ORGANISATION OF EASTERN CARIBBEAN STATES
ENVIRONMENT AND SUSTAINABLE DEVELOPMENT UNIT

ENVIRONMENTAL AND SOCIO-ECONOMIC STUDIES FOR OPAAL DEMONSTRATION SITES

TOBAGO CAYS SITE REPORT, ST. VINCENT AND THE GRENADINES

ECO REPORT No. 06/2007
July 31, 2007

PREPARED BY

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EXECUTIVE SUMMARY

OVERVIEW

Ecoengineering Caribbean Limited was authorised by the Environment and Sustainable Development Unit (ESDU) of the Organization of Eastern Caribbean States (OECS) to undertake Environmental and Socio-Economic studies under the OECS Protected Areas Associated Livelihoods (OPAAL) Project. The OPAAL project has as its global objective, "to contribute to the conservation of biodiversity of global importance in the Participating Member States by removing barriers to the effective management of protected areas (PAs), and increasing the involvement of civil society and the private sector in the planning, management and sustainable use of these areas."

As part of the establishment of PAs under the OPAAL Project, two types of environmental and socio-economic studies were commissioned. Baseline environmental and socio-economic studies were used to determine the status of the resource base, its use and the nature of communities associated with the site, and, detailed site preparation studies were used to identify adverse environmental or socio-economic impacts associated with the development, identifying safeguards and / or mitigation measures.

This site report documents findings of a site visit to Tobago Cays Marine Park (TCMP) during the period February 7th to 16th, 2007.

PHYSICAL CHARACTERISTICS

The TCMP which encompasses the Tobago Cays in the St. Vincent Grenadines consists of five small uninhabited islands lying between St. Vincent and Grenada. The Cays, Petit Rameau, Petit Bateau, Jamesby and Baradal are protected on the windward side by Horseshoe Reef, a semicircular coral reef, approximately 4km long. The fifth Cay, Petit Tabac, is located just to the east other Cays. The Major environmental assets within the TCMP are found mainly in the marine environment, with about 5% belonging to the terrestrial environment.

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GLOSSARY OF TERMS

TERM	APPLICABLE DEFINITION
Archipelagic waters	Waters surrounding chains of islands (archipelagoes). Much of the Caribbean Sea can therefore be referred to as archipelagic waters
Buffer zone	A zone where precautionary measures are put in place to avoid any adverse effects on a nearby 'development'. In this case the buffer zone is intended to prevent any unintentional damage to the park that may arise out of construction activities etc.
Coliforms	Disease causing microorganisms usually associated with fecal matter. Measured in colony forming units (CFUs)
Conventional pit toilets/ latrines	Consists of a privatized 'shed', seat, and a pit into the soil where excreta will decompose under anaerobic conditions
Endemic	Restricted to/ found only/native too…
Equitably	In equal shares
Fauna	Animal life
Fish	Any marine animal including shellfish, some mollusks, mussels, turtles, crustaceans etc. their young and their eggs
Flora	Plant life
Fringing reef	Coral reefs that lie on the edge of a continental shelf
Lease	When property is 'lent' under contract for a certain number of years to a tenant. The tenant can pay a 'rent' on the property but in most cases is responsible for any liability to the property since it can be referred to as his property
Mortality	Death rate/ number of deaths
Nitrates	Compounds arranged in the formula N_xO_y

TERM	APPLICABLE DEFINITION
Palang	A type of line and hook consisting of a long line with sometimes hundreds of hooks that line the sea bed with bait
Phosphates	Compounds arranged in the formula P_xO_y
SPAW Protocol	Specially Protected Areas and Wildlife to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to provide for themselves
SWOT Analysis	An extremely useful tool with which data is subjectively assessed and organized with the TCMP
Topography	Features making up the surface of the earth including mountains, plains etc
Territorial seas	Owned by known states, and bordered by an imaginary boundary line
Unspoilt nature	Nature that has been virtually untouched by man and is truly 'natural'
Value	In this case means non-monetary and includes archaeological value, social value etc.
Ventilated Improved Pit Toilets	These are similar to conventional pit toilets but are 'easier' on the user and the environment. They reduce odours and insects and prevent intrusion of vermin and flies.

LIST OF ACRONYMS

ACRONYM	MEANING
AGRRA	The Atlantic and Gulf Rapid Reef Assessment
BOD	Biochemical Oxygen Demand (mg/L)
CCC	Coral Cay Conservation
CEZs	Conservation Exclusive Zones
CFU	Colony Forming Units
COD	Chemical Oxygen Demand (mg/L)
EC	Eastern Caribbean Dollar
GOB	Government of Barbados
HR	Horseshoe reef
IT	Information Technology
MPA	Marine Protected Area
NTU	Nephelometric Turbidity Units
OECS	Organization of Eastern Caribbean States
OPAAL	OECS Protected Areas Associated Livelihoods Project
PAs	Protected areas
SPAW	Specially Protected Areas and Wildlife
SVG	St. Vincent and the Grenadines
SWOT	Strengths, Weaknesses, Opportunities and Threats
TCMP	Tobago Cays Marine Park
TNTC	too numerous to count
TSS	Total Suspended Solids (mg/L)
UK	United Kingdom
VIP	ventilated improved pit toilet

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TOBAGO CAYS SITE REPORT
ST. VINCENT AND THE GRENADINES

1 INTRODUCTION

1.1 Authorisation and Report Layout

This report, prepared by Ecoengineering Caribbean Limited, is the first of three site reports being prepared for the Environment and Sustainable Development Unit (ESDU) of the Organization of Eastern Caribbean States (OECS). It was conducted in accordance with our revised proposal dated December 15, 2006. This site report documents findings of a site visit to the Tobago Cays Marine Park in St. Vincent and the Grenadines (see Figures 1 and 2) during the period February 7th to 16th, 2007.

This report contains nine chapters and 5 appendices. The remainder of this chapter provides a brief background of the proposed project and specifically the Tobago Cays Marine Park site visit; indicates the scope of work; introduces the project team and lists acknowledgements. Chapter 2 establishes the regulatory and legal framework for the marine park while Chapter 3 describes the methods used to collect baseline data. Chapter 4 describes the environmental assets/characteristics within the marine park. Chapter 5 describes the socio-economic context in which the marine park exists as well as presents the results of stakeholder consultation. Chapter 6 provides a summary of the draft Management Plan while Chapter 7 details the process used to analyse the

proposals documented in the draft management plan. Chapter 8 describes potential impacts which may result from proposals for the protected area and presents mitigation measures for minimizing these impacts. Finally, Chapter 9 highlights the recommendations proposed.

In order to keep the text of this report to a manageable length, detailed information is presented in the following Appendices:

Appendix A: STRUCTURED QUESTIONNAIRE TEMPLATES
Appendix B: CLASSIFICATION OF IMPACTS
Appendix C: SPECIES LISTS AND NOTES OF AQUATIC FAUNA
Appendix D: SPECIES LISTS AND NOTES OF TERRESTRIAL FLORA AND FAUNA
Appendix E : MONITORING AND EVALUATION TOOL
Appendix F : EXCERPT FROM USER NOTES FOR CIDA'S ENVIRONMENTAL ASSESSMENT FORMS

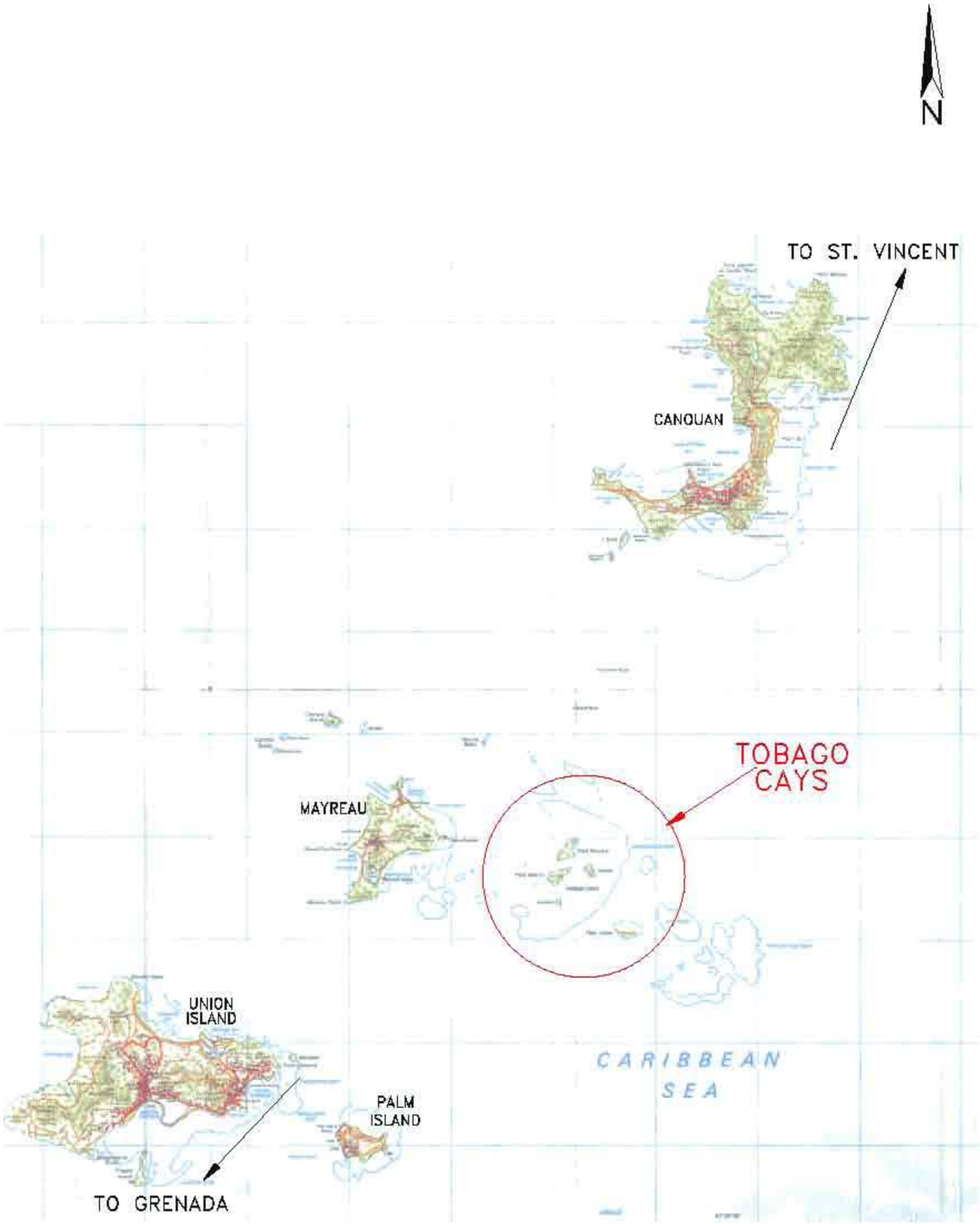
1.2 Background

This project which is termed the OECS Protected Areas Associated Livelihoods Project (OPAAL) has as its global objective "to contribute to the conservation of biodiversity of global importance in the Participating Member States by removing barriers to the effective management of protected areas (PAs), and increasing the involvement of civil society and the private sector in the planning, management and sustainable use of these areas".

Component 2 of the OPAAL Project deals with Protected Areas Management and Associated, Alternative and New Livelihoods. This component seeks to promote biodiversity management and conservation through the establishment of new protected areas and the strengthening existing PAs. This thrust is complemented by support for alternative and/or new livelihoods in areas in proximity to PAs.

As part of the establishment of PAs under the OPAAL Project, two types of environmental and socio-economic studies were commissioned:

- baseline environmental and socio-economic studies to determine the status of the resource base, its use and the nature of communities associated with the site; and



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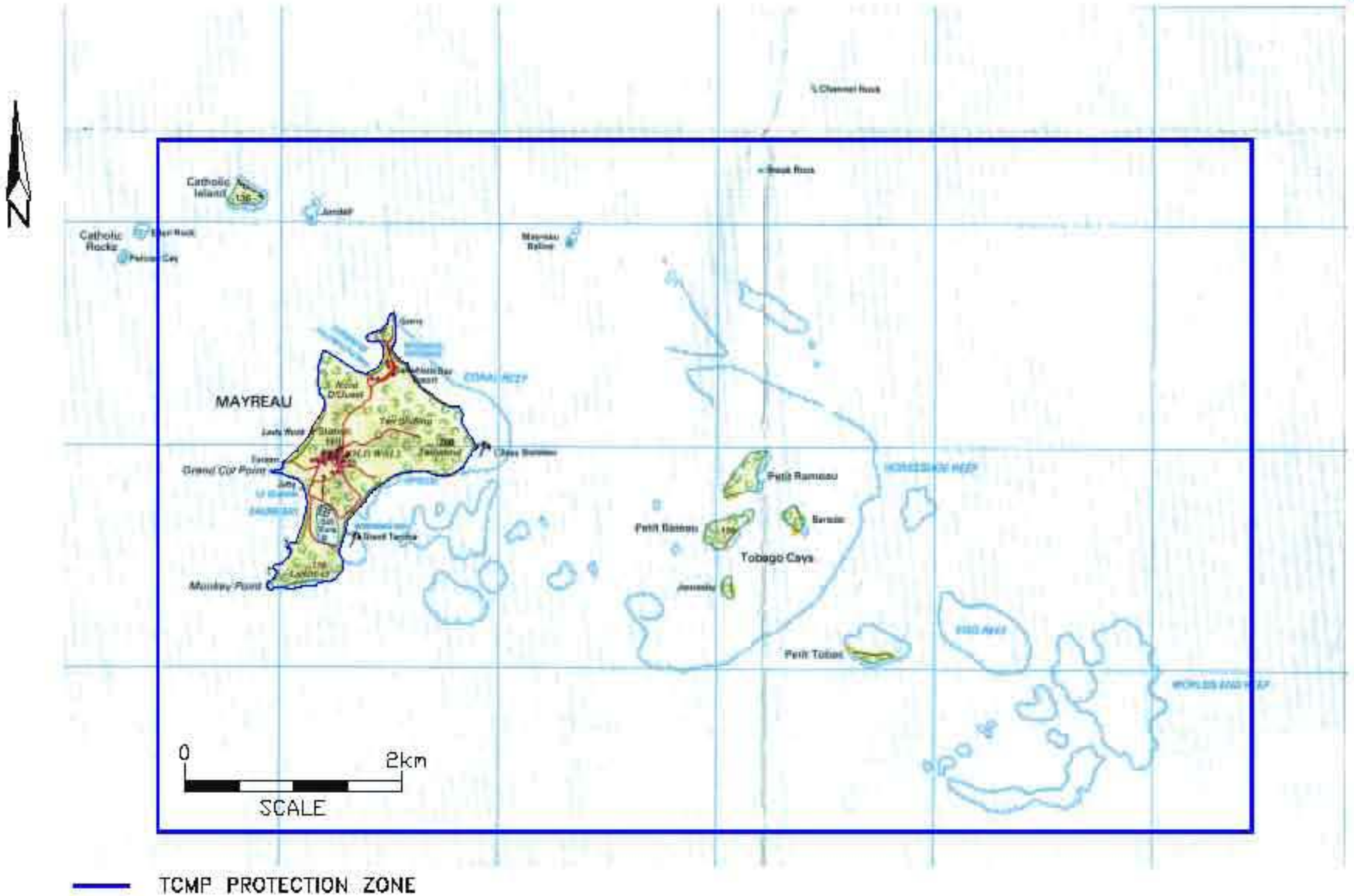
Date: 31/07/07	PROJECT: TOBAGO CAYS SITE REPORT, ST. VINCENT AND THE GRENADINES	
	DWG. NAME: TOBAGO CAYS VICINITY MAP	



Ecoengineering Caribbean Ltd.	Eco Report No. 06/2007	CLIENT: OECS -ENVIRONMENT AND SUSTAINABLE DEVELOPMENT UNIT	FIGURE NUMBER 2
	Date: 31/07/07	PROJECT: TOBAGO CAYS SITE REPORT ST. VINCENT AND THE GRENADINES	
		DWG. NAME: TOBAGO CAYS SITE MAP	

- detailed site preparation studies to identify adverse environmental or socio-economic impacts associated with the development, and identify safeguards and / or mitigation measures.

This study comprises a combination of two elements of work. Firstly, it sought to update an early environmental assessment undertaken at the time of project design to identify any possible adverse impacts associated with likely Project interventions through a review of project sub-components for potential environmental impact. Both environmental and socio-economic assessments were designed to incorporate relevant mitigation measures which can be taken on board in the finalization and implementation of site management plan and specific project activities including the development of relevant infrastructure and livelihood sub-projects. Secondly, the study was undertaken to describe and assess the health and value of biodiversity within the site, levels of use and threats to inform area management and assist in the establishment of monitoring and evaluation system for the site.

Ideally, this study should have preceded and therefore guided the preparation of the site management plan for the OPAAL demonstration site. This had not been the case due to procurement challenges which affected the timely contracting of services and hence the drafting of a management plan for the site was well advanced at the time of conducting the environmental and socio-economic site assessments. Therefore, it will be important that the information, recommendations and conclusions emanating out of this study be used to further inform and strengthen the management planning process.

This site report documents information gathered on a visit to the TCMP during the period February 7th to 16th, 2007.

1.3 Scope of Work

The scope of work for this assignment is as follows:

- Review of Relevant Documents,
- Understanding the Proposals for the PA,
- Review of Regulatory Framework,
- Field Collection of Data,
- Assessment of Potential Impacts, and
- Recommendation of Mitigation Measures.

1.4 Study Team

The following are the key professional staff who worked on this assignment:

Ecoengineering Caribbean Limited

Dr. George K. Sammy, Study Director/Environmental Engineer,
Ms. Debbie Reyes, Study Manager/Environmental Scientist,
Ms. Nadia Tewarie, Environmental Scientist, and
Mr. Jahson Alemu I, Ecologist/Certified Diver.

1.5 Acknowledgements

Ecoengineering Caribbean Limited acknowledges, with thanks, the contributions of the following in completing this assignment:

TOBAGO CAYS MARINE PARK BOARD	Fr. Andrew Roache, Chairman, Tobago Cays Marine Park Board
	Mr. Raymond Ryan, Chief Fisheries Officer
	Mr. Vibert Dublin, Manager, Tobago Cays Marine Park
On-Site Personnel	Albert Hanson – Park Ranger
	Jason Alexander – Park Ranger
	Samuel Debique – Park Ranger
	Hyron Joseph – Park Ranger
	Ms. Meritha Small – Office Assistant
Statistical Department	Ms. Roberts
Ministry of Tourism, Youth and Sports	Ms. Niquette Ballantyne
	Ms. Karen Weekes
Fisheries Department – St. Vincent	Ms. Sophia Punnett
Fisheries Department – Union Island	Mr. Sheron Ferrari
National Trust	Ms. Rachel Moses

2 REGULATORY FRAMEWORK

This chapter provides a brief synopsis of the laws, regulations and policies which govern the management of the Tobago Cays Marine Park. A detailed assessment of these laws, regulations and policies was conducted for the OECS as a separate document by another consultant (Environmental Support Services, 2007). What follows is a brief summary of what is contained in that document**.**

2.1 Policy Framework

The Protected Areas policy for St. Vincent and the Grenadines is articulated primarily by the Master Plan for a System of Protected Areas and Heritage Sites (2004). The Master Plan states that the objectives to be met by the system of protected areas in St. Vincent and the Grenadines are:

- Conservation and protection of all island endemic plant and animal species, such as the St. Vincent Parrot and Whistling Warbler.
- Maintenance of the country's rich diversity of flora and fauna.
- Protection of areas critical to sustainable production of water and electricity.
- Sustain and improvement in the economic and social well being of the country.
- Promotion of pride in appreciation of history, culture and the country's rich maritime traditions.
- Promotion of appreciation, sustained recreational use and enjoyment of natural and cultural heritage.
- Maintenance of the visual, special and aesthetic values of the country's landscape and sustain critical environmental goods and services, such as soil, rainfall and climate.

