surface. The emergency spillway plan, designed to send such overflow into the sea is not acceptable to the major stakeholders in the tourism industry. The Barbados Water Authority has actually diverted raw sewage into the wetlands in order to avoid using the sanctioned emergency outfall.

Vector Control

The presence of the Anopheles Mosquito within the Graeme Hall Swamp is a matter of serious concern. This vector is a major transmitter of Dengue Fever. The Ministry of Health currently uses Malathion to suppress its growth, a measure that has serious collateral effects itself. The fact is that the longer the body of water within the Graeme Hall Swamp takes to interface with water from the ocean, the greater the build up of bacteria within the brackish water with implications for nose and throat infections to sea bathers when the flushing finally takes place. A more closely regulated system of reconnecting the interchange between the wetlands and the sea is a high priority.

3.6. Ranking Wetland Uses

If we are to measure the value at an ecosystem level, we would need to do more than weigh the positive and negative uses. We would need to prioritize these uses in terms of their recognizable importance to the welfare of the south-coast community, the general public and the national economy. Market prices are usually used to objectively determine such priorities with higher valued uses being considered at the top. However, this is not feasible in our case since most of these uses are not exclusive neither to the owner nor to the consumer, and as such do not satisfy the basic criteria for market exchange.

If, however, we consider the economic fortunes of Barbados to be the most important determinant of its future well being, then the benefits of the Graeme Hall Wetlands to the Tourism sector would be weighed proportionally higher. These would be the habitat preservation, public visitation and validation of its international commitment to environmental management. If we consider our threshold test to be the geographical survival of a small island in the face of changing environmental conditions, then the scientific monitoring uses as well as the educational/research uses would be ranked high. Even if we consider the major challenge to south-coast tourism to be the protection of the beaches from sewage pollution, the Wetland function of "sewage spillway of last resort" may be seen as a negative use of the wetlands but a positive benefit of insurance against a major decline in tourist arrivals.

While these relative rankings are not an adequate substitute for quantitative comparisons, they do point in one direction. They all allow us to conceptualize the loss that may be inflicted on economic and social welfare of Barbados by the absence of the wetlands at Graeme Hall. The existence of the Graeme Hall Wetlands is neither an accident nor an insignificant incident in respect to the future of Barbados. Ignoring or miniaturizing its existence value can result in very poor policy decisions and grave consequences.

The current crisis in the disappearance of honey bees, **Colony Collapse Disorder** (or **CCD**) is an example of how something so small can matter so much. Scientists are currently trying to understand this phenomenon simply because honey bees add about $15 billion a year to the value of U.S. crops by pollinating fruit, vegetable, tree nut and berry crops[21]. Habitat and environment that maintain the existence of bees now take on a different dimension of importance.

[21] "**Colony Collapse Disorder**: Researchers Work To Control Varroa Mites, Increase Longevity Of Queen Bees" Science Daily (Feb. 16, 2008),

4. THE VALUATION FRAMEWORK

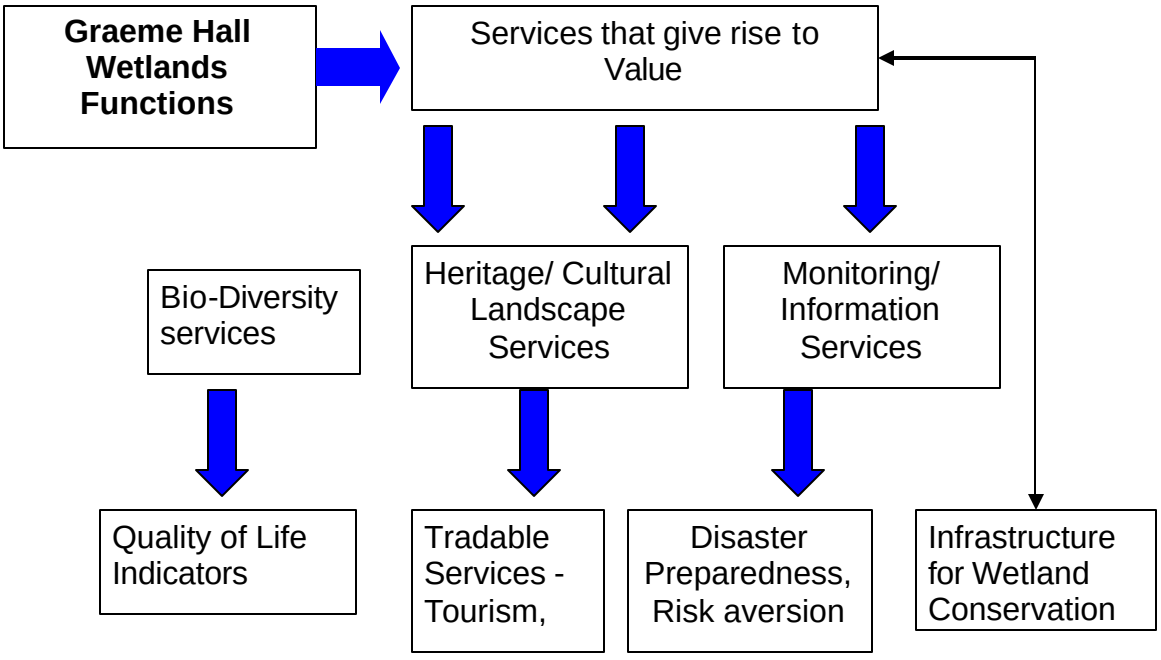
4.1. Value Chain of Wetland Services

There are two main reasons for attempting to impute values to the functions and subsequent services provided by the wetlands in Graeme Hall. The first is that decisions which view alternative uses of these lands as intrinsically more valuable can result in marginal changes that can be detrimental to the resource. A wetland does not need to be entirely lost to reduce its value. Such decisions usually occur when the value of a resource is considered "unaccountable" or "unknown".