The protected areas master plan (2004) also provides guidance on a number of relevant issues, identifies sites for inclusion in the system, and makes recommendations for development of the system of protected areas. Directions provided include the following:

- The system of protected areas should include sites declared by law as well as heritage sites that can be managed without protected areas designation.

- Elimination of multiple designations of sites in order to eliminate conflicts.

- Consolidation of small adjoining protected areas to increase management efficiency.

- A total of 47 sites, 22 existing and 25 proposed protected areas, have been identified for inclusion in the system. The plan also identifies other types of ecosystems (such as mangrove wetlands) that should be included in the system of protected areas, and recommends that, to the greatest extent possible, the IUCN management categories should be used as guidelines. The plan provides a description for the management categories, and recommends selection criteria for each category.

- Recommends the continued involvement of community groups and private sector interests in the development and management of protected areas, particularly heritage sites.

- Recommends a number of actions to be taken for the further development of the system of protected areas, focussing on legal, institutional, research and planning, capacity building, public awareness and participation, product development, and marketing and resource use issues.

2.2 Legal Framework

There are several pieces of legislation applicable to the management of protected areas and environmental resources in St. Vincent and the Grenadines. Those relevant to the Tobago Cays Marine Park are highlighted below:

2.2.1 Marine Parks Act, 1997 (No. 9 of 1997)

"*An Act to provide for the establishment of Marine Parks and for other related matters*".

Section 2 – Defines a marine park to include adjacent land forms part of a single or "complemental" ecological unit.

Section 3(1) – Established the Marine Parks Board to be responsible for the administration of the Act.

Section 5 – Authorises the Minister (responsible for parks) to declare marine parks, by Order published in the Gazette.

Section 7 – Requires the Chief Surveyor to keep a map delineating each marine park established under this Act.

Section 8 – Lists the purposes for which the Minister may make regulations under the Act, including protection of flora and fauna and regulation of use of the parks. The Schedule sets out the composition of the Marine Parks Board, and provides guidance on its functioning. Item 12 of the Schedule states how the expenses of the Board will be met, effectively making the Board responsible for generating its own revenues.

2.2.2 Marine Parks (Tobago Cays) Declaration Order, 1997

- Declares the Tobago Cays Marine Park under Section 5 of the Marine Parks Act (1997).
- Identifies the group of islands that fall within the park (Petit Rameau, Petit Bateau, Petit Tabac, Baradal, and Jamesby).

2.2.3 Marine Parks (Tobago Cays) Regulations, 1998 (SRO No. 26 of 1998)

These regulations for the Tobago Cays Marine Park are permitted by Section 8 of the Marine Parks Act (1997).

Section 3 – Authorises the Marine Park Board to appoint a Park Manager, and sets the functions of the Manager.

These regulations focus on regulating the use of the site, and setting a fee schedule for permitted uses. There is no provision for management planning or monitoring and evaluation, though the Park Manager is required to prepare annual reports on the state of the park.

2.2.4 Marine Parks Bill 2005

The Bill, to be known as the Marine Parks Authority Act, seeks to repeal the Marine Parks Act (1997). The Bill include much wider definitions for protected areas than now exist in St, Vincent and the Grenadines, incorporating categories such as managed resource protected areas, species managed areas, and protected landscapes/seascapes. The new law would establish the National Marine Parks Authority, a corporate entity governed by a Board of Directors. A new institutional arrangement is proposed, wherein the Board of Directors could appoint a Management Committee for every marine park established, as well as delegate management responsibility for a site to a person or non-governmental organisation.

This is a significant departure from the current provisions in the Marine Park Act (1997) and the National Parks Act (2002), both of which seek to centralise protected areas management. The proposed law would establish a Marine Parks Conservation Fund, with its own Trustees to manage the fund.

2.2.5 National Parks Act, 2002 (No. 33 of 2002)

"*An Act to make provisions for national parks and the establishment of an authority for national parks, to make further provision for the preservation, protection, management and development of the natural, physical and ecological resources and the historical and cultural heritage of Saint Vincent and the Grenadines and for connected matters*".

Section 4(1) – Provides for the establishment of the National Parks, Rivers and Beaches Authority, a corporate entity to manage the various assets acquired under the Act.

Section 5 – Dictates that the Director of National Parks be appointed by Cabinet. The Director is the head of the National Parks, Rivers and Beaches Authority, and is responsible for implementing the provisions of the Act.

Section 6 – The staff of the Authority, other than the Director of National Parks, is appointed by the National Parks Board, though they are supervised by the Director.

Section 7(1) – Lists the powers and functions of the Authority, giving the Authority "…*power and control over all rivers, streams, springs, swamps, waterfalls, waterpools and beaches in the State*".

Section 8(1) – Establishes the National Parks Board, and sets the composition of the Board.

Section 9 – lists the powers and functions of the National Parks Board, including giving the Board responsibility for facilitating works necessary for supporting a range of uses in marine parks (Section 9(e)).

Section 10 – Mandates the preparation of a national parks plan. The language in Section 10(1) implies a plan for all national parks, while the language in Section (2) implies that a plan should be prepared for each site. Section 10(2) also provides guidance on the contents of national parks plans. Sections 10(3)-10(5) make provision for a community consultations process for plan preparation and review, as well as the approval of any plan by the National Parks Board, Ministry responsible for parks, and the Cabinet.

Section 11 – Authorises the Minister to declare a national park on Crown land and/or water where the area "… *by reason of its outstanding natural beauty, special historical, cultural or archaeological value, geological or scientific importance, or the opportunity it affords for open-air recreation, requires proper management for the purpose of preserving and enhancing its natural beauty and state*".

Section 12 – Identifies the types of protected areas that can be declared under the Act as marine national park and terrestrial national park.

Section 15 – makes provision for the inclusion of marine reserves and other fishery management areas within national parks.

Sections 16-17 – Provide for private land owners to voluntarily request for the private land to be managed as a national park, and to have agreed provisions of the Act applied to the management of the land. Section 17(3)(c) allows for the payment of compensation for restrictions on the private land to support management as a national park.

Sections 18-22 – Deals with the compulsory acquisition of lands for establishment of national parks. In addition to compulsory acquisition, land for national parks development may be acquired by lease, exchange, and purchase.

Section 23 – Lists the prohibited activities within national parks, except where permitted by the Minister (Section 23(3)) or when the agreement with a private landowner provides for particular exemptions.
Section 32 – Incorporates the offences and associated penalties under the Forest Resource Conservation Act (1992) and the Fisheries Act (1986)(Cap. 52).

Section 35 – Mandates the Minister to establish a special fund, called the National Parks Fund, for the development and management of national parks. Fees and voluntary contributions are to be paid into this Fund.

Section 37 – Deals with the accounting and annual audit requirements of the Authority.

Section 40 – Authorises the Minister to make regulations for the use of national parks and the prevention of damage to assets within national parks. The maximum penalty for breaches of regulations is $5,000.00 or imprisonment for one year.

2.2.6 Fisheries Act (No. 8 of 1986) (Cap. 52)

"*An Act for the promotion and management of fisheries and for matters incidental thereto and connected therewith*".

Section 2 – Defines "fish" as "*any aquatic animal, whether piscine or not and include any shellfish, turtle, mollusk, crustacean, coral, sponge, echinoderm, its young and its eggs*".

Section 4 – Requires the Chief Fisheries Officer to prepare and keep under review a national fisheries development and management plan. The Act also provides for public consultations in the preparation of the plan.

Section 6(1) – Authorizes the Minister to enter into cooperation agreements with other countries in the region or with regional organizations for the purpose of harmonizing procedures for various aspects of fisheries management in the region.

Section 20 – The Minister may, by Order in the Gazette, declare any area of the fishery waters to be a fishing priority area, in which authorized fishing is not impeded.

Section 22 – The Minister may declare a marine reserve for several reasons, including:

(i) for protection of flora and fauna, breeding grounds, and habitats of aquatic life;
(ii) to preserve and enhance natural beauty of such areas; and
(iii) scientific study.

Section 23 – The Minister may grant permission for fishery research "… *on submission of a research plan approved by the Chief Fisheries Officer*".

Section 45(1) – The Minister may make regulations for management and development of fisheries in the fishery waters.

Section 45(2) – Purposes for which regulations may be made include a number relevant to protected areas, including:

a) License and regulation and management of fisheries;

b) Fisheries regulation and conservation measures;

h) Regulating the use of spear guns or similar devises;

p) Regulating

(i) management of marine reserves and fishing priority areas;
(ii) taking of coral and shells;

q) Prescribe measures for protection of turtles.

2.2.7 Maritime Areas Act, 1983 (No. 15 of 1983)

"*An Act to declare the Maritime areas and for matters incidental thereto and connected therewith*".

Section 2 – Defines the "Waters" of St. Vincent and the Grenadines as meaning "… the internal waters, archipelagic waters, and territorial sea …".

Section 10(3) – The Minister (responsible for Foreign Affairs) may make regulations for a range of purposes associated with the innocent passage of foreign vessels through the waters of St. Vincent and the Grenadines. The objectives pertinent to protected areas include conservation of living marine resources (10(3)(d)); pollution prevention (10(3)(f)); and marine scientific research (10(3)(g)).

Section 20 – Authorises the Minister to make regulations pertaining to activities in the exclusive economic zone. Purposes relevant to protected areas include exploitation or conservation of living and non-living resources (20(a)); establishment of artificial structures (20(c)); marine scientific research (10(d)); and protection and preservation of the marine environment (20(e)).

3 METHOD STATEMENT

This chapter is a summary of the methods used on this assignment. It begins with a statement of the context of the study, and then describes each of the tasks which were undertaken, as follows:

- Review of Relevant Documents,
- Understanding the Proposals for the PA,
- Review of Regulatory Framework,
- Field Collection of Data,
- SWOT Analysis, and
- Potential Impacts and Mitigation Measures.

The final section of this chapter introduces two other evaluation tools which were used on this assignment. In describing the various tasks, reference will be made to the original Terms of Reference and Technical Proposal for this assignment; to note any changes and explain the reason for those changes.

3.1 Context

This statement of the context of the study includes four elements:

- Biodiversity in the OECS,
- Challenges in Protected Area Management,
- The OPAAL Project, and
- Environmental and Socio-Economic Studies.

These descriptions are based largely on information provided in the Terms of Reference which formed part of the OECS' Request for Proposals, as well as generalized information (such as is available on the internet). It is in the context stated in this section that the methods for the individual tasks were designed.

3.1.1 Biodiversity in the OECS

The Eastern Caribbean region is endowed with a rich biodiversity, which, partly due to its isolation within the Caribbean Sea, has resulted in relatively high rates of national and regional endemism. One survey of the world's biodiversity hotspots identified the Caribbean as the fifth ranking "hotspot" and one of the highest priorities in any global

strategy for biodiversity conservation and sustainable management. A second study based on faunal distributions classified the Eastern Caribbean region as a unique marine ecoregion of the tropical northwestern Atlantic province and as the most threatened given the highest priority ranking for conservation purposes.

Despite the significance of the region's biodiversity endowment, there have been reductions in both its quantity and quality over time. Many of the region's highly productive offshore ecosystems have come under increasing pressure in recent times from a variety of anthropogenic and natural sources. Efforts aimed at protecting the critical ecosystems in the islands of the Eastern Caribbean have not been very successful. The lack of congruence between nation building and the sustainable use of natural resources remains the biggest hurdle to attaining the goals of sustainable development. The nexus between poverty and the loss of natural capital (through over or indiscriminate resource extraction) is still not clearly understood. For now the establishment of protected areas (PAs) remains the primary tool for resource conservation in the Eastern Caribbean but that itself is characterized by a checkered history of implementation.

3.1.2 Challenges in Protected Area Management

The establishment of an effective framework to create and manage PAs is constrained by significant impediments in the OECS. Existing institutional arrangements are weakened by:

- gaps in policy framework, including limited incorporation of environmental and social costs (direct or indirect) in decision-making; and
- inadequate systems to support integrated planning, information sharing and collaboration.

This has led to adverse impacts on PAs (for example, sedimentation from upstream development or unsustainable exploitation of resource).

3.1.3 The OPAAL Project

The Project Development and Global Objective of OPAAL is to contribute to the conservation of biodiversity of global importance in the Participating Member States by removing barriers to the effective management of protected areas (PAs), and increasing the involvement of civil society and the private sector in the planning, management and

sustainable use of these areas. The project intends to achieve this objective firstly by strengthening national and regional capacities in the sound management of PAs.

OPAAL is geared towards providing global benefits through the conservation of globally significant biodiversity. Most importantly these global benefits will be closely linked to demonstrable benefits for local populations. Perhaps the most important benefit will be the newly developed constituencies for biodiversity conservation who will act to promote conservation and sustainable development due to the tangible economic benefits and improved economic opportunities.

The project is also geared to providing benefits to those target groups associated with project-supported PAs. Where the nature of that dependency is not compliant with the goals of protection for the area, the project will provide for the identification of alternative sources of livelihoods that will ensure equal or greater socio-economic benefits than previously obtained. The empowerment of target groups/persons will be effected through appropriate capacity building initiatives undertaken by the project.

3.1.4 Environmental and Socio-Economic Studies

Component 2 of the OPAAL Project deals with Protected Areas Management and Associated, Alternative and New Livelihoods. This component seeks to promote biodiversity management and conservation through the establishment of new protected areas and the strengthening existing PAs. This thrust is complemented by support for alternative and/or new livelihoods in areas in proximity to PAs.

As part of the establishment of PAs under the OPAAL Project, two types of environmental and socio-economic studies are required:

- baseline environmental and socio-economic studies to determine the status of the resource base, its use and the nature of communities associated with the site; and

- detailed site preparation studies to identify adverse environmental or socio-economic impacts associated with the development, and identify safeguards and / or mitigation measures.

As part of this assignment, significant baseline information must be collected for the Tobago Cays Marine Park.

3.2 Review of Relevant Documents

As the first task on this assignment, Ecoengineering collected and reviewed the following documents provided by ESDU or available from other sources:

- Opportunities for Sustainable Livelihoods in One Protected Area in Each of the Six Independent OECS Territories, for the OECS Protected Areas and Sustainable Livelihoods (OPAAL) Project prepared by Peter Espeut in March 2006.

- OECS Protected Areas and Associated Livelihoods Project Capacity Building for Protected Areas Planning and Management and Associated Livelihoods Protected Areas Training Needs Assessment St. Vincent and the Grenadines Country Report prepared by Kemraj Parsram in January 2007.

- Tobago Cays Marine Park, 2007-2009 Management Plan First Draft Prepared by: Dr Daniel Hoggarth, UK in consultation with members of the Marine Parks Board of St Vincent and the Grenadines and other TCMP stakeholders in February 2007.

This review allowed the field work to be focussed on areas where data was less-readily available.

3.3 Understanding the Proposals for the PA

Ecoengineering's understanding of the Proposals for the TCMP was based on a review of the Management Plan prepared by Mr. Daniel Hoggarth; provided by ESDU. Our initial work was based on a review of the draft Plan (February 2007). A copy of the Final Draft Plan (March 16, 2007) was provided on June 28, 2007, and this report on the Environmental and Socio-Economic Studies was reviewed and amended as required to ensure conformity with the Final Draft Management Plan.

As noted in Section 1.2, the present study paralleled the preparation of the Management Plan for the TCMP. The benefit of this approach is that it allowed a more focussed assessment of the environmental impacts associated with the Management Plan.

Information exchange with Mr. Hoggarth was very effective on this assignment. He took the opportunity of a visit to Trinidad to visit Ecoengineering's office on January 26, 2007, and fully brief our study team on his work to that date and the key issues that he was seeking to address in the Management Plan. We were able to comment on certain environmental issues as well. This visit greatly enhanced our understanding of the Management Plan.

3.4 Review of Regulatory Framework

Ecoengineering's review of the laws, regulations and standards which govern the operation of the TCMP focussed on the following:

Policy Framework

- Master Plan for a System of Protected Areas and Heritage Sites (2004)

Existing Legal Framework

- Marine Parks Act, 1997
- Marine Parks Act (Tobago Cays) Declaration Order, 1997
- Marine Parks Act (Tobago Cays) Regulations, 1998
- Marine Parks Bill, 2005
- National Parks Act, 2002
- Fisheries Act, 1986 (amended 1986 and 1989)
- Maritime Areas Act, 1983

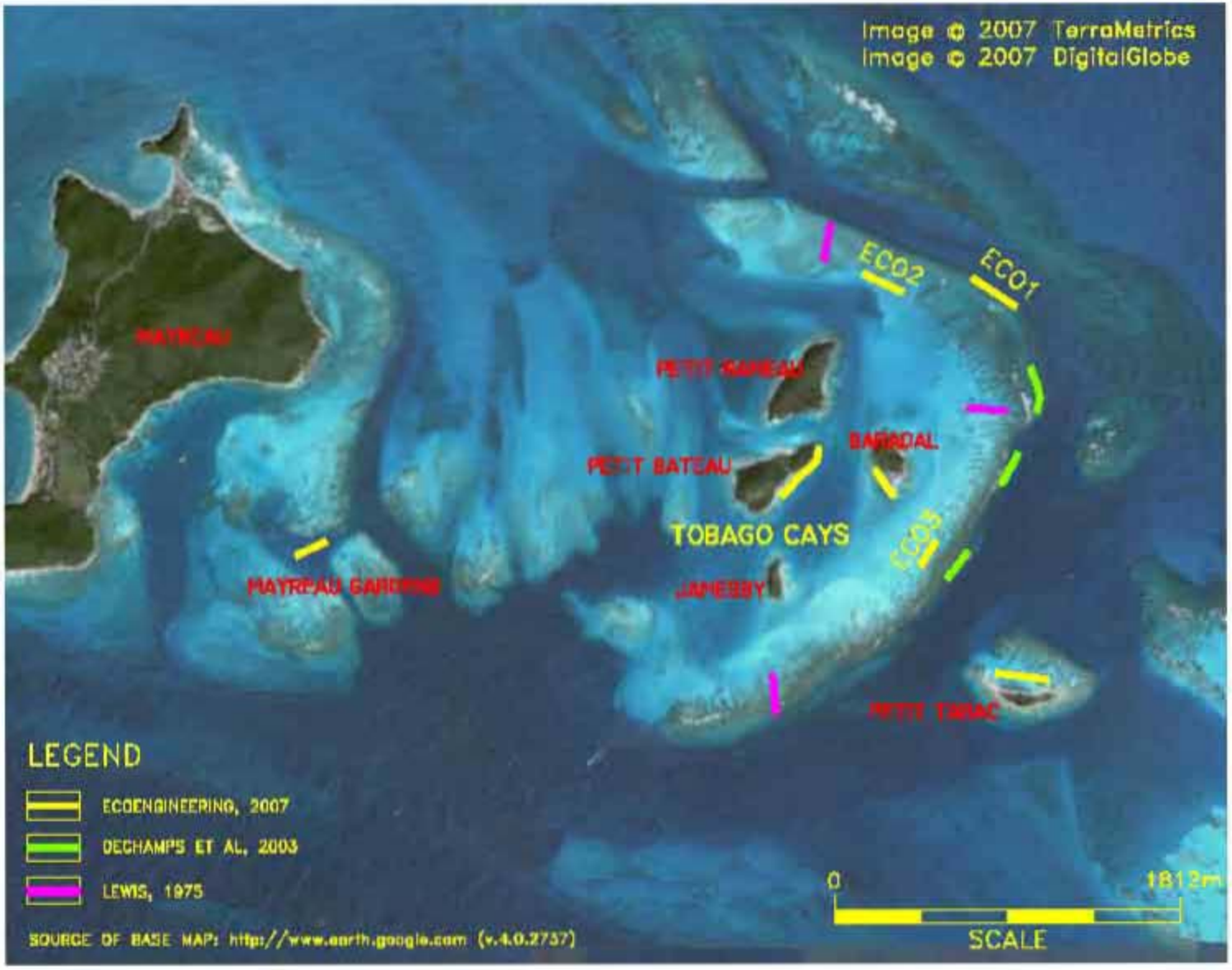
3.5 Field Collection of Data

To build a more robust data base for the Tobago Cays Marine Park, Ecoengineering expanded on available information from previous studies and published sources (see Section 3.2, above) by field reconnaissance and interviews with key stakeholders.