The second reason is the recognition that the Graeme Hall Wetlands are not an unhindered natural occurrence with its own intrinsic existence value. The current status of the wetlands at Graeme Hall is the result of a significant amount of investments in its preservation/ conservation by the owners of the Graeme Hall Nature Sanctuary. These investments, like investments in other physical infrastructure that enhance the value of other lands, should be recognized.

Our model of the value of the Graeme Hall Wetlands draws heavily on the concept of nature as capital. Figure 2 illustrates this model.

Figure 2: Value Chain of Wetland Services



In general, a capital good is considered to be a stock of materials (tangible) or information (intangible) that can generate services of value to humanity. Like any other capital good, wetland functions generate a range of services, either autonomously or in conjunction with the services of other capital goods, which enter directly or indirectly into the value chain in society. This flow of services may be used to transform materials or the spatial configuration of materials in order to enhance the welfare of humans

Our analysis has identified 12 wetland functions and resultant services to which we have attempted to impute values. Table 2 indicates the range of these functions and services.

Table 2: Wetland Functions and Services identified in this study

#	Function	Services	Occurrence
1	Habitat	Roosting and breeding	▪ Red seal coots, sand pipers and egrets
2	Refuge	Safe lay-over site for resident and transient populations	▪ Eastern Caribbean Flyway for Birds
3	Regulating Hydrological Flows	Water regulation	▪ Watershed Drainage
4	Storage and retention of water	Water supply	▪ Provision of water by watershed and aquifer
5	Host of unique biological material	Genetic resources	▪ White mangrove ▪ Red mangrove
6	Capacitance and absorption of pollutants	Disturbance regulation	▪ Upland runoff
7	Removal or breakdown of excess compounds	Emergency waste treatment	▪ South coast Sewage Plan emergency
8	Wetland Maintenance	Environmental Land use practices	▪ Ramsar convention ▪ International obligations
9	Monitoring Site	Adjustment in coastal zone to global changes	▪ CARICOMP Project
10	Landscape Heritage	Quality of life	▪ Open green space ▪ Lower population density ▪ Diversified land use
11	Landscape Heritage	Cultural attraction	▪ Heritage site ▪ Tour destination ▪ Recreational potential
12	Information Repository	Education and awareness	▪ Scientific research ▪ Historical content

4.2. Identifying Wetland Values

Wetland values refer to the explicit task of identifying and measuring the benefits that human welfare and indeed human survival obtain from the services of wetlands. There are two inherent challenges in attaching "values" to ecological systems such as wetlands. The first has to do with the concept of valuation in general and the second has to do with values as emanating from wetlands in particular.

In the concept of valuation, there are two world views. The first deals with values on the margin, where the value of the resource (at least in its current use) is equal to the opportunity cost of its next best use. This is the world of margins in which the classical measures of economic value such as willingness to pay as reflected in market prices will suffice. But there is also a world beyond margins, in which non-linearities, non-substitutability, uncertainty and large spatial and temporal scales tend to dominate. Wetlands are very strong representations of this world.

The second challenge has to do with the two types of values that wetlands can produce. Wetlands can produce value represented by its contribution to economic or ecological welfare and health. Wetlands can also produce value in the signals they send from their changing characteristics. The

latter result in useful indicators that can direct policy and practices to preserve, enhance or sustain human welfare.

We have identified four (4) categories of economic values associated with the Graeme Hall wetlands. These are:

a) The infrastructure investments of the Graeme Hall Nature Sanctuary which not only restored the functional capacity of the Graeme Hall Swamp as a wetlands ecosystem but continues to allow non-intrusive interaction by the public at large;

b) The values associated with information monitoring, protection and risk aversion in the coastal environment (preparedness against sea level changes);

c) The values associated with the critical linkages to the tourism service sector of the economy;

d) The values from bio-diversity, habitat preservation and associated quality of life indicators.

4.3. Measuring Wetland Values

Using Replacement Costs

The Australian Accounting Standards Board (AASB) makes accounting standards for the private, public and not-for-profit sectors and participates in the formulation of international accounting standards. AASB provides guidance to the valuation of specialized assets. It suggests that the fair value of such assets should be valued as follows:

> *"An entity revaluing a non-current asset may need to estimate its fair value because of, for example, the absence of a market in the relevant second-hand non-current assets. In these circumstances, an estimate of fair value, based on the replacement cost of the asset's remaining future economic benefits, may be made by reference to the market buying price of components used to produce the asset or the indexed price for the asset based on a price from a previous reporting period".*[22]

The assets of the infrastructure of GHNS, namely the visitors' centre, walkways, aviaries, man-made ponds and observation decks are specialized assets which will be valued in terms of their replacement costs.

Using Avoidance Costs

Avoidance costs are actual or imputed costs for preventing environmental deterioration by alternative production and consumption processes. In the situation with respect to the South Coast Sewerage Treatment Plant, the issue is that the Graeme Hall Wetlands are being used to avoid the risks associated with the established emergency spillway which is an outfall to the adjacent sea. The risks are to the seagrass, the coral reef and the South Coast beaches which are of substantive value to the Barbadian Tourism sector. If policy makers have to make trade-offs between the damage to the wetlands versus the damage to the tourism sector, it is fundamentally important for them to know what is being traded-off against what. This study values an appropriate solution to the emergency spillway that would not impact negatively on the tourism sector nor take unsolicited advantage of the existence of the wetlands in its drainage path. This cost of such a solution represents the cost that is being avoided by using the wetlands.

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[22] AASB 1040 Revaluation of Non-current assets: July 2001, para 5.8.1

Using Value Implications of economic linkages

There are two basic processes that would allow wetlands to continue to play a positive role in economic activities. These are "Environmental Stewardship" and "Socially Responsible Use". Both of these are pursued in the policies and programmes of the Graeme Hall Nature Sanctuary. This study seeks to evaluate the economic linkages to the Graeme Hall Wetlands. Inclusive among these are the wetlands contribution to quality of life of the local South coast community, attracting tourist visitors to the Barbados destination, monitoring and generating information critical to the management of changes (global warming and sea level rise) in the coastal zone and the preservation of a heritage landscape for future generations.

Measuring Impact on Quality of Life

The quality of life in any community is a composite of social, economic and environmental factors. Factor analysis is the statistical technique that we would have used to determine the number of underlying factors. We do not undertake such an analysis, but other studies in the literature give us a glimpse of what is involved. These studies tend to show that vegetation greenness and urban land use[23] are important indicators of quality of life, with high greenness and low percentage of urban use being of higher quality.

One analysis attempts to attribute some measure of the quality of life in the local community (Christ Church Parish) to the role of the wetlands in providing green space and supporting the social and economic sustainability of the community. This approach is supported by a study conducted on the quality of life in the city of Indianapolis. This analysis integrated remote sensing to capture the geo-physical characteristics and census data to capture the economic and social characteristics; an approach which is quite feasible in the context of Barbados. The regression result showed that "Green Vegetation" had a significant positive relationship with the high end of the social and economic characteristics (income variables, median house value, median number of rooms and education level), and a negative relationship with density variables representing urban land use (temperature, impervious surface, percentage of poverty and unemployment rate)[24].

4.4. Total Value Approach

Our approach is to consider the total value of the Graeme Hall Wetlands as the summation of the various specialized value components. These components include the replacement value of the infrastructure that maintains the wetlands, the value of wetland uses and the value of wetland economic linkages. Some of these have already been quantified. Others would require desk-top estimates of their equivalent value at market prices. Hopefully these estimate can be further refined with more detailed studies.

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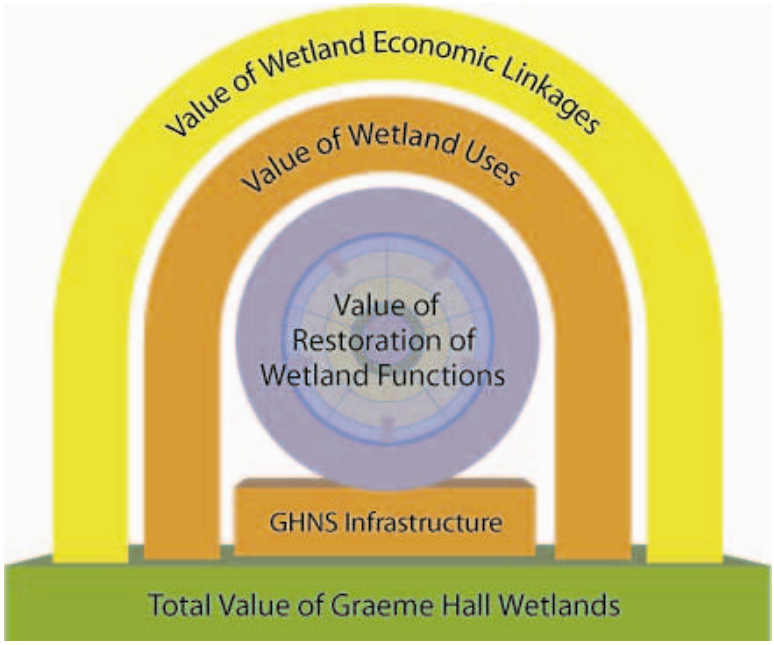
[23] Urban land use such as transportation, commercial and industrial uses are described as impervious surface, although impervious surface is not limited to urban use. Impervious surface may also include some features in residential areas, such as buildings and sidewalks.

[24] Measuring the quality of life in city of Indianapolis by integration of Remote Sensing and Census Data. G. LI and Q. WENG, Department of Geography, Geology, and Anthropology, Indiana State University, 31 March 2006

Figure 3: Illustration of the Total Value Approach.



(Adopted from an illustration in a Report on BP's Impact with Rural Communities by Paul Caulfield)

5. COMPONENTS OF WETLAND VALUES

5.1. Conservation Infrastructure

The Graeme Hall Nature Sanctuary has played a significant role in restoring the Graeme Hall Wetlands and conserving its ecological characteristics. This has been recognized officially in the Master Plan for the Graeme Hall Coastal Ecosystem.[25] The infrastructure provided by the GHNS comprises four (4) major facilities, viz.;

- basic utilities
- reception facilities
- exhibition facilities
- landscape protection facilities

The basic utilities comprise electricity, water, sewage, telephone, gas, security and maintenance. The reception facilities include the visitors' center, entrance and parking, reception area and amphitheatre. There are five (5) built exhibition structures including Gully Aviary, Marshland Aviary, Migratory Bird Exhibit and Aviary, St. Vincent Aviary Exhibit and Interpretive Exhibits. Also included in this component are the bird ponds to attract migratory species and the educational pavilions. Finally landscape protection facilities include roadway, canals, paths and bridges. The Landscaping, Architectural, Engineering, Quantity Survey, Environmental Assessment Fees are also attached to this component.