3.5.1 Marine Field Work

In February 2007 a rapid ecological assessment was conducted on representative coral reefs in the TCMP. The Atlantic and Gulf Rapid Reef Assessment (AGRRA) protocol was adapted for this assessment due to the limited personnel available and the large area to survey. Five roving ecological surveys were conducted, covering the widest area possible over the widest range of habitats and stress gradients. The surveys were conducted at the following locations (see Figure 3):

1. Horseshoe Fore Reef
2. Petit Bateau
3. Petit Tabac
4. Baradal, and
5. Mayreau Gardens



Ecoengineering Caribbean Ltd.	Eco Report No. 06/2007	CLIENT: OECS -ENVIRONMENT AND SUSTAINABLE DEVELOPMENT UNIT	FIGURE NUMBER 3
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		DWG. NAME: STUDY LOCATIONS IN TOBAGO CAYS MARINE PARK	

Reefs were examined with regard to corals species, percentage coral cover, incidence of coral disease and the amount of mortality, algal abundance, and relative abundance of reef fish. Fish species were also noted and at the conclusion of each survey, all recorded species were assigned one of four abundance categories [single (1); few (2-10); many (11- 100); and abundant (>100)]. Partial mortality in stony corals represents the cumulative effects of hurricane damage, diseases, overgrowth by algae and other encrusting organisms, predation, bleaching, physical abrasion, etc.

Along with the coral reefs, a rapid assessment of the seagrass beds within the TCMP was conducted.

3.5.2 Terrestrial Field Work

The primary focus of this study was the marine environmental assets, but for completeness observations were made of the dominant terrestrial flora and fauna on the cays. The description of the flora and fauna on the islands that make up the Tobago Cays was based on a limited field survey and an extensive literature review of available literature.

3.5.3 Interviews with Key Stakeholders

As part of this assignment, the study team met with the following government and other agencies to discuss the operations of the TCMP:

- Statistical Department
- Physical Planning Department
- Ministry of Tourism, Youth and Sports
- Fisheries Department – St. Vincent
- Fisheries Department – Union Island
- National Trust
- Customs Department – Union Island
- Mayreau Environmental Development Organisation

In addition, 41 interviews of other key stakeholders were conducted using a structured questionnaire (see Appendix A). The actual numbers interviewed in each group were as follows:

- 9 Vendors,
- 8 Tourists,
- 7 Water Taxi Operators,
- 5 Commercial Divers,
- 5 Area Residents,
- 4 Fishermen,
- 2 Charter Boat Operators, and
- 1 Dive Shop Operator.

Further information on these interviews is provided in Section 5.2.

3.5.4 Challenges and Constraints

The following challenges and constraints were encountered during the field collection of data:

- There is only one dive shop (Grenadines Dive) located on Union Island, and the dive master was interviewed. In addition to this interview, some of the tourists interviewed also indicated that they dive for recreation.

- The other four divers interviewed indicated that they dive for commercial purposes; that is, spear fishing.

- Fishing is prohibited in the Tobago Cays. The fishermen who traditionally fished in this area have all moved on to other fishing grounds and therefore are no longer dependent on fishing in the Cays for their livelihood. This explains the low number of interviews.

- There was some difficulty in accessing the tourists, as the majority of them were on the sea in various types of marine vessels. There was also the problem of language barriers as not all tourists spoke English. Information on yacht arrivals and countries of origins revealed that most tourists were from France or French speaking countries, and that there were also visitors from Norway, Germany, Denmark and Italy.

- Interviews with water taxi operators and vendors indicated that most tourists visited the area during the period December to March. They also said that this particular year was 'slow' in comparison to previous years. These factors may have contributed to the small numbers of tourists, and by extension vendors that were available for interviews.

- Residents indicated that they hardly or in some instances, never visit the Tobago Cays. They did not indicate the reason for this and were therefore unable to participate in this exercise.

3.5.5 Application of Results

The results of field data collection were used to prepare a description of baseline conditions on which potential impacts can be evaluated. In addition, the field work also disclosed adverse impacts which are already taking place at the TCMP.

3.6 SWOT Analysis

The SWOT (Strengths, Weaknesses, Opportunities and Threats) Analysis was not part of the original scope of this assignment, but was added by Ecoengineering as a means of focussing the analysis of potential impacts (and specifically in relating pre-existing factors to the approaches in the Management Plan). SWOT Analysis is an extremely useful tool with which data is subjectively assessed and organized into a logical order. By identifying Strengths, Weaknesses, Opportunities and Threats associated with the Tobago Cays Marine Park, it will be easier to identify appropriate measures for protecting the environment and specifically for addressing potential adverse impacts. In any SWOT Analysis, it is important to note that the categories are not mutually exclusive. It is quite possible for a single aspect to be associated with a strength and also with a threat.

3.7 Potential Impacts and Mitigation Measures

The assessment of potential impacts consisted of three steps:

- Impact Identification,
- Classification of Impacts, and
- Recommendation of Mitigation Measures.

3.7.1 Impact Identification

Based on the proposals for the PA and the baseline description (see Sections 3.3 and 3.5, respectively), Ecoengineering identified potential adverse impacts to the natural and human environments, of two general kinds:

- new impacts which may arise from the PA Proposal, and
- intensification (or diminution) of existing impacts.

This identification of potential impacts was based, in large measure, on the study team's considerable experience in environmental studies (and in particular Environmental Impact Assessments) in the OECS and in the wider Caricom Region.

3.7.2 Classification of Impacts

The impacts which were identified were also classified on a systematic basis (both assuming that now mitigation measures were applied and also assuming the successful implementation of mitigation measures). The classification method was based on three criteria: extent, intensity, and nature. Based on this, impacts (both with and without mitigation) were classified as low, moderate or high. Where adverse impacts were considered to be insignificant, no classification was applied. Further details on the classification system are provided in Appendix B.

3.7.3 Recommendation of Mitigation Measures

Ecoengineering also identified measures which can be used to effectively reduce environmental impacts of the PA Proposals, both on the Natural Environment and on the Human Environment (that is, on the physical, biological and social environments). Again, we relied largely on our experience on earlier projects of this kind. The mitigation measures were physical measures (fixed anchorages, appropriate trash collection, appropriate sewage treatment) as well as administrative measures (limiting visits during nesting seasons, limiting numbers of visitors at one time).

3.8 Other Evaluation Tools

Two other evaluation tools are discussed in this report:

- A Monitoring and Evaluation (M&E) Checklist, and
- An Evaluation Matrix

The M & E Checklist was adapted for use in Protected Areas in the OECS. This is introduced in Section 6.9 and discussed further in Section 9.5.

The Evaluation Matrix was adapted from a Canadian model. It is introduced in Section 9.13 and used in that same section to summarize environmental, social and livelihood aspects of the actions envisaged in the Management Plan and the Livelihoods Study.

4 ENVIRONMENTAL CHARACTERISTICS

The Tobago Cays Marine Park (TCMP) which encompasses the Tobago Cays in the St. Vincent Grenadines consists of five small uninhabited islands lying between St. Vincent and Grenada, at 12 °28' N, 61° 22' W (see Figure 1). The Cays, Petit Rameau, Petit Bateau, Jamesby and Baradal are protected on the windward side by Horseshoe Reef, a semicircular coral reef, approximately 4km long (see Figure 2). The fifth Cay Petit Tabac is located just to the east other Cays. While the boundaries of the TCMP are still in some dispute regarding whether the island of Mayreau should be included in the Park (personal communication with Fr. Andrew Roache, February 2007), our scope assumes that the western boundary of the TCMP lies along the eastern coastline of Mayreau.

The Cays are also surrounded by a series of fringing reefs. The bank-barrier and fringing reefs of the Tobago Cays are dominated by the branching Elkhorn coral (*Acropora palmata*) in shallow water and by various head corals in the deeper fore-reef zones; their structure has been described by Lewis (1975), Adey and Burke (1976); and Heyman, et al. (1988).

This chapter describes the key environmental assets encountered within the park which were determined through field reconnaissance during the period February 8th to 16th, 2007 as well as a review of relevant literature also collected during this period. A brief description of the methods used to capture this information is included at the beginning of each description.

The description of the key environmental assets will be presented under the following sub-sections:

- Marine Environment, and
- Terrestrial Environment

4.1 Physical Oceanography

The sections below provide information under the following headings:

- Bathymetry,
- Tides and Currents, and
- Water Quality

4.1.1 Bathymetry

The islands lie on a shelf, extensive in the Grenadines but narrow around St. Vincent itself. The Grenadines shelf extends up to three times further to the east of the main chain of islands than to the west. This shelf is not uniformly shallow (Wells, 1988), but is marked by a ridge on its eastern margin of some relic reef system (D'Anglejan and Mountjoy, 1973).

Although a deep basin (>150 m) lies just west of Mustique, most of the southern Grenadines are on a wide shallow shelf, conducive to the formation of many coral reefs. The bottom then slopes away rapidly after the 50, depth contour. This highly active erosive environment often exposes hard rock faces.

4.1.2 Tides and Currents

The dominant ocean currents in the vicinity of St. Vincent and the Grenadines flow from the east-southeast (Mills, 2001). Some upwelling of deeper ocean waters is thought to exist along the eastern part of the insular shelf.

Tides throughout the islands are semi-diurnal. There is a predominant current flow from east to west of up to 3 knots (Parsler, 1989), which brings seasonal influxes of surface fresh water from the Amazon and Orinoco estuaries. This prevailing flow is reversed by a weaker, shorter duration west to east flow every day. Localised currents and topography significantly affect the tidal stream. Currents tend to suppress the east-going stream and enhance the west-going stream, while narrow channels strengthen the west-going streams. The seasonal variation in salinity in the SVG waters is between 34.5% and 36.5% (UNEP/CEPAL, 1979).

Due to the prevailing north easterly winds, the sea often breaks at depths of less than 8 m on the eastern side of the island chain (UK Hydrographic Office, 2000). These prevailing winds can produce rough weather in the Bequia Channel, which is exacerbated when the tidal stream is set against the wind. In sharp contrast, the sea state on the western side of the island tends to be calm (UK Hydrographic Office, 2000).

4.1.3 Water Quality

This discussion on marine water quality in the Tobago Cays was summarised from results of sampling conducted in 2006 (CERMES, 2006). However, these results are included only as a rough guide since sampling inconsistencies and difficulties may have resulted in a failure of the quality control of some of the parameters of the sampling program (CERMES, 2006).

4.1.3.1 Sampling Locations and Parameters

As noted by CERMES in 2006, sampling was conducted at four locations (Egg Reef, Horseshoe Reef, Petit Bateau and Petit Tabac) by TCMP park rangers. At each location two samples were collected: one for nitrates and phosphates and the other for microbial examination. While no indication of the depth at which samples were taken was given, samples were tested for the following parameters either in-situ or by use of an off-site laboratory:

- Heterotrophic plate count using membrane filtration,
- Total Coliforms,
- Faecal Coliforms,
- Turbidity.
- pH,
- Salinity, and
- Temperature.

Although it is the usual practice to measure temperature and salinity in-situ, these measurements were actually taken in the laboratory. Therefore the results were not representative of conditions on site at the time of sampling. Due to this sampling error, the following discussion of results does not include these parameters.

4.1.3.2 Results

Standards used for comparison are included in Table 1 while results of water quality testing are contained in Table 2.

TABLE 1: MARINE WATER QUALITY STANDARDS FOR BIOLOGICAL AND CHEMICAL PARAMETERS

PARAMETER	STANDARD
BLUE FLAG	
pH	6.5-8.5
Nitrates (mg/l)	0.6
Phosphates (mg/l)	0.1
Total Coliform (CFU/100 ml)	<250
Faecal Coliform (CFU/100 ml)	<100
Ministry of Housing, Lands and the Environment, Government of Barbados (Draft)	
pH	7.0-8.7
Dissolved Oxygen	5.5
Turbidity (NTU)	1.5
Nitrates (mg/l)	0.002
Phosphates (mg/l)	0.009
Faecal Coliform (CFU/100 ml)	200

TABLE 2: RESULTS OF 2006 MARINE WATER QUALITY TESTING

Site	Date	Egg Reef	Petit Tabac	Petit Bateau	Horseshoe Reef
pH	19/05/06	8.48	8.32	8.52	8.45
	12/07/06	8.31	8.31	8.4	8.39
	14/08/06	8.4	8.45	8.44	8.39
	19/09/06	8.35	8.29	8.35	8.28
Phosphate (mg/l)	19/05/06	0	0	0	0
	12/07/06	0	0	0	0
	14/08/06	0	0	0	0
	19/09/06	0	0	0	0
Nitrate (mg/l)	19/05/06	<10	<10	<10	<10
	12/07/06	<10	<10	<10	<10
	14/08/06	<10	<10	<10	<10
	19/09/06	<10	<10	<10	<10

HTC (CFU/g/ml)	19/05/06	1	1	nil	2
	12/07/06	2	nil	TNTC	2
	14/08/06	TNTC	2	TNTC	100
	19/09/06	TNTC	TNTC	TNTC	TNTC
TC (CFU/g/ml	19/05/06	nil	nil	nil	nil
	12/07/06	240	100	TNTC	TNTC
	14/08/06	2	4	16	6
	19/09/06	50	110	80	40
FC (CFU/g/ml)	19/05/06	nil	nil	nil	Nil
	12/07/06	nil	nil	6	Nil
	14/08/06	nil	nil	nil	Nil
	19/09/06	4	12	20	28
BOD (mg/l)	19/05/06	1.2	1.3	1.5	0.5
	12/07/06	1.1	1.3	1	1.2
	14/08/06	0	0.3	1.7	2.3
	19/09/06	4.3	4.0	3.8	3.4
Oxygen	19/05/06	5	1.5	4.5	1.3
	12/07/06	5.3	4.7	4.8	5.2
	14/08/06	5.6	5.7	6.4	5.3
	19/09/06	4.3	5.5	5.1	5.0
Turbidity (NTU)	19/05/06	0	3	5	0
	12/07/06	0	0	0	0
	14/08/06	10	6	10	3
	19/09/06	5	7	5	7

Notes:

1 TNTC – too numerous to count
2 NTU – nephelometric turbidity units
3 CFU – colony forming units

4.1.3.2.1 pH and Air Temperature

The mean pH for the sites was 8.38. This was within the Blue Flag and Government of Barbados (GOB) standards (see Table 1). As noted in Section 4.1.3.1 above, the recorded water temperature values were inaccurate due to the sampling method, however, mean air temperature values on sampling days were 28.8, 29.3, 29 and 30 °C for May, July, August and September respectively (SVG Meteorological Service). This gradual increase in air temperature is considered normal for tropical sea surfaces and provides a reasonable guide to actual surface water temperatures.

4.1.3.2.2 Nitrates and Phosphates

Phosphate concentrations were zero across all the sites and hence were below the Blue Flag standard. Nitrate concentrations were consistently below 10 mg/l for all sites.

4.1.3.2.3 Dissolved Oxygen and BOD

Dissolved oxygen values fluctuated during the sampling period but were generally below the GOB standard. In May dissolved oxygen concentrations were substantially lower than the GOB standard. Petit Tabac and Horseshoe Reef showed the lowest concentrations of dissolved oxygen. In July, dissolved oxygen concentrations increased but were still below the standard. The highest concentrations during the sampling period were recorded in August with all sites except Horseshoe reef having concentrations above the standard (see Table 1).

BOD was generally low and stable from May to August with an average of 1.1 mg/l for all sites but increased in September to an average of 3.8 (CERMES, 2006). No standards were available for comparison.

4.1.3.2.4 Total and Faecal Coliforms

In general, faecal coliforms were nil for all sites for the first three month of the sampling period with the exception of Petit Bateau in July in which 6 colony-forming units per 100 ml were recorded. Significant increases in CFU were observed in September for all sites with Horseshoe Reef exhibiting the greatest number of coliform counts.

Total coliform counts were nil for May but showed increases in July, August and September. High counts were recorded as ‘too numerous to count’ were observed for petit Bateau and petit Tabac in July. Egg Reef and Horseshoe Reef had counts of 240 and 100 / 100 ml respectively. In August lower numbers of coliforms were observed for all sites. Coliform increased in September with petit Tabac exhibiting the greatest number of coliforms (CERMES, 2006).

4.1.3.2.5 Turbidity

The lowest mean turbidity, 2 NTU, occurred in May which had an average of 4 NTU. This decreased in July to 0 NTU, increased in August to a mean of 7.3 NTU and decreased slightly in September to 6 NTU. Turbidity measurements for three of the months during the sampling were above the GOB standard pf 1.5 NTU (CERMES, 2006).

4.2 Marine Environment

The main marine assets within the TCMP are the coral reefs and sea grass beds which support a wide array of marine life. General information concerning the TCMP of St. Vincent and the Grenadines was obtained from the TCMP Board and several historical documents which will be cited where applicable. Field reconnaissance surveys were also conducted at selected sites within the TCMP. Figure 3 shows the extent of the TCMP and the areas surveyed. Reconnaissance surveys focused on areas of high marine diversity, areas of high human activity ("popular") and areas of damage or scarring.

4.2.1 Coral Reefs

Surrounding the Tobago Cays are several shallow fringing reefs, and a major horseshoe barrier reef. Within the last 20 years several formal and informal reports have suggested that there has been a slow degradation of the coral reef ecosystems in the Tobago Cays. Stressors on the reef include physical storm damage (associated with the passage of hurricanes and tropical storms), anchors, and fishing gear, as well as from white-band disease, other diseases, and localized nutrient pollution from yachts (Wells, 1988; Smith et al, 1997). Reef monitoring exercises by Heyman et al (1988), Deschamps et al (2003) and the French Mission for Cooperation and the SVG Fisheries Division (FMC & FD, 1995) (see Figure 3) have all noted deterioration in the quality of coral reefs in some areas of the Tobago Cays. Live colonies of *A. palmata* that once flourished at Horseshoe Reef in the high-energy shallow-reef zones have virtually disappeared (Deschamps et al. 2003). A report by Coral Cay Conservation (2002) indicated that low diversity of habitats and by extension biodiversity in the Tobago Cays is necessary for maintaining the diversity and productivity of the surrounding reefs. Horseshoe Reef and the fringing reef around Petit Tabac exhibit exceptional biological and conservation value (CCC 2002). The report further identifies Mayreau Gardens as having a range of habitats types and one of the most biodiverse areas in the Park (CCC 2002), to the extent that it has also been described as "the jewel of the Tobago Keys" (Heyman et al 1988).

4.2.2 Method

As noted in Section 3.5.1, the method used to assess the coral reefs and the seagrass beds was a rapid ecological assessment. This was undertaken by five roving ecological surveys which covered the widest area possible over the widest range of habitats and stress gradients.

The following locations were chosen for these dives:

- Horseshoe Fore Reef,
- Petit Bateau,
- Petit Tabac,
- Baradal, and
- Mayreau Gardens.