5.2. Private Buffer Lands

The lands to the west of the Graeme Hall Nature Sanctuary, while having alternative land use value, are currently used as a buffer[26] to the core nature resource, the mangroves and its habitat. Figure 4 provides a graphic illustration of the characteristics of the buffer zone to the extreme west of the wetlands. These lands are adjacent to the residential communities of Amity Lodge and Rendezvous to the west and north. As land development potential, the value of these lands would be predominantly determined by the characteristics of their location. Our expectation of market values for this area is conditioned by the following:

a. The land owners are likely to seek closer associative value with easy accessibility from the main artery leading out from the capital city, Bridgetown, Highway 7;

b. The land owners are also likely to seek premiums from the existence of a restored and internationally recognized wetlands in Graeme Hall (a Ramsar Site and a Heritage Conservation Area) even though such land use changes would impact negatively on the ecological character of the Graeme Hall wetlands.

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[25] "Once the Graeme Hall Nature Sanctuary began its restoration and development of the western section in the early 1990s, indiscriminate use of the swamp was severely curtailed" Master Plan for the Graeme Hall Coastal Ecosystem. Chpt. 1. Site Description, p.3.

[26] Buffer zones are crucial in the protection of both sensitive habitat and bio-diversity. See "Use of buffer zones for the protection of environmental habitats in Canada" Authors: Kuchnicki, T. C., Clarke, A. E., François, D. L., Glaser, J. D., Hodge, V. A., Wolf, T. M., Pest Management Regulatory Agency, 2720 Riverside Drive, Ottawa, ON, K1A 0K9, Canada.

Figure 4: Graeme Hall Lands (Orientation looking West)

5.3. Emergency Spillway Services

The existence of the South Coast Sewage Treatment Facility poses a serious challenge to the integrity of the Graeme Hall Wetlands. The emergency outfall system for this facility is based on the notion of the assimilative capacity of the ocean. But using an outfall off the coast of Graeme Hall can result in damage to the seagrass as well as contamination of the beaches and coastal waters

This challenge emerged in 2005 when emergency raw sewage was discharged into the Wetlands. According to the Report on the Master Plan for Graeme Hall, in 2005, the Barbados Water Authority, *"under pressure from hotels and beach tourism interests, re-direct(ed) the raw sewage into Graeme Hall Swamp, instead of the designed emergency outfall system to the bisecting canal and on to the sea*."[27] Our expectation is that when volumes exceed the capacity of this facility, the Graeme Hall Wetlands will continue to be used as the preferred option for inappropriately directed discharges.

[27] Master Plan, op.cit., "Failure on Effluent Discharge Line"

5.4. Eco-System Monitoring

The coastal zone of Barbados is recognized as a key element in the country's tourism sector. This is why the CARICOMP programme is a valuable service to planning in the sector. The Caribbean Coastal Marine Productivity (CARICOMP) Programme is regional scientific effort to study land-sea interaction process, to monitor for change, and to provide appropriate scientific information for management. The Programme focuses on understanding the productivity, structure and functions of three important coastal ecosystems: mangroves, seagrasses and reefs, throughout the region.

The site monitoring in the Graeme Hall Wetlands provides the base-line data on coastal diversity and helps the nation to document threshold responses of this ecosystem to global changes including human impact and climate change.

5.5. Tourism Sector Support

Tourism is largely a private sector activity that utilizes public assets for private gain and in the south coast the Wetlands are the important public assets. The relationship between tourism and wetlands is however complex and sometimes adversarial. In Barbados, Tourism is the main driver of the economy contributing nearly close to 15% of the island's Gross Domestic Product (GDP). The provisional **Barbados Central Bank** figures indicate that in 2007, the sector earned about $172 million out of GDP that was estimated at $1.15 billion

The Graeme Hall Nature Sanctuary has established a strong linkage with the tourism sector in three major areas:

a) As a destination tour
b) As a valid component in the diversification of the tourism product
c) As validation of new advertising theme for the country brand.

Barbados is largely a "tour operator business driven" destination. The key elements of Barbados' tourism product are its solid historical and cultural legacy, its political stability, varied entertainment and its natural physical attributes. The new direction taken by the Barbados Tourism Authority to promote environmentally friendly practices among its members[28] and the community indicates the benefits that are expected to be reaped from an environmental profile.

Pursuant to this goal will be efforts to re-brand Barbados as a ""Green Tourism Destination". There is a major pitfall in developing advertising themes that would effectively portray this vision. That is the charge of "*greenwashing*". This term (a combination of green and whitewash) is used to describe the act of misleading consumers regarding the environmental practices of a company or country, or the environmental benefits of a product or service. These factors are all essential components determining the level of visitor arrivals to destination Barbados.

[28] The establishment of the Barbados Environmental and Sustainable Tourism (BEST) Programme in collaboration with PA Consulting Group, Caribbean Alliance for Sustainable Tourism (CAST) and the Tourism Development Corporation (TDC), seeks to accomplish this.

5.6. Heritage Landscape

There is substantial literature on Wetland valuation to suggest that the landscape, its location and the functions it support are importance sources of value. A review of 190 wetland valuation studies showed that the wetlands with high values all shared key socio-economic and geo-referenced variables. The authors of this study collected over 190 wetland valuation studies in order to present a comprehensive meta-analysis of the valuation literature that includes tropical wetlands (e.g., mangroves), estimates from diverse valuation methodologies, and a broader range of wetland functions (e.g., biodiversity value). The regression analysis of 215 value observations,[29] revealed a high correlation between the value determined for the wetlands and the per capita incomes and spatial relationship. The spatial relationship was determined by distance from the population center, the availability of transportation, physical barriers to access and cultural norms regarding wetland values.

Graeme Hall would have probably scored high on the metrics of the spatial determinants as used in the global study are also sound, namely:

- *Distance to population center*: Graeme Hall is within 5 km of the capital city of Bridgetown
- *Transportation availability*: Highway 7 is a major road artery which runs parallel to the GHNS and is well serviced by public transportation. Local public transportation routes which service the area include Oistins/Speightstown omnibuses and public service vehicles licensed to operate on Route 11 of the transport network are also available.
- *Physical Barriers*: The restoration work done by GHNS now provides walkways, exhibition aviaries, lookouts, all designed to keep the intrusion of visitors at a minimum
- *Cultural Norms*: Barbados is gradually moving to a culture that is valuing the natural environment as an integral part of its developmental potential. The Graeme Hall Wetlands has direct implication for five of the eight sections in the structure of the Physical Development Plan Amended 2003[30], namely, Strategic Policies; Land Use Policies; National Open Space System; Community Plans; and National Park Plan.

The study of these 190 wetland valuations also revealed differences in wetland values resulting from the availability of different functions. Wetland functions such as water quality improvement, flood control, biodiversity and amenity provision tend to result in higher than average values, whereas functions that involve the provision of direct use natural resources, such as water supply, fuel wood and other materials tend to have lower than average values.[31] In our study the former would refer to habitat conservation and bio-diversity and the latter to emergency sewage spillway. The study concluded that socioeconomic variables, such as income and population density, that are often omitted from such analyses to be important in explaining wetland value. These two variables point to the role of wetlands in influencing the quality of life in the adjacent community.

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[29] The Empirics of Wetland Valuation: A Comprehensive Summary and a Meta-Analysis of the Literature. by Luke M. Brander, Rymond J. Floras and Jan E. Vermant. *Institute for Environmental Studies (IVM), Vrije Universiteit, Amsterdam*

[30] Physical Development Plan op. cit., 1.3 Structure of the Plan p. 1-4

[31] Empirics of Wetland Valuation op, cit., 4. Meta-Regression, p.25

5.7. Local Community Quality of Life

We argue the contribution of the Graeme Hall Wetlands to local quality of life on two bases. The first is its contribution to green open space and a lower density per Km^2 in the Parish of Christ Church. Table 3 shows the population density of the 11 Parishes of Barbados. In the urban corridor including the parishes of St. Michael and Christ Church, the density of the latter falls off by 59%.

Table 3: Population Density by Parish

Parish	Population	Area(km.²)	Area(mi.²)	Density per Km^2
Saint Michael	83,684	39	15	2,146
Christ Church	49,497	57	22	868
Saint James	22,741	31	12	734
Saint George	17,868	44	17	406
Saint Philip	22,864	60	23	381
Saint Thomas	12,397	34	13	365
Saint Peter	10,699	34	13	315
Saint Joseph	6,805	26	10	262
Saint John	8,873	34	13	261
Saint Lucy	9,328	36	14	259
Saint Andrew	5,254	36	14	146

Source: Barbados Census Data, 2002

The second and more important basis is its contribution to sustainability of economic life in the South coast communities. Sustainability is the key factor in quality of life. Studies have indicated that *"Sustainability thinking …. expands the perspective, recognizing that human wellbeing is influenced by social and economic, as well as environmental factors, and seeks to measure indicators in all three areas, but usually with emphasis on environmental indicators."*[32]

The Graeme Hall Wetlands support the sustainability of life in the south coast through its protection of the coastal zone, diversification of the tourism product and decrease in the urban density.

[32] MEASURING PROGRESS: Community Indicators and the Quality of Life. David Swain, DPA, Associate Director, Jacksonville Community Council Inc. April 2002

6. GRAEME HALL TOTAL VALUE

6.1. Components of Total Value

Our estimate of the total value of the Graeme Hall Wetlands aggregates values in three categories.

1) The value of the conservation of the Wetlands characteristics.
2) The value contribution of the wetlands to the tradable services in Barbados. These contributions are two-fold:
   - The contributions of the heritage, cultural and landscape services to Barbados Tourism
   - The contribution to risk aversion in the south west coast and disaster preparedness in coastal zone management.
3) The value of the wetlands preservation of bio-diversity to the quality of life in Barbados

Conservation Value:
The Replacement costs of the GHNS infrastructure has been estimated at US$23,635,520. The summary of these costs are as follows:

Table 4: Replacement Cost Estimates

1. Basic Utilities	$3,147,120
2. Reception Facilities:	$4,151,520
3. Exhibition Facilities:	$7,751,240
4. Landscape Protection Facilities:	$8,585,640
Total	**$23,635,520**

Source: Infrastructure Costs as detailed in Annex 2

Value of Buffer Zone Lands:
The lands in the buffer zone adjacent to the residential communities of Amity Lodge and Rendezvous comprise about 8 acres. These lands can easily be re-assigned to residential or tourist facilities development, in unison with the characteristics of the mixed land use corridor between Bridgetown and Oistins. This would of course reduce the buffer zone and impact negatively on maintaining the current ecological characteristics of the landscape. We have found listings (see Annex 3) of property in this location, quoted at US$18 per sq. ft., which translates into US$756,000 per acre, or a total value of $6.048 million.

Value of Risk Aversion:
The use of the Graeme Hall Wetlands as an emergency dump for South coast sewage is an insurance policy for protecting the coastal zone from possible contamination by a sewage outfall. Hypothetically, both parties, (the wetland conservationists and the beach tourism interests) would

be happy if the emergency outfall was located somewhere else. A comparable system was introduced in Atlanta USA between 2002 and 2005[33]. This project constructed an 8.5-mile, 16-foot-wide separate sewage tunnel in the northern part of Atlanta built to alleviate spills from the combined sewer that had plagued the area since the 1980s. The cost of the project was $173 million[34]. Sending emergency spillway 8 miles east of Graeme Hall would deposit such material around Long Bay on the Atlantic coast. This is one representation of the magnitude of the avoidance cost that the wetlands in Graeme Hall is forced to provide as surety for the South Coast tourism.