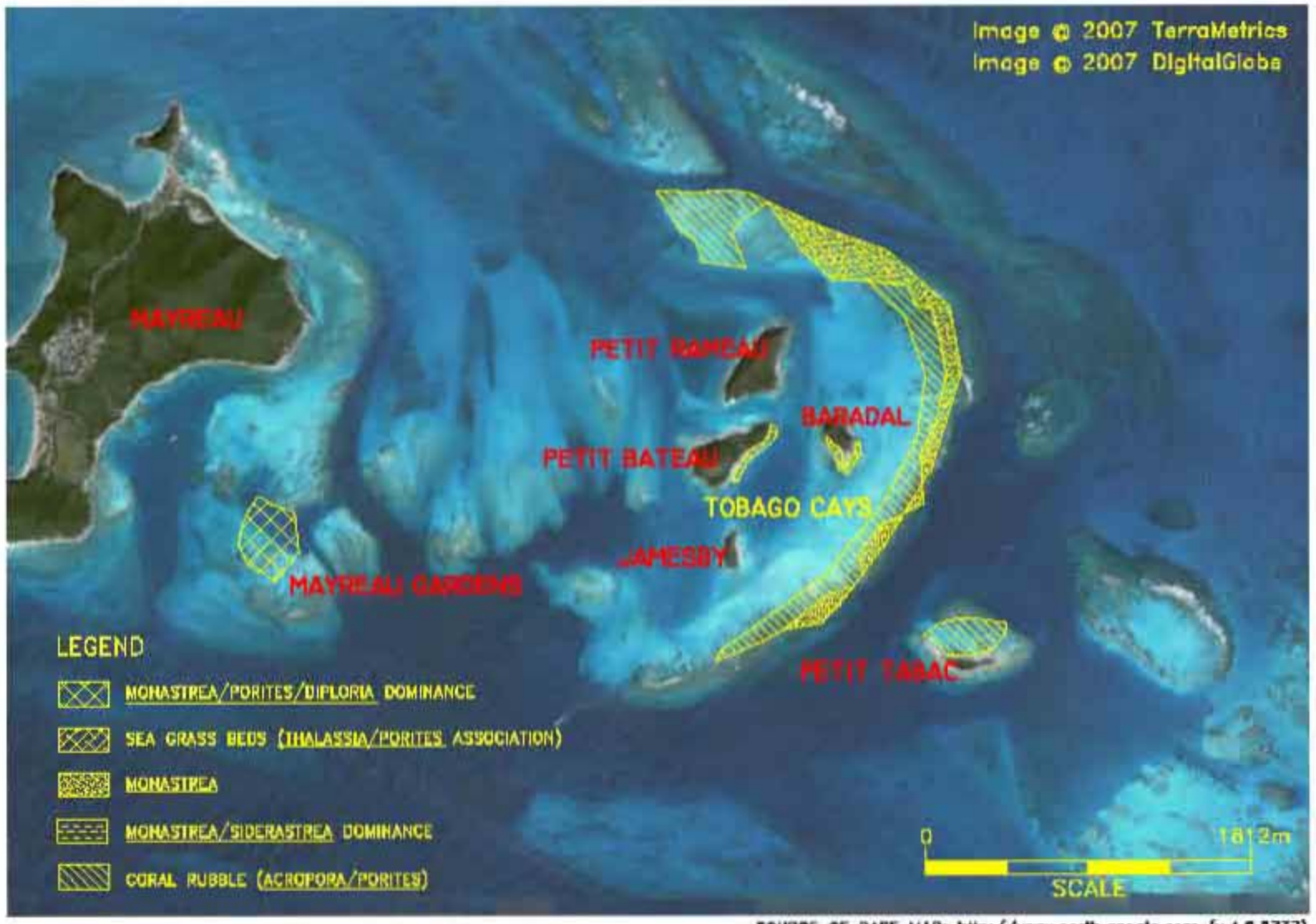
Most sites were dominated by dead coral rubble and had live coral cover between 5% and 30%. This information is displayed graphically in Figures 4 and 5.

4.2.2.1 Horseshoe Reef

Horseshoe Reef (hereafter called HR) is considered to be the largest reef in St. Vincent and the Grenadines. The earliest published description of HR was conducted by Lewis in 1975 which indicated the presence of 30 species of corals within the Tobago cays, representing 9 families. In this preliminary study three distinct sections were identified in HR, the back reef, reef crest and fore reef. Lewis indicated that there was a dominance of *Montastrea annularis* on the fore reef, *Acropora palmate* along the reef crest and characteristic assemblages of *Millepora* and *Palythoa* in the back reef.

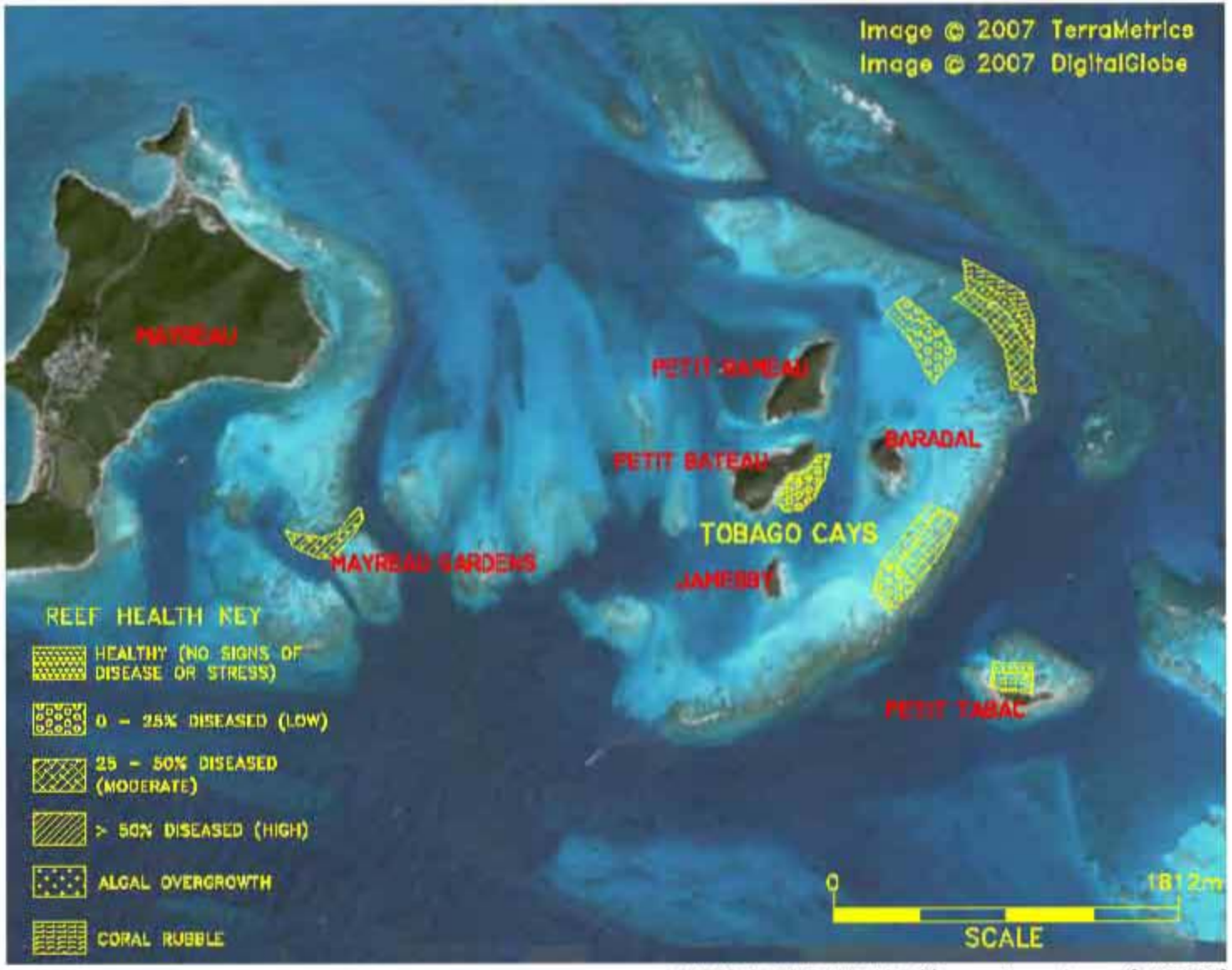
In subsequent years several studies have been conducted on HR, especially in light of the high incidences of disease and mortality in Caribbean reefs. While coral disease has a world wide distribution, the Caribbean continues to be a “disease hot spot” and currently, diseases stand out as one, if not the most important factor in the deterioration of many Caribbean coral reefs (Harvell et al. 1999, Weil et al. 2002, Weil 2004).

The French Mission for Cooperation and the SVG Fisheries Division (FMC & FD, 1995) as part of the reef monitoring programme for the TCMP indicated that a general deterioration of the reefs in the TCMP, including HR. Over a 6 month period there was a 0.71% loss of average coral cover. The report also indicated that *Montastrea*



SOURCE OF BASE MAP: http://www.earth.google.com (v.4.0.2737)

Ecoengineering Caribbean Ltd.	Eco Report No. 06/2007	CLIENT: OECS -ENVIRONMENT AND SUSTAINABLE DEVELOPMENT UNIT	FIGURE NUMBER 4
		PROJECT: TOBAGO CAYS SITE REPORT ST. VINCENT AND THE GRENADINES	
	Date: 31/07/07	DWG. NAME: HARD CORAL DOMINANCE (ECOENGINEERING SURVEY 2007)	



SOURCE OF BASE MAP: http://www.earth.google.com (v.4.0.2737)

Ecoengineering Caribbean Ltd.	Eco Report No. 06/2007	CLIENT: OECS -ENVIRONMENT AND SUSTAINABLE DEVELOPMENT UNIT	FIGURE NUMBER 5
	Date: 31/07/07	PROJECT: TOBAGO CAYS SITE REPORT ST. VINCENT AND THE GRENADINES	
		DWG. NAME: STATUS OF TOBAGO CAYS CORAL REEFS (ECOENGINEERING SURVEY 2007)	

annularis was the dominant species, with a relative abundance of over 50 %, and the remaining area was equally shared by *Colpopyllia natans*, *Porites porites* and *Siderastrea sidereal.*

Deschamps et al (2003) assessed the reef with respect to the relative health of and mortalities of the corals, as well as looking at the algae and fishes. The survey revealed a dominance of *M. annularis* (31%), *Porites asteroids* (23%), *P. porites* (23%), *M. faveolata* (5%), and *Millepora complanata* (4%). Most shallow areas were composed of dead *A. palmata* encrusted with colonising *Millepora, Porites* and coralline algae. Relatively low incidences of coral disease and primarily partial bleaching were observed.

4.2.2.1.1 Horseshoe Fore Reef

This deep area east of the Cays consists of a mixed coral community growing over primarily coarse *Acropora palmate* rubble and bare rock. Surveyed areas (ECO 1) displayed scattered colonies of hard corals, such as *Porites sp., Milleopra sp., Colpophyllia sp., Acropora palmata*, *Montastrea sp.* and *Siderastrea* along with several species of Gorgonians, sponges and other soft corals. However, their appearance is marred by the presence of disease. Sea fans showed signs of aspergillosis (see Photograph 1) and bleaching, several colonies of *Colpophyllia* and *Montastrea* exhibited signs of bleaching as well as Black Band disease, White Plague and algal smothering (see Photograph 2). There is also a heavy algal presence on the reef, with some areas being 75% covered in *Halimedia*. Local park rangers indicated that the recent hurricanes have had devastating effects on some of the reefs within the Cays, resulting in the “ploughing” of reefs and creation of nearby rubble islands of *Acropora palmata*. Dead branching corals (*A. palmata, A. cervicornis, Madracis mirabilis*) on the outer reef slopes coupled with coral partial-mortality in all species have limited reef regeneration. The park rangers also indicated that the coral communities are regenerating. However, the presence of disease and the heavy macroalgal presence on the reef are slowing the regeneration process.

Dense patches of macroalga turf smothered several colonies of coral. Most of the calcareous and fleshy macroalgal cover was represented by *Halimeda spp*. and *Dictyota spp*., respectively. These are major competitors with corals for the resources present. Higher densities of macro alga turf were found in areas in excess of 12 m.

The fore reef supports a myriad of habitats and by extension supports a wide biodiversity. However, the herbivore community seem to be ineffective at controlling the spread of the algal turf and coral smothering. Key herbivores such as *Diadema antillarum* were too few to have an impact. Other herbivores included Acanthurids, Scarids and Pomacentrids. Butterflyfish (Chaetondontids) are indicative of healthy reefs and the scarcity of these fish suggests that the reefs are stressed.

Other major families of reef fish noted were snappers (Lutjanudae), groupers (Serranidae), puffer fish (Tetradontidae and Diodontidae) and grunts (Pomadasyidae). It was observed that these were the targets of spear fishermen. Park rangers indicated that snappers and groupers are a common fishery resource used by recreational fishermen in the Cays, However, the low abundance of adults and dominance of juveniles suggest the over-fishing of these species in the area.

The findings of the roving reef assessment of Horseshoe Reef fore reef are consistent with the reports by Lewis, Dechamps and FMC & FD, with respect to the dominance and distribution of hard corals. The reef has undergone further deterioration since the passage of the last hurricane, Ivan, 2004. The rubble generated from destroyed *Acropora* and *Porites* beds have accumulated in the shallow areas near Petit Bateau within the TCMP to form small coral rubble shoals.

4.2.2.1.2 Horseshoe Back Reef

Two back reef areas were observed during this survey (see Figure 3). The back reef is relatively flat ranging from 1-5 m in depth. In the deeper areas (see Figure 3 healthy communities of stony corals such as *Montastrea spp, Siderastrea spp., Colpophyllia sp.,* and *Porites spp.* dominated. Within these colonies were *Millepora sp.*, gorgonians, and other soft corals. Approximately 5-15% percent of the stony coral showed signs of disease. Diseases included white band and yellow spot.

In contrast, shallower areas of the back reef (ECO 3) showed prolonged signs of degradation and stress. These areas are frequented by tourists on a regular basis and “reef walking” seemed to be the major impact on these reefs. The existing patchy reefs lay atop the skeleton of dead *Acropora sp*. The dominant stony corals were *Montastrea sp., Siderastrea sp.* and *Diploria* however many of these showed signs of disease.

PHOTOGRAPH 1: ASPERGILLOSIS AFFECTING SEA FAN

PHOTOGRAPH 2: DISEASE AFFECTING MONASTREA

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		DWG NAME:	PHOTOGRAPHS 1 & 2

The algal communities varied considerably between the northern (ECO 2) and southern (ECO 3) back reef areas. Approximately 60-80% of the coral patches in ECO 2 had high densities of the macroalgae *Halimeda spp*. ECO 1 however exhibited approximately 30% macroalgal cover. Like the fore reef, there were few species of key herbivores such as parrotfish (*Scarus taeniopterus)*, surgeonfish (*Acanthurus coeruleus*) and angelfish (*Pomacanthus arcuatus*) and the existing herbivores seemed unable to effectively control alga growth in shallow areas.

Lewis described HR back reef as having sand bottoms with meadows of sea grasses, however during the site assessment, only isolated areas of small patches of sparse *Thalassia* were noted. Lewis also described a rich alcyonarian community in the back reef. Most of the alcyonarians were confined to the corals in ECO 1 (greater than 4m), where as none were noted in the shallower more damaged areas of the back reef. The characteristic *Millepora* was still common in the back reef; however many were damaged and showed signs of stress.

4.2.2.2 Petit Bateau

Petit Bateau is surrounded by patches of shallow fringing reefs. The reefs show a mixture of alive and dead coral, with new colonies establishing themselves atop dead *Acropora* branches. The dominant stony corals included *Montastrea* and *Siderastrea*. Other major corals noted included *Millepora*, *Colpophyllia sp.* and *Porities*. Large coral heads of *Montastrea, Colpophyllia sp.* and *Diploria* showed signs of white plague and an unknown disease, resulting in bare splotches void of polyps. Areas between the reef patches were a combination of sand and sea grass. Similar to the other reefs within the Cays, there was an abundance of the macro alga *Halimeda spp*. and *Dictyota spp* and the scarcity of *Diadema sp*.

The fish fauna consisted primarily of juveniles of parrotfish (Scaridae), damselfish (Pomacentridae), grunts (Pomadasyidae), and surgeonfish (Acanthuridae). Appendix C contains a list of all the species of fish encountered on the reefs surveyed.

4.2.2.3 Petit Tabac

Petit Tabac is located to the west of Horseshoe reef and therefore does not receive the protection from sea surge as the other Cays. The survey area at Petit Tabac displayed the poorest reefs within the Tobago Cays. Areas previously under fringing reefs were now covered with dead pieces of *Porites* and *Acropora,* and small dead *Montastrea* mounds (see Photograph 3). Park rangers indicated that the reefs in this area

experience heavy and continuous sea surge, and coupled with the passage of the last hurricane, the fringing reefs have been deteriorating due to the physical damage. The reef is very shallow, with very small isolated colonies of soft corals, *Porites* and sponges. However, the coral rubble has become approximately 75% covered by red encrusting algae and *Halimeda*. In deeper areas in excess of 3m, colonies of *Montastrea* and *Siderastrea* have established themselves, along with common sea fans (*Gorgonia flabellum*) and sea plumes (*Pseudopterogorgia sp.*) on the large sand bottom.

Several species of small and juvenile fish fauna have taken advantage of the protection offered within the coral rubble. Although very few large fish were noted, barracudas (*Sphyraena barracuda)*, filefish (*Cantherhines macrocerus*) and eels (*Gymnothorax funebris)* were observed.

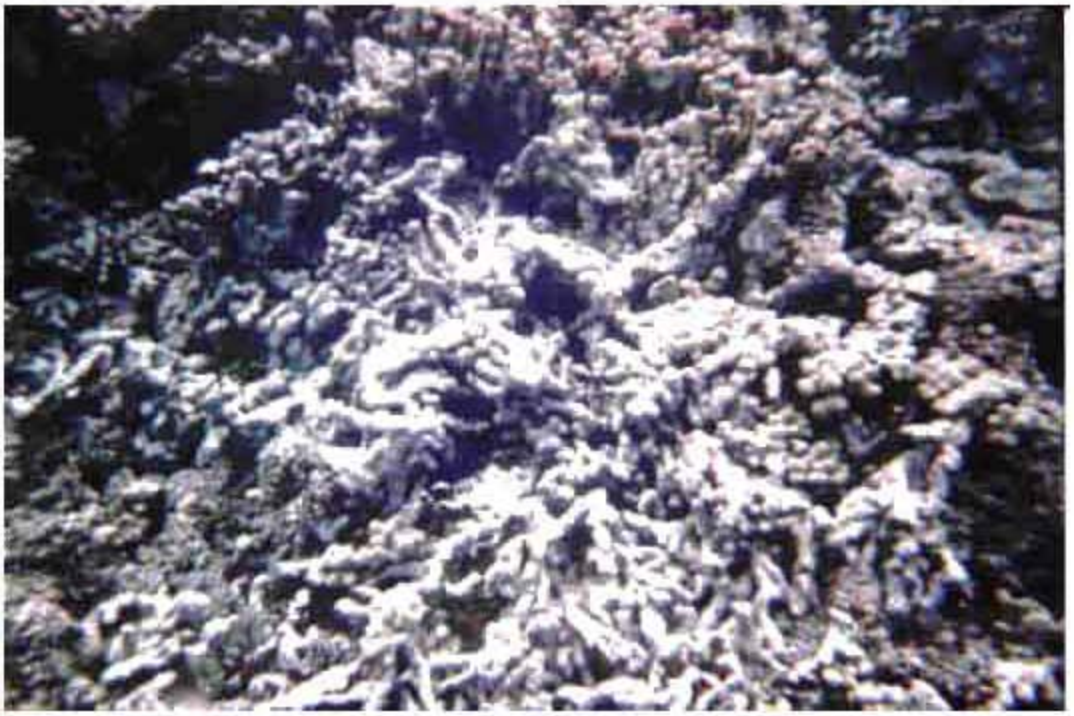
4.2.2.4 Baradal

Lewis 1975 describes the marine environment around Baradal as an association of sea grasses (*Thalassia*) with scattered corals (*Porites*) at varying densities depending upon the depth. Lewis also describes patches of reef with communities' of *Acropora, Diploria, Siderastrea, Porites* and Alcyonarians.

During this current survey, sea grass beds around Baradal were dominated by *Thalassia* and *Syringodium*, with dispersed small colonies of *Porites, Acropora, Siderastrea, Manicina* and sponges (see Photograph 4). Within the sea grasses was an abundance of *Dictyota.* Along the leeward side of the island colonies of *Porites* were dead *Acropora* skeletons. Though there was little *Acropora palmata*, many areas further offshore were dominated by healthy *Acropora* in small, dense patches.

4.2.2.5 Mayreau Gardens

Mayreau Gardens is a series of seven dive sites ranging from a steep sloping wall, reaching depths of up to 70 ft in deep areas to 25 ft in shallow areas. Shallow areas were a white sand bottom with sea grass and patches of coral. A wide variety of habitats and biodiversity are supported within the Mayreau gardens due to the presence of an environmental gradient from well-illuminated turbulent waters in shallow areas, to darker calmer conditions at the base of the reef.



PHOTOGRAPH 3: EXTENSIVE AREA OF CORAL RUBBLE AT PETIT TABAC

PHOTOGRAPH 4: SEAGRASS/PORITES ASSOCIATION

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This reef supported the widest coral and fish community noted during the assessment; however the site was also characterised by the highest incidence of coral disease. Approximately 50% of the Sea Fan and Sea whips were afflicted with aspergillosis. Other Gorgonians and soft corals displayed a combination of aspergillosis and white spot. The vast majority of hard corals such as *Montastrea, Colpophyllia, Diploria* and *Siderastrea* showed extensive damage due to hurricanes and diseases such as white plague and black band (see Photograph 5). Many of these diseases seem to affect specific coral types, whereas smaller colonies of hard corals, soft corals were minimally affected.

Some areas showing signs of recovery consisted of small colonies of mixed corals atop the branches of dead and broken *Acropora* (see Photograph 6). Dominant corals included *Montastrea, Diploria*, *Millepora*, *Porities* and Gorgonians. There was a high presence of sponges, soft corals and encrusting algae on dying coral heads. There was also a high presence of *Halimeda* on the reef as well. Higher densities of macro algae were noted at the bottom of the reef in deeper areas (>30ft), than in shallower areas (<30 ft).

4.2.3 Seagrass beds

The sea grass beds lie within the shallow lagoon south of Baradal. This area has long been a popular yachting destination and has undergone severe assault due to anchor damage; which has scarred and reduced the size of the sea grass beds. The TCMP Board has successfully been able to implement measures to curb further scaring of the sea grass beds.

In this survey, healthy sea grass beds were found along the southern coast of Baradal (see Figure 4). The main species of sea grass were *Thallassia and Syringodium* (see Photograph 7). Within the sea grass bed were small colonies of loggerhead sponges (*Spheciospongia verparium*), various soft corals and small colonies of *Porites* and *Siderastrea*. The sea grass beds support several species of juvenile fish, green turtles (*Chelonia mydas*), starfish (*Oreaster reticulates)*, conchs (*Strombus gigas*) and sea eggs (*Tripneustes ventricosus*) (see Appendix C). However, like other areas within the Cays, there is a significant presence of *Halimeda*, with some *Dictyota* on the windward side of the sea grass bed (see Photograph 8).

4.2.4 Fish and Other Aquatic Fauna

As noted in Section 3.5.1, Roving Diver surveys were conducted on the reefs to assess the current status and quality of the reefs. Apart from corals and seagrass, other species observed on the reef were noted. Appendix C contains a listing of fish species and other aquatic fauna observed during this survey.

4.3 Summary of Marine Environment

The following is a summary of the description of the marine environment:

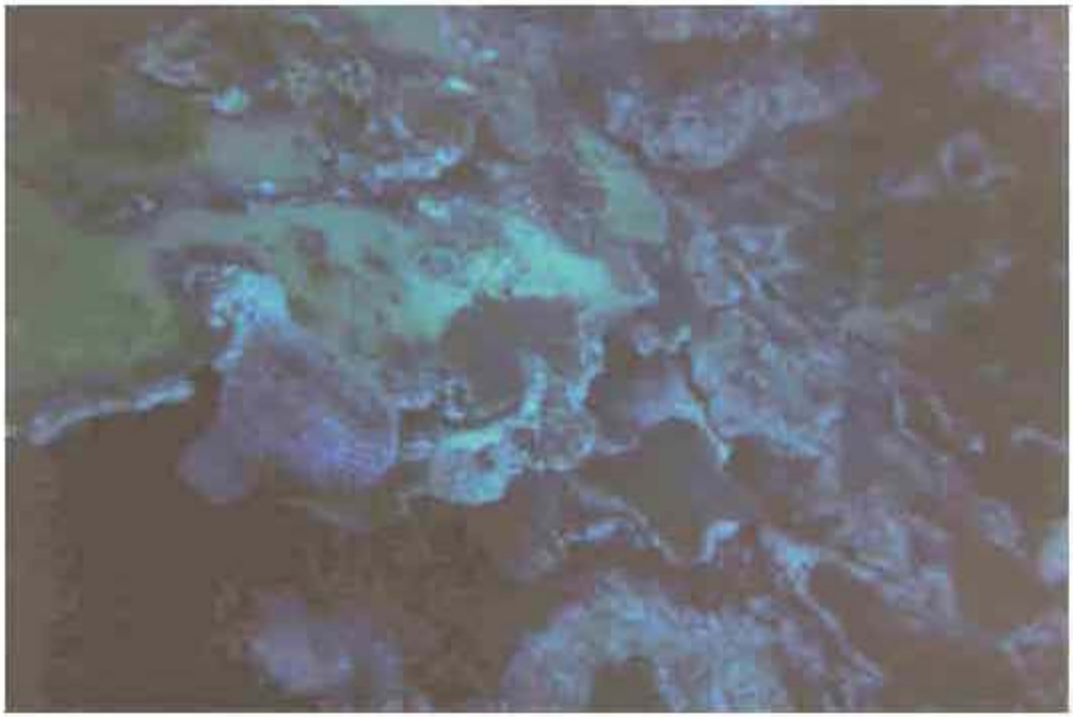
- Horseshoe fore reef which is part of the Horseshoe reef, has been marred by disease and bleaching. In addition, there is evidence of heavy algal overgrowth. This reef is home to fish families such as snappers, groupers, puffer fish and grunts.

- The Horseshoe back reef consists of two areas, a deeper region and a shallower region. The deeper region has been affected to a small extent by white band disease while the shallower regions show signs of prolonged stress and degradation. Reef damage on the shallower areas is associated with areas frequented by tourists / visitors. Damage is usually from reef walking.

- Petit Tabac was observed to have reefs of the poorest condition within the cays. It lies west of the horseshoe reef and therefore does not receive the protection from storm surge damage. The poor condition is therefore due to continued storm surge damage after the passage of hurricanes. Fish species observed were mostly juvenile reef fish although some large species such as barracuda were observed.

- Baradal is mostly surrounded by seagrasses with some patch coral reef communities while Mayreau gardens supported to widest coral and fish communities of all the sites surveyed. The gardens also showed the highest incidence of coral disease.

- Seagrass beds lie within the small lagoon off the island of Baradal. Although in the past, the seagrass community in this lagoon has undergone scarring, the intervention of the park rangers has resulted in the reduction of the incidence of anchoring over the seagrass and therefore a reduction in the scarring of the seagrasses.



PHOTOGRAPH 5: SEVERAL DISEASES AFFECTING MAYREAU GARDENS HARD CORALS

PHOTOGRAPH 6: RECOLONIZATION ATOP DEAD ACROPORA AND AGARICIA SKELETON

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PHOTOGRAPH 7: HEALTHY SEA GRASS BEDS AND GREEN TURTLE

PHOTOGRAPH 8: HALIMEDA OVERGROWTH INVADING SEA GRASS BEDS

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		DWG. NAME: PHOTOGRAPHS 7 & 8

4.4 Terrestrial Environment

The land area of the TCMP, i.e. the eastern coastline of the island of Mayreau and smaller Cays, comprises approximately 5% of the total area of the Park. Principal vegetation types include beach vegetation and dry forest. Information provided by the park rangers indicated that the beaches within the Cays provided nesting habitats for hawksbill and green turtles in the past. However, this habit has reduced significantly in the past few years. The park rangers further indicated that green turtles are now only observed nesting and grazing off Baradal which has the most developed seagrass community within the Cays.

4.4.1 Method

In accordance with our Terms of Reference for this assignment, very little emphasis was placed on the terrestrial vegetation within the Park. However, for completeness, observations of the dominant flora and fauna present in the TCMP were conducted during data collection for the environmental and socio-economic characteristics. The following description of the vegetation and fauna within the TCMP is based on these observations as well as from available literature. Appendix D presents a listing of the floral and faunal species observed and known to be present within the Park as well as species notes.

4.4.2 Flora

In general, the flora observed on the Cays was typical for the climatic conditions which exist on the islands. No threatened, rare or endangered species as well as no invasive species were observed.

4.4.2.1 Petit Rameau

Petit Rameau is the largest of the islands and like Petit Bateau, Jamesby and Baradal is an elevated coral reef complex. There is a small beach on the south west corner of the island and a mud flat grown up with *Rhizophora mangle* on the southern side. The small beach area has an inland fringe of *Coccoloba uvifera* and *Hippomane manchinella*. The *Rhizophora* however has been completely removed.

The windward slope of Petit Rameau is pitted, exposed coral rock. Only *Sesuvium portulacastrum* and *Cactus broadwayi* grow on the eastern shore. Immediately behind this zone of spray tolerant plants, however the brush develops in windrows. Definite aisles appear between these wind-affected plants. Plants forming these windrows are *Randia aculeate*, *Tabebuia pallida*, *Pisonia fragrans* and *Pithecellobium unguis-cati*. In the shelter of these plants are found *Lantana involucrate* in abundance. After these windrow plants such as *Ficus laevigata* and *Caesaria decandra* reach a height of about 6 feet with other species growing in their lee. The most abundant plant in such a location on Petit Rameau was *Diospyros inconstans* which was dominant in local areas. Diospyros fruits seem to be the principal food of the iguana (Iguana iguana) which was abundant on Petit Rameau.

4.4.2.2 Petit Bateau

Petit Bateau consists of two hills separated by a sand plain. About two acres of arable land were present in the plain area and in the past cotton was planted here. The area most recently cultivated has grown up with *Rauwolfia lamarckii*, *Cnidoscolus urens*, and *Croton flavens*. *Panicum maximum* was planted here in the past as this plain is now dominated by this species. Another grass species encountered was *Paspalum arundinaceum* while *Bourreria succulenta* was the most abundant species Undergrowth in this area consisted of *Cephalocereus nobilus*, *Cactus broadwayii*, and *Agave caribaeicola.*

The southern hill of Petit Bateau is approximately 150 feet high and the highest point on the Tobago Cays. This ridge is heavily wooded with *Coccoloba caribea, Randia aculeate*, and *Bourreria succulenta*. This area is heavily infested with *Caesalpinia bonduc* and *Cnidoscolus urens* making penetration difficult.

4.4.2.3 Baradal

Baradal has a gradual slope from an extensive sandy beach on the south to a rocky outcrop perhaps 50 feet tall on the north. The beach vegetation consists of a heavy growth of *Coccoloba uvifera, Hippomane manchinella, Caesalpina bonduc* and coconut *(Cocos nucifera)*. The rocky outcrop appears to have been cleared at some time in the past. The most conspicuous plant of this area is a large leafed *Agave* which may be *Agave sisal*. The stout spines and the dense growth of this plant make penetration of this small island difficult. *Accacia macracanthoides* is the most abundant shrub in the centre of the island but the margins are dominated by *Bourceria succulenta*.

4.4.2.4 Jamesby

Jamesby is the smallest of the Tobago Cays. A coral sand beach has been deposited on the eastern side of the island and Manchineel (*Hippomane)* is well established on this beach and slightly encroaching on the rocky ridge. The ridge has open woody vegetation consisting of *Bourreria succulenta*, *Ficus laevigala*, *Pisonia fragrans* and several species of *Croton*. This area too is well protected by the dense under-shrub of *Cnidoscolus urens*.

4.4.3 Fauna

Charlier (2004) lists four TCMP species as 'threatened, rare or endangered' indicators of global biodiversity significance:

- iguana (*Iguana iguana*),
- red-necked pigeon (*Colomba squamosa*)
- hawksbill turtle (*Eretmochelys imbricata*); and
- leatherback turtle (*Dermochelys coriaces*).

Important migratory species are further listed as:

- Zenaida dove (*Zenaida aurita)*
- sea gulls (*Larus spp*.)
- frigate bird (*Fregata spp*.)
- brown pelican (*Pelecanus occidentalis*)
- brown booby (*Sula leucogaster*)
- bridled tern (*Sterna antillarum*)
- red-billed tropicbird (*Phaeton aethereus*)
- sooty tern (*Sterna fuscata*)
- common tern (*Sterna hirundo*)

In the mid 1980s, Heyman et al (1988) reported that the introduction of goats had upset the ecology of the islands, and that iguana and Zenida dove were endangered and in need of protection. The goats still remain on Petit Rameau in small numbers, the iguana are reportedly still present on Jamesby at least, but the dove is no longer found in the Cays (Jacques Daudin, personal communication). The Ramier bird or rednecked pigeon, *Columba squamosa*, was reported as absent from the Cays in 1987, though limited numbers were then present on Union Island (Heyman et al, 1988).

4.5 Summary of Terrestrial Environment

The following is a summary of the description of the terrestrial environment:

- Vegetation colonising the cays within the park are typical island vegetation and consists of beach vegetation and dry forest.

- No rare, threatened or endangered species were observed.

- Four species found in the cays are listed as rare including the iguana, red-necked pigeon, hawksbill turtle and the leatherback turtle.

5 SOCIO-ECONOMIC CHARACTERISTICS

This discussion of socio-economic characteristics is derived from two main sources, meetings with government agencies and other organisations in St. Vincent; and a number of reports including:

- The St. Vincent and the Grenadines Population and Housing Census Report 2001;
- A Report on Evaluating Management Effectiveness at the Tobago Cays Marine Park, CERMES, 2006; and
- Fish Exporting in the Grenadine Islands: Activities of Trading Vessels and Supplying Fishers, Chakalall et al, 1995;

Additionally, socio-economic data on the various stakeholders associated with the TCMP were obtained through a series of questionnaires, interviews and meetings.

5.1 Demographic Data

The data provided in this section are discussed under the following headings:

- Population,
- Number of Households,
- Employment / Unemployment, and
- Commercial Activity.

This information is provided as a context for the results of stakeholder consultations.

5.1.1 Population

Table 3 below shows that the population in the Southern Grenadines (Union Island, Mayreau, Canouan, Palm Island and Petit Martinique) has been increasing since 1980. The percentage change from 1980 to 1991 was 13.9 % and from 1991 to 2001 this change was lower at 13.1%. In 2001, the population of the Southern Grenadines represented approximately 3% of the total population of the island state of St. Vincent and the Grenadines (see Table 3).

TABLE 3: POPULATION AND PERCENTAGE CHANGE

CENSUS DIVISION	POPULATION			% CHANGE	
	1980	1991	2001	1980-1991	1991-2001
Total Mainland	90,600	98,132	97,638	8.3	-0.5
Northern Grenadines	4,740	5,514	5,389	16.3	-2.3
Southern Grenadines	2,505	2,853	3,226	13.9	13.1

Additional information was received from a Preliminary Census Report issued by the Statistical Department prior the publishing of the Final Census Report. While this information does not exactly correlate with the final figures presented in Table 3 above, it does provide individual island population figures. Table 4 shows that the population in Mayreau (which abuts the TCMP) was 254 persons in 2001 which increased by 72 over the 1991 figure. Similarly, the population of Union Island and Palm Island (a private resort island) was 1,935 in 2001 which increased by just 7 persons from the 1991 figure.

TABLE 4: POPULATION OF INDIVIDUAL GRENADINE ISLANDS

ISLAND	POPULATION	
	1991	2001
Mayreau	182	254
Union Island and Palm Island	1928	1935

5.1.2 Number of Households

In a direct parallel with the number of persons, the number of households in the Southern Grenadines has increased over the past three census periods. The greatest increase occurring during the 1991 to 2001 period where the number of households increased by 60.1% (see Table 5).

TABLE 5: NUMBER OF HOUSEHOLDS BY CENSUS DIVISION

CENSUS DIVISION	1970	1980	1991	2001	PERCENTAGE CHANGE		
					1970-1980	1980-1991	1991-2001
Total Mainland	15,642	18675	24,776	27,555	19.4	32.7	11.2
N. Grenadines	788	1,045	1,450	1,721	32.6	38.8	18.7
S. Grenadines	510	570	776	1,242	11.8	36.1	60.1

Household numbers for the individual Grenadine islands are provided in Table 6 below. Again, these figures do not exactly correlate with the numbers in Table 5 but they are provided for comparison. In a parallel of the population figures, household numbers in Mayreau increased by 22 houses over the 10 year period between the 1991 and 2001 census. The increase in number of households in Union Island and Palm Island was 96 from 1991 to 2001.

TABLE 6: NUMBER OF HOUSEHOLDS BY ISLAND

ISLAND	1991	2001
Mayreau	24	46
Union Island and Palm Island	102	198

5.1.3 Employment/Unemployment

Employment in the Southern Grenadines was 86.9% in 2001 which was an increase over the information provided in the 1990 census which put employment in the Southern Grenadines at 80.6% (see Table 7).

Unemployment is St. Vincent is generally high at 21.1% in 2001 up from 19.8 in 1991. However, unemployment in the Southern Grenadines is lower at 13.2% in 2001 which is significantly lower than 19.4% in 1991.

TABLE 7: EMPLOYMENT, UNEMPLOYMENT AND PARTICIPATION RATES BY GENDER AND CENSUS DIVISION

CENSUS DIVISION	2001		
	EMPLOYED	UNEMPLOYED	LABOUR FORCE PARTICIPATION RATE
Northern Grenadines	82.9	17.1	63.0
Southern Grenadines	86.8	13.2	71.5
Total	78.9	21.1	59.4
1991			
Northern Grenadines	87.3	12.7	64.0
Southern Grenadines	80.6	19.4	70.4
Total	80.2	19.8	62.3

As noted in Table 8 below, the majority of employed persons worked in the tourism sector as cooks or waiters. However, a significant number (26.3%) were fishermen.

TABLE 8: EMPLOYED PERSONS IN THE SOUTHERN GRENADINES BY SECTOR (1991)

OCCUPATION	TOTAL	PERCENT
Fishermen	68	26.3
Fish worker	15	5.8
Hotel manager	16	6.2
Hotel clerk/reception\	13	5
Tour guide	13	5
Cooks/waiter	108	41.7
Hotel cleaner	26	10
Total	256	100

5.1.4 Commercial Activity

Commercial Activity specifically associated with the Tobago Cays includes:

- Fishing;
- Yachting,
- Diving,
- Cruise Ship
- Charter Boat Operators,
- Water Taxi Operators, and
- Vendors.

This information was obtained from interviews with fishermen as well as data obtained from the Fisheries Division and from the draft management plan (Hoggarth, 2007)

5.1.4.1 Fishing

The data below applies to fishermen who fish within the St. Vincent Grenadines, however, information obtained from the stakeholder consultation indicates that the majority of fishermen no longer fish within the Tobago Cays Marine Park boundaries because of the restriction. The only fishing activity known to still occur within the Cays is spear fishing, however, since this activity is prohibited, no information on the number this represents was available.