Value of Disaster Preparedness:
The monitoring activities of both water quality and changes in the coastal zone will continue to produce information that is invaluable to Barbados' preparation for disasters at both the local (community) level and the national (island-wide) level. We would not wish to miniaturize these threats by speculating on the value of this information.

Value to Tourism Services:
The value of the wetlands to the tourist sector is reflected in its impact on "long-stay" tourist arrivals, i.e. repeat visitors who regard the wetlands as a memorable experience or others who are motivated by the environmentally friendly "brand" of destination Barbados.[35] In the absence of any studies that have disaggregated the motivation of visitors or the appeal of the tourism product, we are forced to guess estimate, a not too uncommon practice in multi-dimensional responses[36]. We would regard as moderate to low and estimate of Graeme Hall Wetlands contribution to tourist arrivals at 15%.

If we accept the number of "long-stay" visitors to Barbados at 563,024 in 2006,[37] and if we also accept the estimate of tourist expenditures of $1,252 per visitor[38] (2004), then this would translate into tourist expenditures of $705 million. Graeme Hall Wetlands value to tourism services (15% of this value estimate) would be in the vicinity of $105,736,000

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[33] City of Atlanta, Department of Watershed Management, Nancy Creek Tunnel Relief Sewage Project. www.cleanwateratlanta.org/NancyCreek/Overview/fProjDesc.htm.

[34] See **Cleaning up sewer spills, American City and Council,** Nov 1, 2007 12:00 PM

[35] The role of environment in the new "Brand Barbados" is receiving significant attention. The Barbados Tourism Authority (BTA) speaks of creating a "Quality Experience" in reference to promoting Barbados in the global competition is for luxury destinations. In a special advertising focus, Business Week (UK) the claim is made that "The bottom line is that the only sustainable option for tourism on a small island state like Barbados is to offer quality over quantity, and to offer it all year round". Business Week (UK): Business Focus: Island Economies, Special Advertising Section, 2006. **www.businessfocus.org.uk.**

[36] "Guessing" Parameter Estimates for Multidimensional Item Response Theory Models, Christine E. DeMars, James Madison University, Educational and Psychological Measurement, Vol. 67, No. 3, 433-446 (2007).

[37] Barbados Economic and Social Report, Economic Planning and Research Unit, Ministry of Economic Affairs and Development, May 2007 p.62.

[38] Central Bank Estimates Table 51: **Estimated Visitor Expenditure by Type of Visitor - 2004**

Value of supporting local Quality of Life:

The Economist Intelligence Unit in 2005, ranked 111 countries based on a methodology that linked the results of subjective life-satisfaction surveys to the objective determinants of quality of life (GDP per capita) across countries. Barbados is ranked 33rd by the UN QOL index and 36th in ranking of GDP per capita[39]. The difference in both rankings is very small, implying that on a comparative level these values appear to be similar. Using the GDP per capita value we can estimate a QOL value for the 49,500 residents of the parish of Christ Church at $823 million.

How much of this would we attribute to the existence of the Graeme Hall Wetlands? The mixed use corridor along the south coast includes the parishes of St. Michael (Bridgetown) and Christ Church where the population density is dramatically different (59% lower in Christ Church). The restored structure of the Graeme Hall Wetlands, its accessibility through the Graeme Hall Nature Sanctuary all contribute in excess of any other identifiable factors to maintaining property values and the economic viability of tourist establishments in that area. We feel that 30% would be a low estimation of the value of this significant contribution to the Quality of Life in Christ Church Parish. That would be an equivalent value of $242.8 million.

6.2. Estimate of Total Value

Table 5 sets our initial assessment of the value of the services of the Graeme Hall Wetlands (under speculative assumptions) annually at $551.3 million.

Table 5: Estimation of Total Valuation

WETLAND SERVICES	WETLAND VALUE	Value Method	ESTIMATE
Wetland Conservation Values	GHNS Replacement Value	Replacement Cost	$ 23,635,520
	Buffer Zone Value	Real Estate Market Prices	$ 6,048,000
Heritage Cultural Landscape Values	Tourism Sector Support	Proportionate Tourist Expenditure Estimates	$105,736,000
Wetland Emergency Avoidance	Risk Aversion	Avoidance Cost - Market Price	$173,000,000
CARICOMP Monitoring	Disaster Preparedness		
Bio Diversity	Quality of Life Support – South coast community	Shadow-value: Net Factor Income	$242,868,780
	Total Value Estimate		**$551,288,300**

Note: Values are in US$

6.3. Limitations

Our initial estimation of the value of the ecosystem represented by the Graeme Hall Wetlands is limited in many ways. Our analysis did not shy away from moving beyond the traditional theories of economic values in order to achieve a fuller understanding of wetland ecosystem services. The study has only focused on the values representing contributions to economic or ecological welfare and health. It has not value the signals that wetlands changes convey, which can be used to enhance, preserve and sustain welfare of the coastal community. The study also produced some "shadow values" of ecosystem services such as support to quality of life indicators. There can be

[39] The Economist Intelligence Unit: World-wide Quality-of-life index (2005).

little dispute that these values are positive and our opinion is that our estimates are likely to be under-valuing these services. These limitations point to the need for substantive progress to be made in the composition of a database or studies containing the information necessary for conducting analyses of ecosystem service valuation on the national, regional and local scales.