5.1.4.1.1 Number of Fishermen

As noted in Section 5.1.3, fishing accounted for approximately 23% of employed persons in the Southern Grenadines and the majority of these are male (Statistical Office, 2001 and Heyman et al, 1988). An accurate account of the number of fishermen living on Union Island is difficult to acquire, since documented numbers are conflicting. Heyman (1988) puts the figure at 200 with 140 based in Clifton and 60 in Ashton. Chakalall et al (1995) puts the figure at 38 (25 in Ashton and 13 at Clifton). Espeut (2006) reports Fisheries Division statistics listing 194 fishing boats registered in the Vincentian Grenadines, including 35 in Union Island, 11 in Mayreau and 22 in Canouan. Some of these are believed to operate as water taxis, rather than fishing, but register to take advantage of the duty free fuel concessions available to fishers. Compared to Heyman et al's 200 fishermen in 1987, only 28 fishermen are now registered as living in Union Island.

5.1.4.1.2 Fishing Gear

The small-scale fisheries of the Grenadines are pursued by a variety of gear and vessel types. The gear consists mainly of fish traps, spear guns, handlines, trolling lines, gill nets, beach seines, trammel nets and longlines.

Fishing gear used is generally simple, small scale and of low efficiency. Gear materials are mostly purchased locally, often from trading vessels which bring them in. Handlining methods include trolling lines and droplines. Trolling lines mainly catch tunas, kingfish, dolphin and barracuda.

Drop-lines are used mostly in deep slope and bank areas. Boats fishing with drop-lines either drift over the shelf area being fished or go “banking” where the boat tries to remain over a particular area and depth by rowing constantly.

Palang or bottom-set long-lines are also used in the Grenadines. The lines are usually laid along the bottom, but sometimes hung vertically down the shelf slope or bank edge. Trap fishing is done with traditional wire traps made of hexagonal mesh wire stretched over a wooden frame. Some are set in shallow water for subsistence catches while most are set deeper (>18-27 m) and catch a wide variety of reef fish including snappers, groupers and parrotfish. Traps are typically checked every 5-7 days (Chakalall et al, 1995).

Seine nets are used to catch coastal pelagics. Seines are typically used in two ways: close inshore, by pulling the net onto a beach or just offshore by encircling the fish (purse seining) and hauling the net up into the boat. Beach seining is done in sheltered coastal areas where the seafloor is smooth and gently sloping. One end of the beach seine is secured on shore while the remaining portion is “fed out” in a semi-circular fashion from a seine boat, which is usually rowed. The net is then gradually hauled in towards the shore carrying trapped fish with it.

Gillnets are made from monofilament nylon, not easily detected visually by fish. They can be set fixed at any depth or left to drift at the surface. Gillnets are commonly arranged circularly, or semi-circularly open to the beach while schools of fish are driven towards the mesh where they are trapped, usually by their gills. These nets are used to catch pelagic fishes.

Spear fishing is another common harvesting method in the Grenadines. Spear guns are used (while snorkelling) for some demersal fish species and turtles. Wire snares attached to end of hand held wooden sticks (1m in length) are used while diving for capturing lobster.

5.1.4.1.3 Fishing Fleet

Most of the artisanal fishers in the Grenadines use simple coastal fishing craft, 4-10 in size, equipped with oars, sails or outboard engines. They normally fish in inshore coastal areas, shallow coral reef areas and on deep fore-reef slopes.

The fishing fleet is composed of several types of open or partially decked wooden or fibreglass boats. The Grenadine fleet is composed of double-ender, pirogue, canoe, sloop, launch, and bow stern type vessels.

Double ender vessels are keeled wooden vessels with no differences in shape of the bow and stern. These vessels are designed to be sail powered and are steered by a rudder. Propulsion can also be supplied by an outboard engine. The largest double ender vessels are used for seining or whaling, with smaller ones used to assist seines and for trap and line fishing. Vessel length varies from 1.9-9.2 m.

Pirogues are fibreglass or wooden boats, with a high bow and flat stern, occasionally with a cabin, propelled by an outboard motor. These vessels are used for fishing offshore pelagics and deep demersals.

Bow and stern vessels are open, keeled, vessels with flat sterns range in sizes from 2.5-8.8 m. These vessels are mainly used in the lobster, conch and seine fisheries.

5.1.4.1.4 Demersal Fishing Activity and Seasonality in Fishing

Fishing for shallow water reef and deep demersal species is a year round activity for fishers. Lobster, conch, turtle and sea egg resources have closed seasons during which all fishing is prohibited. From December/January to May/June a “high season” is observed for fishers due to increased landings from offshore migratory pelagics such as dolphin (*Coryphaena hippurus*), yellowfin tuna (*Thunnus albacares*) and Kingfish (*Scomberomorus cavalla*). In the “low season”, landings are lower and more coastal

pelagic species such as jacks (*Selar crumenophthalmus*) and cero mackerel (*Scomberomorus regallis*) are landed. Demersal fishing is typically undertaken on a daily basis with fishers going out early in the morning and returning in the early or mid-afternoon period, with trip duration averaging between 6-8 hours.

5.1.4.1.5 Fish Landings

Information in fish landings was provided by the Fisheries Division. Fish landing data are provided for Union Island, Petit Martinique and Canouan. Data on fish landings from Petit Martinique (caught by fishermen in the St. Vincent Grenadines) are collected by hotels through an arrangement with the Fisheries Division. As noted in Table 9 below, fish landings at Union Island have fluctuated dramatically over the past 8 years. This phenomenon is confirmed from the observations of fishermen interviewed. In general the highest landings by weight were in the year 2000. There was a dramatic decrease in 2001 where fish landed by weight decreased by almost a factor of 4.

TABLE 9: ESTIMATED LANDED WEIGHT (LBS) AT VARIOUS LANDING SITES

LANDING SITE	2006	2005	2004	2003	2002	2001	2000	1999
Union	46,762	51,138	46,442	27,202	0	13,727	52,539	34,884
Petit Martinique	0	0	0	0	0	26,180	123,420	75,635
Canaoun	0	0	0	0	0	66,990	0	5,094

Note:

1. Data from Petit Martinique and Canaoun come from hotels that buy mostly lobster and data is only available from 1999 - 2001
2. This data has been raised (raising factor = # of days in the month / # days sampled)
3. Where there is 0 there was no data collected

Landings by estimated value follow the same pattern as landings by estimated weight (see Table 10). Landed values for Petit Martinique would traditionally be higher than the other two landing sites because of the species landed namely lobster which fetches a higher price than other species.

TABLE 10: ESTIMATED LANDED VALUE (EC$) AT VARIOUS LANDING SITES

LANDING SITE	2006	2005	2004	2003	2002	2001	2000	1999
Union	370,620	351,595	246,770	159,507	0	137,731	485,215	393,968
Petit Martinique	0	0	0	0	0	107,100	481,000	338,314
Canaoun	0	0	0	0	0	366,227	0	24,189

Note:

1. Data from Petit Martinique and Canaoun come from hotels that buy mostly lobster and data is only available from 1999 - 2001
2. This data has been raised (raising factor = # of days in the month / # days sampled)
3. Where there is 0 there was no data collector

5.1.4.2 Yachting

Both local and foreign companies provide yacht chartering services for use in the Grenadines. Three major charter companies offer bareboat and crewed yacht charters out of harbours in St Vincent; two smaller companies are based in Bequia. The combined national charter fleet comprised about 85 vessels in 2002, 12 of these being catamarans (UNECLAC, 2002 and Franklin and Mahon, 2003).

Table 11 below provides a comparison of yacht arrivals by Port of Entry. Union Island is clearly an important stop by yachts entering the Southern Grenadines being second only to Bequia. Generally, yacht arrivals to St. Vincent and the Grenadines have increased between 2004 and 2005 with the exception of Kingstown and Union Island. The decline in yacht arrivals at Union Island from 2004 to the present time was also confirmed by the water taxi operators and vendors who cater almost exclusively to these visitors.

While the numbers above are a good indication of the general numbers of yacht visitors that enter the Tobago Cays Marine Park, it should be noted that all yachts that visit the Tobago Cays do not always clear in Union Island.

TABLE 11: YACHT ARRIVALS BY PORT OF ENTRY

PORT OF ENTRY	2004	2005
Kingstown	26,785	19,734
Bequia	28,876	36,913
Mustique	637	960
Canouan	507	826
Wallilabou	272	945
Union Island	27,150	25,232
Total	84,227	84,610

5.1.4.3 Diving

Scuba diving in the Tobago Cays is provided by four local dive shops that average approximately 1,000 dives each year (French Mission, 1993). The dive shops in Union Island (Grenadines Dive) and Canouan (Canouan Dive Centre) run most of the trips to the Park. Other SVG dive shops in Bequia and St Vincent occasionally operate in the Park. Popular dive site within the TCMP and in the vicinity include:

- Horseshoe Reef;
- Mayreau Gardens;
- World's End Reef, and
- Egg Reef.

5.1.4.4 Cruise Ships Operators

As noted in the draft Management Plan for the Tobago Cays, the Cays are included in many of the cruise liner trips that cover the eastern Caribbean during the high season, November to April each year (Hoggarth, 2007). Table 12 obtained from the draft Management Plan shows the numbers of scheduled visits of cruise ships to the Tobago Cays for the 2006 to 2007 season.

From the table, it is estimated that a total of 15,890 persons are expected to visit the Tobago Cays during the period November 2006 to April 2007.

TABLE 12: SCHEDULED VISITS OF CRUISE SHIPS TO THE TOBAGO CAYS MARINE PARK FOR THE 2006-07 SEASON, AND ESTIMATED NUMBERS OF PARK VISITORS

SHIP	PERSONS ON BOARD	PARK VISITORS EACH TRIP	TOTAL VISITS BY SHIP	TOTAL PARK VISITORS (ESTIMATE)
Blue Dream	750	200	25	5,000
Club Med II	350	50	10	500
Club Med II to TC	350	350	6	2,100
Oceana	1,800	500	4	2,000
Arcadia	1,800	500	7	3,500
Aurora	1,800	500	1	500
Seabourne Pride	180	60	2	120
Sea Dream	80	30	5	150
Wind Surf	350	70	6	420
Arion	400	200	8	1,600
ESTIMATE TOTAL NUMBER OF PARK VISITORS FROM CRUISE SHIPS IN THE CURRENT SEASON				**15,890**

5.1.4.5 Charter Boat Operators

The main provider of day trips (Wind and Sea Ltd, of Union Island) has four such day trip boats, carrying from 40 to 100 passengers (Hoggarth 2006 and Wind and Sea, 2007).

As well as the regular scheduled visits of the cruise liners, some local companies provide occasional 'excursions' to the Cays for a picnic and swim. These may run from Bequia or St Vincent and can include up to 300 people on a single boat.

5.1.4.6 Water Taxi Operators

As with the number of fishermen, an attempt to accurately quantify the number of water taxis operating in Tobago Cays is problematic. Information derived from data collection for the draft Management Plan indicates that there are currently around 40 water taxis operating out of Union Island, and another 5-10 in Mayreau. Charuk 2004 suggests the number is closer to 12. These vessels only provide actual 'taxi' services as a part of their business, for instance in ferrying the vendors to and from the Cays.

Since all yachts have their own dinghies, they usually do not need a taxi service. For these customers, the water taxis more often offer to pick up items such as ice, drinks, groceries and vegetables from Union Island. The water taxis have also in the past taken garbage from the yachts to Union Island for disposal, again for a fee (Hoggarth, 2007).

5.1.4.7 Vendors

Vendors operate in the TCMP selling T-shirts, handicrafts, ice, bread, fresh fish, fruits and vegetables to the visiting yachts. Vendors are restricted to the north beach of Petit Bateau. As most vendors use strings tied between the coconuts trees to display their exhibits, there is some competition for the best pitches. As well as selling from the beach, some speed boats travel around from yacht to yacht selling bread and fruits in the morning, T-shirts and lambis in the afternoon, and lobster in the evening (Hoggarth, 2007).

5.2 Results of Stakeholder Consultations

A review of the existing literature on the Tobago Cays, revealed that there are several stakeholders whose livelihoods are directly or indirectly associated with the Cays. These stakeholders were separated into primary and secondary stakeholders based on guidelines outlined in the Socio-Economic Manual for Coral Reef Management. Based on these guidelines the following are the definitions used for identification of primary and secondary stakeholders:

Primary stakeholders – people who directly depend on the reef for a living and who make direct use of the reef and its resources (e.g. fishermen, dive operators).

Secondary stakeholders – people who do not use the reef and its resources directly, but make use of products or services from the reef (e.g. fish traders) or whose actions may affect the reef (e.g. upstream farmers);

5.2.1 Method

5.2.1.1 Overview

The method used to collect information from the various stakeholders was a structured questionnaire (see Appendix A). In general interviews were conducted between 9:00 am to 5:00 pm. However, there were several groups, such as the fishermen and the water taxi operators who were interviewed after 5:00 pm because they spent their days between Union Island and the Cays. Finally, information from the secondary stakeholders was obtained through meetings which were arranged prior to the interview or walk in interviews.

5.2.1.2 Challenges and Constraints

A total of forty-one interviews were conducted. The actual numbers of each group is shown in Table 13 below. In the absence of census data on the size of these user groups, the percentages of the groups interviewed could not be provided in the table. Challenges and constraints encountered during collection of field socio-economic data were highlighted in Section 3.5.4 above.

TABLE 13: NUMBERS OF INTERVIEWS CONDUCTED

GROUP	NUMBER INTERVIEWED
Dive Shop Operator	1
Commercial Divers	5
Water taxi operators	7
Fishermen	4
Vendors	9
Tourists	8
Charter boat operators	2
Residents	5
TOTAL	**41**

5.2.2 Primary Stakeholders

Using the definition of primary stakeholders outlined above, the following were the primary stakeholders identified for the Tobago Cays Marine Park:

- Fishermen
- Yachters / Tourists,
- Divers,
- Charter Boat Operators,
- Water Taxi Operators,
- Vendors, and
- Residents.

5.2.2.1 Fishermen

5.2.2.1.1 Respondent Information

Of the four fishermen that were interviewed, three were from Union and one was from Mayreau. All were male. One respondent did not give his age, while the remaining respondents were all in the 36 to 45 age category (see Table 14).

TABLE 14: AGE CATEGORIES OF FISHERMEN

AGE CATEGORY	FREQUENCY	PERCENTAGE
18 – 25	0	0
26 – 35	0	0
36 – 45	3	75
46 – 55	0	0
56 – 65	0	0
> 66	0	0
No response	1	25

The highest level of education reached by fifty percent of respondents was secondary education, while twenty-five had primary education. Twenty-five percent of respondents gave no response. Seventy-five percent of respondents indicated that they had experience in other occupations. They were: security guards, boat builders, labourers, and electricians (see Table 15).

TABLE 15: FISHERMEN'S LEVEL OF EDUCATION

LEVEL OF EDUCATION	FREQUENCY	PERCENTAGE
Primary	1	25
Secondary	2	50
Technical / Vocational	0	0
Tertiary	0	0
No response	1	25

5.2.2.1.2 Household Information

Twenty-five percent of respondents indicated that they were the main income earner in their households (see Table 16). The dependents were female ranging 12 and 29 years of age. There were two students in the fishermen household, one at the pre-school level and the other at tertiary (see Table 17).

TABLE 16: FREQUENCY OF MAIN INCOME EARNERS

ARE YOU THE MAIN INCOME EARNER?	FREQUENCY	PERCENTAGE
Yes	1	25
No	2	50
No response	1	25

TABLE 17: AGE CATEGORIES OF FISHERMENS' HOUSEHOLDS

AGE CATEGORY	MALE	FEMALE
0 – 5	0	0
6 – 11	0	0
12 - 17	0	1
18 – 29	0	1
30 -45	1	0
46 – 60	0	0
> 60	0	0
No response	0	0

5.2.2.1.3 Use of Reef

When asked how long they had been fishing, half of the respondents gave no response. Twenty-five percent had been fishing for one to five years and the remainder had been fishing for more than twenty years (see Table 18).

TABLE 18: DURATION IN OCCUPATION

DURATION IN OCCUPATION	FREQUENCY	PERCENTAGE
< 1	0	0
1 – 5	1	25
6 – 10	0	0
11 – 15	0	0
16 – 20	0	0
> 20	1	25
No response	2	50

Fifty percent of the fishermen owned their own boat. Twenty-five percent did not own the boat they used and the remainder gave no response. Fifty percent of these boats were made of wood. One boat was made of fibreglass. Seventy-five percent of the boats were motorised.

The fishermen all had differing frequencies of fishing. Twenty-five percent fished once a day, twenty-five percent fished once a week, another twenty-five fished many times a week, while the remainder gave no response. There was no specific fishing grounds, one fisherman fished to the east of Union Island, another fished to the south. The types of fish caught were: snapper, redfish, dolphin and kingfish. The fishing methods used were: spear fishing, tow fishing, fish pots, line fishing. The catch size ranged from 22 – 300 pounds. When asked if the catch size had changed since they started fishing, fifty percent indicated that it decreased, twenty-five percent indicated that it increased and the remainder said that it remained the same.

5.2.2.1.4 Management

When asked to recommend measures to protect the quality of the reef, fishermen suggested that diving and spear fishing should be stopped, as well as increasing the information available to foreigners.

When asked what impact making the reef a Marine Protected Area would have on their livelihood, they all responded that they would not be affected.

5.2.2.1.5 Summary of Fishermen's Concerns

In the main fishermen were concerned with the following:

- The continuation of spear fishing in the cays;
- The impact of diving on the reefs;
- The provision of information to visitors to the cays.

5.2.2.2 Yachters / Tourists

5.2.2.2.1 Respondent Information

Eighty-eight percent of the respondents were male, ranging in ages from twenty-six to forty-five, as well as over sixty-six (see Table 19). Their countries of origin were: United States, England, Ireland, Canada, France and Denmark. Sixty-three percent had visited this area on previous occasions, with one respondent on his fortieth visit. The numbers of persons travelling together ranged from two to seven.

TABLE 19: TOURISTS'S AGE GROUPS AND FREQUENCIES

AGE CATEGORY	MALE	FEMALE
18 – 25	0	0
26 – 35	2	0
36 – 45	1	1
46 – 55	2	0
56 – 65	0	0
> 66	2	0
No response	0	0

When asked how they first became aware of the area, seventy-five percent of respondents cited 'other' sources such as: guide books and charter companies. The remainder were informed by family and friends. There were a variety of professionals in this group. These included: fire fighters, executives, engineers, as well as a few retired individuals.

5.2.2.2.2 Use of Reef

The activities that tourists engage in while at the Tobago Cays included: diving, snorkelling, swimming, sailing, hiking, fishing and wind surfing. They accessed the reef by snorkelling, private boat, or catamaran.

When asked if the reef quality had changed, thirty-eight percent indicated that it had, noting changes such as: coral bleaching, reef breakage, algae, hurricane damage. One respondent commented on the large number of commercial boats in the area.

5.2.2.2.3 Management

When asked if they thought that developing the Tobago Cays into a Marine Protected Area would help improve the quality of the coral reefs, all of the respondents agreed that it would.

Tourists were also asked how they may be affected if the area becomes a Marine Protected Area. They agreed that it would have little impact or even enhance their experience, if implemented in an effective, reasonable manner. One respondent suggested a garbage pick-up at the Cays.

5.2.2.2.4 Summary of Yachters / Tourists Concerns

The main concerns of the yachters / tourists are:

- Coral bleaching,
- Breakage of the reefs by poor practices of visitors,
- Observed algal damage,
- Hurricane damage, and
- Increased boat traffic.

5.2.2.3 Divers

5.2.2.3.1 Respondent Information

All respondents were male between the ages 25 to 55 (see Table 20). The highest level of education attained by the majority of respondents (67%) was primary, one respondent attained tertiary education and one respondent did not indicate his highest level of education (see Table 21).