Nevertheless, the absence of such confirming data does not prevent us from coming to some very significant conclusions about the valuable role that the Graeme Hall Wetlands play in the economic and social welfare of Barbadians. If we actually lived in a world that was ecologically sustainable, socially fair and where everyone had perfect knowledge of their connection to ecosystem services these connections would be clearly reflected in both market prices and surveys of willingness-to-pay.

We can conclude unhesitatingly that if the ecosystem services of the Graeme Hall Wetlands were actually paid for, in terms of their value contribution to quality of life, the tourism product and the Barbadian economy, the structure of prices in the Barbados economy, including wages, interest rates and profits, would be very different from what they are today. The costs of a Tourist visit would be higher with implications for destination competition. The cost of living would be higher impacting on wages, salaries and income distribution.

6.4. Conclusions

The estimate of value of services produced by the Graeme Hall Wetlands is close to 20% of GDP. This is not an un-expected result. The study of the value of the world's eco-system services produced an estimate of US$33 trillion which was 1.8 times the global GNP[40]. The true meaning of the magnitude of these valuations is not that we are undervaluing natural resources like the Graeme Hall Wetlands. Rather, they tell us that we must begin to give the natural capital stock that produces these services, adequate weight in the decision making process, otherwise current and continued future human welfare may drastically suffer

We recognize the challenges to be overcome for us to achieve a more precise estimate of the value of Graeme Hall ecosystem services. Nevertheless, this initial estimate should provide a starting point for introducing the Graeme Hall Wetlands as a resource of critical value to the south west coast of Barbados, to its leading economic sector Tourism and to sustainable development in its economy.

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[40] **The Value of the World's Ecosystem Services and Natural Capital**, authors Robert Costanza, Ralph d'Arge, Rudolf de Groot, Stephen Farberk, Monica Grasso, Bruce Hannon, Karin Limburg, Shahid Naeem, Robert V. O'Neill, Jose Paruelo, Robert G. Raskin, Paul Sutton & Marjan van den Belt. Center for Environmental and Estuarine Studies, Zoology Department, and Insitute for Ecological Economics, University of Maryland

7. LEGACY AND SCENARIOS OF THE FUTURE

History and legacy are all integral parts of the view that we have of ourselves. The composition of the current population living in Barbados is a product of a history of decisions involving the movement of human being from one part of the world to another as well as the creation of institutions to keep them there. The natural environment as we have inherited it today is also a product of a history of decisions and non-decisions about land use. Barbados lost most of its forest cover from 1626, as settlers changed the landscape to create sugar plantations. So we are in a continuum of decision interface between the human system and the natural system, producing as it were a new set of human/institutional arrangements to "manage" our existence within an ever changing natural environment. Thus a look into the history of "open green spaces" that have survived this continuum and are considered "priceless" in today's world is an exercise well worth pursuing.

7.1. Lessons of History

We have at least three good examples of open green spaces, created in a different historic era, but playing very significant roles in economic and social development today.

- Trinidad & Tobago: Queens Park Savannah (Port of Spain), 260 acres acquired as a parcel of land known as Paradise Estate in 1817 and regulated as a park in 1882;
- New York State: Central Park (New York City), 843 acres, an irregular terrain of swamps and bluffs, punctuated by rocky outcroppings, acquired through using the power of eminent domain and designed as a park by Frederick Law Olmsted and Calvert Vaux in 1858;
- United Kingdom: Hyde Park (London), 350 acres, acquired by Henry VIII from the monks of Westminster Abbey in 1536 as private hunting grounds; opened in 1637 by Charles I as a public park.

These historic parks can teach us three lessons. The first is the combination of functions and services provided by the parks differ in value to society 100 years later. The second is the role played by these parks in promoting their cities as tourism destinations. The third and most important lesson, however, may be that the decision to create these open green spaces may not have been supported by any justifiable data or knowledge at that time. In hindsight, they appear to be "wise" decisions rather than data/knowledge-based decisions.

7.2. Strong Linkage Scenario

The strong linkage scenario is based on the premise that the current views of wetland values are the critical inputs to decisions as to its disposition. This scenario envisions the Graeme Hall Wetlands as a natural resource with a combination of ecological characteristics and nature tourism attractions. Infrastructure developments will continue to allow the target tourism audience to observe some of the natural features from a safe distance. The ecological linkages are enforced by efforts to maintain biodiversity, and the biotic and non-biotic populations of the wetlands.

7.3. Weak Linkage Scenario

The weak linkage scenario is the long-term legacy approach. It is the link that perpetuates the landscape through generations in the belief that future generations will seek and find new values and new uses for the wetlands in their time. This scenario has very weak linkages to any of the wetland benefits currently being considered as valuable today. However, it has a solid premise in the fact that wetlands are dynamic systems, continuously undergoing natural changes in spite of human decisions at any point of time. This scenario calls for the nation to commit itself to simply "holding on" to the resource and let it transit through generations on its own.