TABLE 20: AGE CATEGORIES OF DIVERS

AGE CATEGORY	FREQUENCY	PERCENTAGE
18 – 25	0	0
26 – 35	1	17
36 – 45	2	33
46 – 55	1	17
56 – 65	0	0
> 66	0	0
No response	2	33

TABLE 21: DIVERS' LEVEL OF EDUCATION

LEVEL OF EDUCATION	FREQUENCY	PERCENTAGE
Primary	4	67
Secondary	0	0
Technical / Vocational	0	0
Tertiary	1	17
No response	1	17

5.2.2.3.2 Household Information

Sixty-seven percent indicated that they were the main income earners in their household (see Table 22). Seventeen percent indicated that they were not the sole income earner, while the remaining seventeen percent gave no response. The income earners sustained one or two households. The male dependents ranged from 0 to 17 years of age and the female dependents ranged from 0 to more than 66 years of age. Five households had other employed adults, which included domestic workers and a librarian. There were a total of fourteen students in the divers' households. They attended pre-school, primary and secondary schools (see Table 23).

TABLE 22: FREQUENCY OF MAIN INCOME EARNERS

ARE YOU THE MAIN INCOME EARNER?	FREQUENCY	PERCENTAGE
Yes	4	67
No	1	17
No response	1	17

TABLE 23: AGE CATEGORIES OF DIVERS' HOUSEHOLDS

AGE CATEGORY	MALE	FEMALE
0 – 5	1	2
6 – 11	1	3
12 - 17	5	2
18 – 29	1	3
30 -45	2	2
46 – 60	1	0
> 60	0	2
No response	0	0

5.2.2.3.3 Use of Reef

Eighty-three percent of the respondents were commercial divers. The remaining seventeen percent gave no response. Fifty percent of the respondents have been diving for 6 to 10 years, seventeen percent has been diving for 16 to 20 years and seventeen percent have been diving for more than 20 years. The remainder gave no response.

Thirty-three percent of respondents dived once a day, another thirty-three percent dived several times a day, while the remainder dived 4 to 7 times a week (see Table 24). One respondent said that Tobago Cays was his primary diving ground, while others listed other areas such as: Canouan, Mayreau and Palm Island.

When asked if the reef quality had changed since they started diving, all of the respondents stated that it did. The changes noted were: damage, specifically reef breakage, due to hurricanes, decrease in coral quality, decrease in water quality and clarity, and decrease in the amount of fish and coral.

TABLE 24: FREQUENCY OF DIVES

FREQUENCY	NO. OF RESPONDENTS	PERCENTAGE
once a day	2	33
several times a day	2	33
1 – 3 times a week	0	0
4 – 7 times a week	2	33
once a month	0	0
> once a month	0	0
No response	0	0

5.2.2.3.4 Management

When asked what impact making the reef a Marine Protected Area would have on their livelihood, divers responded that only if diving is prohibited, their livelihoods would be affected. One diver suggested that jobs can be provided.

5.2.2.3.5 Summary of Concerns of Divers

The main concerns expressed by divers included:

- Breakage of the reef due to hurricane damage,
- Reduction in water quality,
- Poor water quality and clarity, and
- Decrease in the amount of fish and corals.

5.2.2.4 Charter Boat Operators

5.2.2.4.1 Respondent Information

Of the two charter boat operators interviewed, one was based on union Island and the other was based in Bequia. The respondents were both male. Apart from running a charter boat company one of the operators possessed other skills / businesses such as bar tending and certified scuba diver. The other operator also owned a restaurant, a boutique, a hotel, a bar and a wharf for yacht provisioning.

5.2.2.4.2 Current Use of Protected Area

Both operators had been in the business for over 10 years with one being in business for over 20 years. One operator owned just one boat while the other chartered 5 boats. Boats were built similarly of fibreglass, were motorised with sails and were registered with the relevant authorities.

The charter boats owned by the operator on Union Island were large boats able to house up to 80 guests, while the boat operated out of Bequia usually housed just 8-10 persons per trip. Boats in all instances were usually operated as term charters which was usually a minimum of an overnight trip to as long as a week. However, the operator out of Union island also did day trips due to proximity to the cays.

While the high season is generally recognised as from November to April by the operator on Union Island, the operator out of Bequia indicated that his high season was the period of February to March. No reason was given for this difference.

Both of the operators had generally the same stops for their term charters: Mayreau and Tobago Cays. However, the Union Island operator did indicate that Palm Island may be included in his stops while the operator out of Bequia would obviously have to return to the home port of Bequia.

Neither of the operators indicated that they experienced any constraints with using the protected area.

5.2.2.4.3 Use of Reef

Activities currently enjoyed by charter boat guests on the reefs include snorkelling, swimming, fishing, trolling and sightseeing. The charter boat operators agreed that the Tobago Cays are attractive to their clients due to the nice reef, the small, unspoilt islands, the beaches and the clear water. Only one of the operators expressed the opinion that the quality of the reef systems within the TCMP has changed. Changes observed include physical damage, bleaching of the corals, decrease in the water quality and the presence of algae on the reef.

5.2.2.4.4 Management

Unanimously the charter boat operators agreed that measures that should be implemented to protect the reef should include:

< Provision of moorings for yachts and dinghies;
< Setback distances with markers from the reefs; and
< Signage in different languages within the TCMP.

One of the operators was neutral on whether developing the reef into a marine protected area would help protect the coral reefs. His determination was dependent on what control measures are instituted. The other operator agreed strongly that developing the reef as a marine protected area would help to protect the reef.

5.2.2.4.5 Summary of Concerns of Charter Boat Operators

Charter boat operators were mainly concerned with the following:

- Physical damage to the reefs,
- Bleaching of the corals,
- Decrease in water quality, and
- Presence of algae on the reef.

5.2.2.5 Water Taxi Operators

5.2.2.5.1 Respondent Information

All tour boat operators surveyed were male. Forty-three percent were in the 26 to 35 age category, fourteen percent of respondents were from the 36 to 45 category, while forty-three percent did not indicate their age (see Table 25).

The majority of operators (sixty-six percent) were from Union Island. There was one operator from Mayreau.

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TABLE 25: AGES OF WATER TAXI OPERATORS

AGE CATEGORY	FREQUENCY	PERCENTAGE
18 – 25	0	0
26 – 35	3	43
36 – 45	1	14
46 – 55	0	0
56 – 65	0	0
> 66	0	0
No response	3	43

The majority (43 %) of respondents did not indicate their level of education. Of those who did respond, the majority (29%) attained secondary education. 14 % indicated that the highest level of education reached was primary, while the remaining 14 % attained tertiary education (Table 26). Seventy-one percent of the respondents indicated that they had other skills. These included: bartending, fishing, crafting, and carpentry.

TABLE 26: WATER TAXI OPERATORS' LEVEL OF EDUCATION

LEVEL OF EDUCATION	FREQUENCY	PERCENTAGE
Primary	1	14
Secondary	2	29
Technical / Vocational	0	0
Tertiary	1	14
No response	3	43

5.2.2.5.2 Household Information

Fifty-seven percent of respondents were the main income earners in their households (see Table 27). They supported either 1 or 2 persons and one respondent supported more than one household. The male dependents ranged from 6 to 29 years. The ages of the female dependents were skewed, with one dependant each from the 6 to 11, and over 60 age categories. Twenty-nine percent of respondents gave no response.

There were a total of three students in the tour boat operators' households, two at the primary level and one at secondary level.

TABLE 27: FREQUENCY OF MAIN INCOME EARNERS

ARE YOU THE MAIN INCOME EARNER?	FREQUENCY	PERCENTAGE
Yes	4	57
No	1	14
No response	2	29

5.2.2.5.3 Use of Reef

Most of the tour boat operators (86%) had been in this occupation for 5 to 20 years, while fourteen percent were in the tour boat operating business for 20 to 30 years (see Table 28).

TABLE 28: DURATION IN OCCUPATION

DURATION IN OCCUPATION	FREQUENCY	PERCENTAGE
< 5	0	0
5 - 10	3	43
10 – 20	3	43
20 – 30	1	14
> 30	0	0
No response	0	0

The majority of operators (71%) owned their own boat. Forty percent owned one boat and sixty percent owned two boats. One operator was not the owner of the boat, while one operator gave no response. The majority of boats (57%) were wooden, and 14% were made of both fibreglass and wood. All of the boats were motorised.

The number of persons on each boat trip ranged from 6 to 17 Thirty-three percent indicated that they made one trip per day, twenty-two percent made two trips daily and thirty-three percent made more than three trips everyday.

The length of the trips ranged from less than one hour to more than three hours. Only two tour boat operators indicated that their primary route was the Tobago Cays. The others also operated in the Cays, but also had other routes such as: Mayreau, Palm Island and Bequia.

When asked how the tour boat business has changed in the time that they have been in that business, 43% of respondents said that there were more operators, 29% said that business had increased and 29% said that it remained the same.

5.2.2.5.4 Management

Tour boat operators were asked to recommend measures to protect the quality of the reef. These included: more patrol boats, 24-hour patrols by park rangers, moorings, availability of information to persons who use the reef, especially tourists, and enforcement of existing legislation.

When asked if they thought developing the reef into a Marine Protected Area would help to protect the coral reefs, eighty-six percent of respondents agreed that it would. The remainder were neutral on this topic.

5.2.2.6 Vendors

5.2.2.6.1 Respondent Information

Forty-four percent of the respondents were male and fifty-six percent were female. Fifty-six percent were from Union Island, twenty-two percent were from Mayreau and the remaining twenty-two percent were from St. Vincent. The highest level of education attained by all of the vendors was primary. Thirty-three percent indicated that they had no other skills, while fifty-six percent listed their other skills as: sailing, cooking, fishing, and crafts.

5.2.2.6.2 Household Information

The majority of vendors (67%) were the main income earners in their household. The numbers of households they supported ranged from 1 to 4. The male dependents ranged from 0 to 17 years and 30 to 60 years of age, while the female dependents ranged from 0 to 45 years of age. In three households, there were other employed adults, which included a captain and a tradesman and carpenter. A total of twenty-five students were included in the vendors' households. They attended pre-school, primary and secondary schools (see Table 29).

TABLE 29: AGES OF OCCUPANTS OF VENDORS' HOUSEHOLDS

AGE CATEGORY	MALE	FEMALE
0 – 5	1	1
6 – 11	3	3
12 - 17	5	8
18 – 29	0	4
30 -45	1	1
46 – 60	1	0
> 60	0	0

5.2.2.6.3 Use of Reef

Fifty-six percent of the vendors have been vending for 10 to 20 years, while the remaining forty-four percent have been vending for 5 to 10 years. T-shirts was the most popular item sold (44%). Jewellery and wraps accounted for 31% of the items sold, craft items accounted for nineteen percent and the remaining six percent were souvenirs.

Seventy-eight percent of the vendors indicated that business had decreased since they started vending, while eleven percent indicated that business had increased. The remainder gave no response. Thirty-three percent of vendors accessed the reef with their private boats, twenty-two percent took water taxis, twenty-two percent indicated that they had other means of accessing the reef and the remainder gave no response.

When asked if there were any constraints in using the protected area, some vendors stated that they had conflicts with other vendors; one vendor said no infrastructural provisions were made for vending in the area.

Eighty-nine percent of vendors observed that reef quality had changed over time, mainly due to hurricane damage; one vendor also thought that diving was a contributor, while another noted a decline in fish numbers.

5.2.2.6.4 Management

When asked to recommend measures to protect the quality of the reef, the vendors suggested that fishing and diving should be prohibited, more moorings should be provided, passage ways should be marked and that policies should be implemented.

5.2.2.6.5 Summary of Concerns of Vendors

The vendors were concerned with the following:

- Hurricane damage to reefs,
- Decline in fish numbers, and
- Damage to reef caused by divers.

5.2.2.7 Residents

5.2.2.7.1 Household Information

The respondents were between the ages twenty-six to forty-five (see Table 30), eighty percent of whom were male. The highest level of education attained by 80% was primary. One respondent attained technical / vocational education.

Forty percent of respondents lived at their current address for five to ten years. Twenty percent indicated that they occupied their current resident for more than thirty years. The remaining respondents gave no response. Household sizes ranged from two to nine, with males comprising fifty-two percent. Household members ranged from ages 0 to 60. Employed adults included: business owners, sailors, bartenders, and teachers. Students were either at the pre-school, primary or tertiary level.

TABLE 30: AGES OF OCCUPANTS OF RESIDENTS' HOUSEHOLDS

AGE CATEGORY	MALE	FEMALE
0 – 5	0	2
6 – 11	2	2
12 - 17	0	0
18 – 29	3	0
30 -45	1	1
46 – 60	1	2
> 60	0	0

5.2.2.7.2 Use of Reef

Sixty percent of respondents visited the Tobago Cays yearly. Twenty percent visited weekly and a further twenty visited monthly. Most respondents stated that they did not have a particular time to visit the reef, while one respondent indicated that August was his preferred visiting time. Most residents utilized the water taxi service to access the reef.

The activities that residents engaged in at the Tobago Cays include: diving, snorkelling, swimming, fishing, sight-seeing, picnics and barbeques. When asked if the reef quality had changed, the majority (80%) of residents indicated that it had, due to natural impacts such as hurricanes and weather changes.

5.2.2.7.3 Management

When asked what activities should be controlled or prohibited in the Tobago Cays, residents responded that snorkelling should be controlled and anchoring prohibited. They were also asked what impact turning the reef into a Marine Protected Area would have, some responded that the damage to the reef would decrease, fish will multiply and sea life would be protected.

5.2.2.7.4 Summary of Concerns of Residents

Residents were mainly concerned with:

- Deterioration of the reef quality due to hurricane damage.

5.2.2.8 Management of Reefs

This section documents the attitudes of respondents to statements pertaining to reef management and value. Respondents were asked to rate these statements on a scale of 1 to five with 1 representing strong disagreement and 5 representing strong agreement. The responses for all the stakeholders are summarized below.

'Reefs are important for protecting land from storm waves'. Most respondents (78%) agreed with this statement. One diver, fisherman, tour boat operator and resident responded that they did not agree with this statement (see Table 31).

TABLE 31: IMPORTANCE OF REEFS

RESPONSE	FREQUENCY	PERCENTAGE
Strongly disagree	3	8
Disagree	3	8
Neutral	1	2
Agree	17	41
Strongly agree	15	37
No response	2	5

'Coral reefs are only important if you fish or dive'. Sixty-six percent of respondents disagreed with this statement. Of the seventeen percent who agreed, the majority were tour boat operators, followed by fishermen, vendors and residents (see Table 32).

TABLE 32: CORAL REEFS IMPORTANT IF YOU FISH OR DIVE

RESPONSE	FREQUENCY	PERCENTAGE
Strongly disagree	13	32
Disagree	14	34
Neutral	3	7
Agree	9	22
Strongly agree	1	2
No response	1	2

'In the long run, fishing would be better if we cleared the coral'. Seventy-eight percent disagreed with this statement. The nine percent who agreed included: vendors, fishermen, tour boat operators and divers (see Table 33).

TABLE 33: INCREASED FISHING IF CORALS ARE CLEARED

RESPONSE	FREQUENCY	PERCENTAGE
Strongly disagree	16	39
Disagree	16	39
Neutral	3	7
Agree	3	7
Strongly agree	1	2
No response	2	5

'Fishing should be restricted in certain areas just to allow the fish and coral to grow'. Seventy-five percent of respondents agreed with this statement. Those respondents who disagreed with this statement were vendors and tour boat operators, as well as, divers and fishermen (see Table 34).

TABLE 34: RESTRICTION OF FISHING

RESPONSE	FREQUENCY	PERCENTAGE
Strongly disagree	0	0
Disagree	6	15
Neutral	1	2
Agree	21	51
Strongly agree	10	24
No response	3	7

'Future generations should be able to enjoy the coral reefs'. Sixty-nine percent agreed with this statement. Of the fourteen percent who disagreed, the majority were tour boat operators and vendors, followed by divers and fishermen (see Table 35).

TABLE 35: REEFS FOR FUTURE GENERATION

RESPONSE	FREQUENCY	PERCENTAGE
Strongly disagree	3	7
Disagree	3	7
Neutral	2	5
Agree	15	37
Strongly agree	13	32
No response	5	12

'We should restrict development in some coastal areas even if no one ever fishes in those areas just to allow the fish and coral to grow'. Just over half of the respondents (59%) agreed with this statement. The twenty-nine percent who disagreed comprised of vendors, divers, tour boat operators, fishermen and residents (see Table 36).

TABLE 36: RESTRICT DEVELOPMENT ALONG COASTAL

RESPONSE	FREQUENCY	PERCENTAGE
Strongly disagree	2	5
Disagree	10	24
Neutral	1	2
Agree	16	39
Strongly agree	8	20
No response	4	10

'Seagrass beds have no value to people'. Sixty-nine percent of respondents disagreed with this statement. Seven percent said that they were neutral. Those who agreed included: divers, fishermen, vendors, tour boat operators and residents (see Table 37).

TABLE 37: SEAGRASS BEDS OF VALUE TO PEOPLE

RESPONSE	FREQUENCY	PERCENTAGE
Strongly disagree	15	37
Disagree	13	32
Neutral	3	7
Agree	5	12
Strongly agree	2	5
No response	3	7

Ninety-eight percent of the respondents thought that the Tobago Cays should be a Marine Protected Area. One vendor gave no response.

5.2.3 Secondary Stakeholders

Again, based on the definition of secondary stakeholders given above, the following were the secondary stakeholders identified:

- Hotels, and
- Restaurants.

5.2.3.1 Hotels and Restaurants

Four hotels on Union Island as well as the Palm Island Resort on nearby Palm Island were interviewed for this assignment. These hotels also had restaurants on the premises. The main objectives of these interviews were:

- The level of interaction that hotel guests have with the TCMP;
- Whether the hotels buy fish from fishermen that fish within the TCMP;

All of the hotels interviewed indicated that they do organise day-trips for their guests to visit the Tobago Cays but these tours are usually organised at the request of the guests and not with any regularity. The exception was the hotel on Palm Island which also operates Captain Yannis tours and therefore tours are more regular (at least once a week) but still dictated by the interest of the guests.

Although all the hotels / restaurants did indicate that they were in the habit of purchasing fish and lobster from fishermen who fish in the Tobago Cays, all indicated that this practice has stopped since the re-launching of the Park in December 2006. However, none of them indicated a new source for the fish purchased for the on-site restaurants.

5.2.3.1.1 Positive Feedback

At all the hotels the feedback on the tours was very favourable. Guests enjoyed the snorkelling, swimming with turtles and barbeques on the beaches.

5.2.3.1.2 Negative Feedback

Guests at all the hotels did relate some negative aspects of the visit to the cays including:

- Harassment by vendors;
- Lack of proper facilities; and
- User Fees.

As a group, the hotels indicated that guests have reported that there is some level of harassment by the vendors who operate on the beaches in the Cays. Guests complained of high prices and aggressive behaviour. This sentiment is echoed by some of the tourists interviewed as well as articles written by Park visitors in the past.

Guests have also indicated that some sort of toilet facilities should be provided for those who may wish to spend the entire day in the Cays. This is especially so for these tours that involves a drop-off at the beginning of the day and a pick-up at the end of the day. While guests have made it clear that no obtrusive buildings should be built, some basic toilet facilities should be set up.

The fee system for use of and entry into the Park was instituted when the Park was re-launched in December of 2006. Two of the hoteliers interviewed indicated that guests have also complained about the fees that have been implemented. At present guest at all the hotels will be required to pay E.C. $10.00 per person for a visit to the Park for a maximum of 24 hours.

Section 8.3.8 provides recommendations for mitigating some of these negative issues raised by owners of hotels and restaurants.

5.2.3.2 Management

All of the respondents at the various hotels and restaurants were unanimous in their agreement that the development of the Tobago Cays as a marine protected area would benefit the reefs. Additionally, they all agreed that the Tobago Cays should continue to be developed as a marine protected area.

5.3 Summary of Key Findings

Fish landings at Union Island have fluctuated dramatically over the past 8 years. This phenomenon is confirmed from the observations of fishermen interviewed.