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ANNEX 1: LIST OF RAMSAR SITES WITHIN THE CARIFORUM COUNTRIES

Country	Site	Date	Location	Size	Coordinates
ANTIGUA AND BARBUDA	Codrington Lagoon	*02/06/05*	Barbuda	3,600 ha	17°39'N 061°51'W
BAHAMAS	Inagua National Park	*07/02/97*	Great Inagua Island	32,600 ha	21º05'N 073º20'W
BARRBADOS	Graeme Hall Swamp	*12/12/05*	Christ Church	33 ha	13°04'N 059°35'W
BELIZE	Crooked Tree Wildlife Sanctuary	*22/04/98*	Orange Walk	6,637 ha	17º44'N 088º29'W
BELIZE	Sarstoon Temash National Park	*19/10/05*	Toledo	16,955 ha	15°58'N 089°00'W
CUBA	Buenavista	*18/11/02*	Villa Clara, Sancti Spiritus	313,500 ha	22°27'N 078°49'W
CUBA	Ciénaga de Lanier y Sur de la Isla de la Juventud	*18/11/02*	Isla de la Juventud	126,200 ha	21°36'N 082°48'W
CUBA	Ciénaga de Zapata	*12/04/01*	Matanzas	452,000 ha	22°20'N 081°22'W
CUBA	Gran Humedal del Norte de Ciego de Ávila	*18/11/02*	Ciego de Ávila	226,875 ha	22°19'N 078°29'W
CUBA	Humedal Delta del Cauto	*18/11/02*	Granma, Las Tunas	47,836 ha	20°34'N 077°12'W
CUBA	Humedal Río Máximo-Cagüey	18/11/02	Camagüey	22,000 ha	21°43'N 077°27'W
DOMINICAN REPUBLIC	Lago Enriquillo	*15/05/02*	Suroeste	20,000 ha	18°28'N 071°39'W
JAMAICA	Black River Lower Morass	*07/10/97*	St. Elizabeth	5,700 ha	18º04'N 077º48'W
JAMAICA	Palisadoes – Port Royal	*22/04/05*	Kingston	7,523 ha	17°55'N 076°49'W
JAMAICA	Portland Bight Wetlands and Cays	*02/02/06*	St Catherine, Clarendon	24,542 ha	17°49'N 077°04'W
ST. LUCIA	Mankoté Mangrove	*19/02/02*	St. Lucia	60 ha	13°43'N 060°55'W
ST. LUCIA	Savannes Bay	*19/02/02*	St. Lucia	25 ha	13°48'N 060°37'W
SURINAME	Coppenamemonding	*22/07/85*	Saramacca	12,000 ha	05º56'N 055º43'W
TRINIDAD & TOBAGO	Buccoo Reef / Bon Accord Lagoon Complex	*08/07/05*	Tobago	1,287 ha	11°10'N 060°57'W
TRINIDAD & TOBAGO	Caroni Swamp	*08/07/05*	Trinidad	8,398 ha	10°34'N 061°27'W
TRINIDAD & TOBAGO	Nariva Swamp	*21/12/92*	Trinidad	6,234 ha	10º23'N 061º04'W

Annex 2: Detailed Replacement Costs

Description	US Dollars
Basic Utilities	
Underground Electric Utilities	1,050,280
Underground water distribution and pumps	694,400
Water treatment facility	54,560
Water storage and treatment tanks (cisterns)	198,400
Underground security, telephone and data distribution	136,400
Underground sanitary and storm water sewer system	199,640
Underground gas utility	28,520
Maintenance and Shop Building, emergency shelter	318,680
Storage facilities (2)	19,840
FF&E (Furnishings, Fixtures and Equipment)	446,400
Sub-Total	***3,147,120***
Reception Facilities	
Main Visitor Centre foundation (under the Amphitheatre	1,066,400
Car park and Main Entry, Gates	632,400
Administrative Office Complex	280,240
Kitchen and Restroom Building (Avian)	274,040
Store and Reception Centre	286,440
Amphitheatre	1,612,000
Sub-Total	***$6,231,000***
Exhibition Facilities	
Birds Ponds	2,079,480
Educational Pavilions	44,640
Captive breeding structure	47,120
Gully Aviary	2,494,880
Marshland Aviary	2,344,840
Migratory Bird Exhibit and Aviary	384,400
St. Vincent Aviary Exhibit	47,120
Interpretive Exhibits	230,640
Signage	78,120
Sub-Total	***$7,751,240***
Landscape Protection Facilities	
Access (banking) roadway, pond-spring roadway and fill	1,386,320
Canals, geotech installation, berms (wetland)	1,546,280
Sprinkler system and controls	381,920
Pathways and Bridges	1,526,440
Landscape	1,620,680
Architectural, Engineering, Quantity Survey, Environmental Assessment - Fees	2,124,000
Sub-Total	***$8,585,640***
GHNS Replacement Cost Valuation TOTAL	**23,635,520**

ANNEX 3: SELECTED LISTING OF PROPERTIES

Property Type	Property Area . sq. ft	Value per sq. Ft.	Value US$	Address	Parish	Price BB$	Agent	Status & No. of Pictures
House	12,796	$72	$36	Rendezvous Terrace	Christ Church	$925,000	Atlantic Realty	Available
House	12,726	$75	$38	Rendezvous Gardens	Christ Church	$950,000		Available
House	12,000	$79	$40	Rendevous	Christ Church	$950,000		
House	6,500	$146	$73	Rendezvous Ridge	Christ Church	$950,000	Central	Available
House	6,000	$150	$75	Graeme Hall	Christ Church	$900,000	C.Alleyne Realty	Avai
House	7,000	$157	$79	Graeme Hall	Christ Church	$1,100,000		Sold
Land	18,000	$22	$11	Rendezvous High Ridge	Christ Church	$400,000		Available
Land	9,628	$31	$16	Graeme Hall	Christ Church	$300,000		Available
Land	9,628	$36	$18	Graeme Hall Park	Christ Church	$350,000	Island Oasis	Sold
Land	55,156	$65	$33	St. Lawrence Gap	Christ Church	$3,600,000		
Land	54,000	$67	$34	Rendezvous	Christ Church	$3,600,000		Availa
Land	11,000	$91	$46	St. Lawrence Gap	Christ Church	$1,000,000		
Land	11,120	$104	$52	St. Lawrence Gap	Christ Church	$1,156,480	ISLAND GOLD Elegant Properties	
Land	43,560	$230	$115	St. Lawrence Gap	Christ Church	$10,000,000		Availa