Unemployment in the Southern Grenadines was lower at 13.2% in 2001 which is significantly lower than 19.4% in 1991.

The numbers of fishermen interviewed were low. This was due to a lack of interest by fishermen approached. They indicated that the restrictions in the Park caused them to find alternative fishing grounds further out to sea.

As noted in Section 5.2.2.1.1, the majority of fishermen (75%) indicated that they had other skills such as security guards, boat builders, labourers and electricians.

Water taxi operators were also skilled in other areas. Seventy-one percent had skills including: bartending, fishing, crafting and carpentry.

A significant percent (33%) of vendors indicated that they had no other skills apart from vending while 53% were skilled as cooks, fishermen and craft making.

Overall, there was a general agreement that the development of a Marine Protected Area would be beneficial to the reef. In response to the question of whether or not the reef should become a Protected Area, ninety-eight percent of the respondents said that it should.

All of the respondents at the various hotels and restaurants were unanimous in their agreement that the development of the Tobago Cays as a marine protected area would benefit the reefs. Additionally, they all agreed that the Tobago Cays should continue to be developed as a marine protected area.

Respondents indicated that snorkelling should be controlled and anchoring prohibited in the Tobago Cays.

When asked what impact turning the reef into a Marine Protected Area would have, some responded that the damage to the reef would decrease, fish will multiply and sea life would be protected.

Based on the response to the statements about the importance of coral reefs and sea grass beds, it was evident that most of the respondents were knowledgeable about coral reefs.

6 PARK MANAGEMENT PLAN

This chapter summarizes relevant information from the Final Draft of the 2007 – 2009 Management Plan for the Tobago Cays Marine Park (16 March, 2007) , prepared by Dr. Daniel Hoggarth. These aspects of the plan will be used in the SWOT Analysis in Chapter 7, from which recommendations will be made for the environmental management of the TCMP. An important tool for the Management of the TCMP is a Monitoring and Evaluation Score Card which has been adapted for use in Protected Areas in the OECS, and this tool is introduced in the last section of this chapter.

6.1 Policy Statements

This statement discusses the Guiding Principles, Mission Statement, Goal and Objectives of the TCMP and the Management Plan.

6.1.1 Guiding Principles

The Final Draft Management Plan lists a series of guiding principles, of which the following are most relevant to environmental management:

- **Sustainable Development** must allow for the needs of both present and future generations.
- **Conservation** must be an integral objective and component of the Plan.
- Benefits must be shared as **Equitably** as possible.
- Management of the TCMP should be people-centred and **Participatory**.
- Management solutions should be **Flexible**, based on an **Adaptive** approach.
- Management of natural resources should be **Integrated** and **Inter-disciplinary**.
- TCMP shall **contribute** as far as possible to the delivery of St. Vincent and the Grenadines **commitments under international agreements**, such as the **Convention on biological Diversity and the SPAW Protocol**.

While these are all laudable principles, care must be taken to ensure that there is a common understanding of each of the terms in bold. For example, there is one school of thought that "conservation" infers extreme limits on human activity. Similarly, on at least one occasion the term "flexible management" has been interpreted to mean "anything goes". But once there is clear understanding of what is intended by each principle they will contribute significantly to the environmental management of the TCMP.

6.1.2 Mission of the TCMP

As listed in the Final Draft Management Plan, the Mission Statement of the TCMP is:

> ***"to contribute to national and local development, through the management of the park's natural resources, based on the principles of sustainable use, cooperation among resource users, active and enlightened local participation, and equitable sharing of benefits and responsibilities among stakeholders."***

6.1.3 Goal

The goal stated in the Final Draft Management Plan is:

> ***"to protect and enhance the natural resources of the TCMP and allow for their sustainable and equitable use by local people and visiting tourists, by developing and implementing effective participatory management systems".***

6.1.4 Objectives

The Final Draft Management Plan also lists two primary objectives for the TCMP:

- ***Enhanced conservation and management of biological diversity.***
- ***Sustained economic benefits from the use of existing natural resources.***

6.2 Management Structure

The Final Draft Management Plan proposes a management structure where the TCMP management committee would be formed to sit between the National Marine Parks Board / Authority and the employed park staff. This proposal ensures that there is adequate representation of local bodies or user groups in the TCMP. Figure 6 shows the proposed management structure for the TCMP.

6.3 Zonation

The Final Draft Management Plan envisages that the TCMP will have designated zones, as shown in Figure 7. The zones envisaged are:

- a Management Zone,
- a Protection Zone,
- Anchorage Zones,
- a Windsurfing Zone,
- Conservation Exclusion Zones, and
- A Buffer Zone on Mayreau.

6.3.1 Management Zone

The Management Zone lies generally west of the island of Mayreau, and will be designated for general use. This will include anchoring to the west of Mayreau, diving, snorkelling, and fishing (within the restrictions of the fisheries regulations).

6.3.2 Protection Zone

The Protection Zone lies generally east of the island of Mayreau, but also includes a small area west of Mayreau around the wreck of HMS Puruni. This zone seeks to prohibit extractive activities (such as fishing) but permit entry and recreational use. In this zone, a “no fishing” provision will be strictly enforced to restore fish populations and to preserve the nursery function in shallow waters. Special provision will be made for anchoring (see Section 6.3.3, below), and wind surfing (see Section 6.3.4, below).

6.3.3 Anchorage Zone

These zones, in conjunction with fixed moorings, will be created to minimize anchor damage within the TCMP. Two anchorage zones (in areas with sandy substrate) will be created for the anchoring of yachts and motor cruisers. One anchorage zone will be created for small cruise liners and two large cruise liners.

6.3.4 Windsurfing Zone

A single windsurfing zone will be created, and windsurfing will not be permitted elsewhere in the Protection Zone.

6.3.5 Conservation Exclusion Zones

The Plan also provides for the creation of conservation exclusion zones to encompass some of the biologically richest parts of the TCMP. No entry will be permitted into these zones except for occasional scientific monitoring and research. The exact locations of these zones are yet to be established.

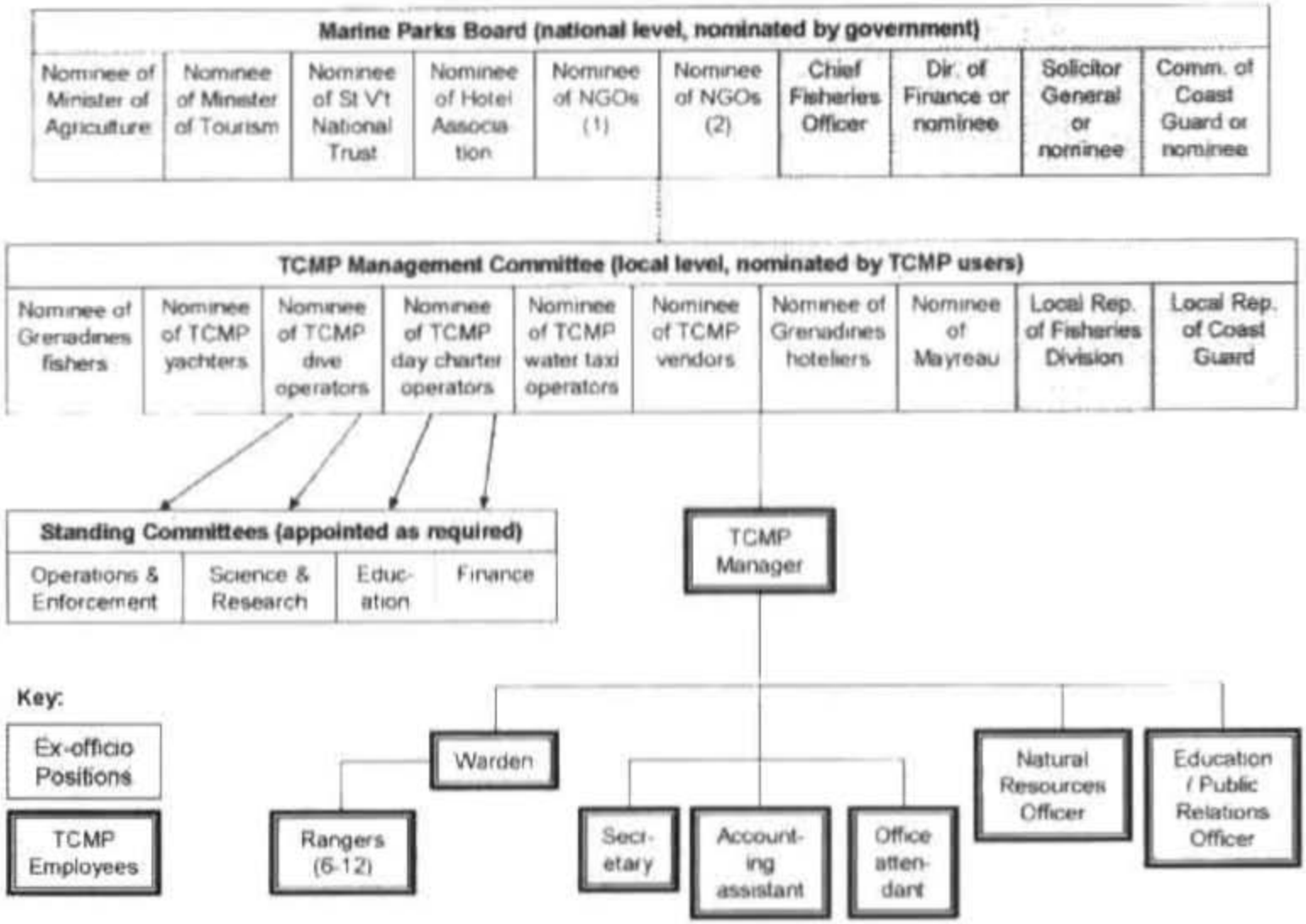
6.3.6 Buffer Zone on Mayreau

A buffer zone is proposed on the east coastline of Mayreau, extending from the high water line for a distance of 100 m inland. No construction of any houses, beach facilities or other permanent or temporary structures will be permitted in this zone.

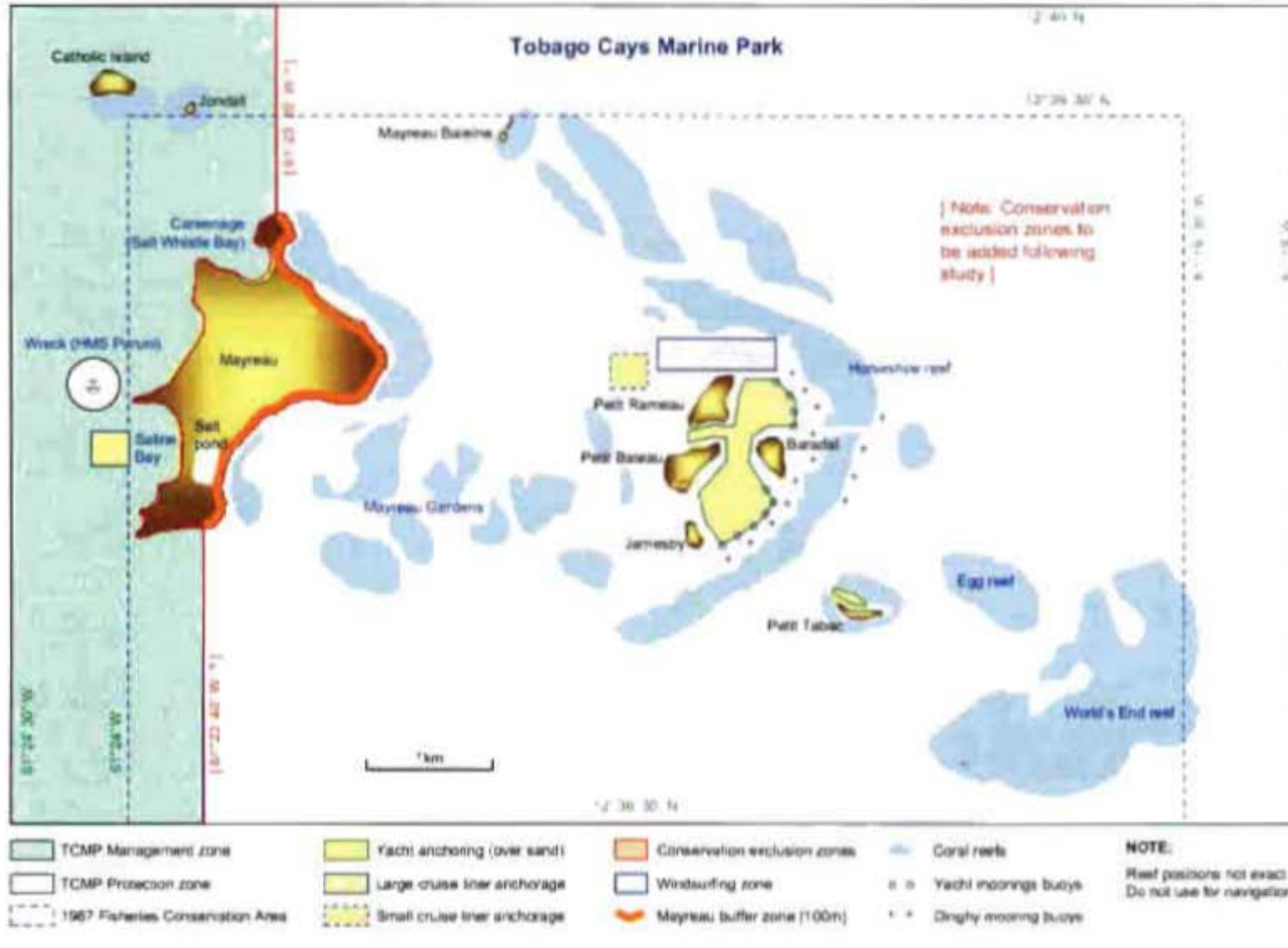
6.4 Rules and Regulations

The Final Draft Management Plan outlines rules and regulations for governing the TCMP relating to the following activities:

- Entry to the Park;
- Use of Boats;
- Snorkelling and Scuba Diving;
- Other Water Sports;
- Fishing;



Eco Engineering Caribbean Ltd.	Eco Report No. 06/2007	CLIENT: OECS -ENVIRONMENT AND SUSTAINABLE DEVELOPMENT UNIT	FIGURE NUMBER 6
	Date: 31/07/07	PROJECT: TOBAGO CAYS SITE REPORT ST. VINCENT AND THE GRENADINES	
		DWG. NAME: PROPOSED MANAGEMENT STRUCTURE	



SOURCE: TOBAGO CAYS MARINE PARK 2007 – 2009 MANAGEMENT PLAN FIRST DRAFT

Ecoengineering Caribbean Ltd.

Eco Report No. 06/2007	CLIENT: OECS -ENVIRONMENT AND SUSTAINABLE DEVELOPMENT UNIT	FIGURE NUMBER 7
Date: 31/07/07	PROJECT: TOBAGO CAYS SITE REPORT ST. VINCENT AND THE GRENADINES	
	DWG. NAME: PROPOSED ZONING WITHIN TOBAGO CAYS MARINE PARK	

- Infrastructure (buildings and moorings);
- Resource Extraction; and
- General (filming, beach barbeques, open fires, domestic animals, camping and salvage of wrecks).

It is expected that these Rules and Regulations will be made available in concise form (as a TCMP brochure) and in detailed form (as a TCMP guide book).

6.5 Licensing of Commercial Operators

This section of the Final Draft Management Plan outlines a system of licensing for all commercial operators of the park. It provides for an operator's license at specific rates which is renewable either monthly or annually. It also emphasizes that non-compliance will result in suspension or cancellation of licenses by the Board.

6.6 Resource Management

The plan also proposes a system of resource management by ongoing monitoring and evaluation of the resources both biological and socio-economic. This management is proposed by the following:

- Undertaking surveys to prepare inventories and determine the distribution of the park's land-based biological resources, including vegetation, bird and reptiles.
- Provision of mooring buoys for use by yachts, dinghies, snorkellers and divers.
- Implementation of a maintenance plan for various park facilities and infrastructure such as boats, the proposed ranger base, moorings and buoys and IT equipment.
- Garbage management under an arrangement made between the TCMP board and the Southern Grenadines Water Taxi Association.
- On-shore Facilities such as walking trains as well as a dry toilet facility.

6.7 Staffing

The Final Draft Management Plan envisages a full-time establishment of 10 persons:

- Park Manager,
- Head Ranger / Park Warden,
- 6 Rangers

- Secretary
- Accounting Assistant
- Office Attendant
- Natural Resources Officer / Marine Biologist
- Education / Public Relations Officer

The full-time staff will have access to part-time personnel to address accounting, information technology, education / public relations, boat mechanic services and office assistance. It is envisaged that this increased level of staffing will allow patrols of the Park 7 days per week and also allow some patrolling outside of normal working hours.

6.8 Public Involvement

The Final Draft Management Plan is faithful to the principle that the Management of the TCMP should be people-centered and Participatory. Two aspects are particularly relevant to the environmental management of the Park: public education and monitoring.

6.8.1 Public Education

The Final Draft Plan notes that the rules and regulations of the TCMP will be effective only if they are understood and accepted by the different Park users. Visitors and locals must be aware of the “do’s and don’ts” of the Park, and vessel masters must be familiar with the Park rules. The draft Plan identifies seven priority communication instruments:

- a **Leaflet / Flyer** targeted to all TCMP visitors,
- a **Handbook** targeted to Key Stakeholder Groups and Management Partners,
- a **Web Site** targeted to all potential visitors,
- **Information Boards / Posters** targeted at visitors arriving by yacht,
- **Park Entry Signs** targeted at visitors arriving for the first time,
- **Advertorials** targeted at potential visitors (especially from abroad), and
- **Infomercials / Public Service Announcements** targeted at the National and Caribbean public.

Longer term options include the development of a visitor centre and educational material for school children. All of these approaches will increase the effectiveness of environmental management at the TCMP.

6.8.2 Monitoring and Research

The draft Monitoring Plan also discusses (but does not necessarily support) a system of recruitment and training of students to work with Park staff on a range of activities (including scientific monitoring of Park conditions). Such a system will provide skills to local students which may assist them in future employment. It is also likely to enhance "buy-in" by locals to the Park concept.

The draft plan also proposes the development of a research plan for the TCMP. It expected that research will be fostered by undertaking the following actions:

- Determination of the status of the resource base, its uses and the nature of the communities associated with the site.
- Provide training and support to the TCMP staff to implement the monitoring and evaluation plan.
- Collect data to estimate adopted indicators using monthly samples, questionnaires or annual surveys.
- Evaluate data on an annual basis and present full observations.
- Prepare a research plan for the TCMP.

6.8.3 Training

The Final Draft Management Plan summarises the training needs recommended from previous studies including the Training Needs Assessment (Parsram, 2007). It recommends the following actions relating to training:

- Preparation of a training plan for TCMP staff and other stakeholders, guided by recommendations of OPAAL Training Needs Assessment.
- Begin implementation of training plan.

A Monitoring and Evaluation Score Card has been adapted for use in Protected Areas in the OECS, and the Management Plan for TCMP suggests that this tool may be used in assessing progress in achieving its management effectiveness goals. To this end, the Management Plan recommends training in the use of the tool. The Scorecard itself has been applied to TCMP by the OECS, and a copy of that evaluation is included in Appendix E of this report. This section provides a summary of the tool, in preparation for recommendations which will be made in Chapter 9.

6.9 Monitoring and Evaluation Scorecard

A Monitoring and Evaluation Score Card has been adapted for use in Protected Areas in the OECS, and the Management Plan for TCMP suggests that this tool may be used in assessing progress in achieving its management effectiveness goals. To this end, the Management Plan recommends training in the use of the tool. The Scorecard itself has been applied to TCMP by the OECS, and a copy of that evaluation is included in Appendix E of this report. This section provides a summary of the tool, in preparation to recommendations which will be made in Chapter 9.

6.9.1 Overview

According to the information provided in Appendix E, the M & E Scorecard is a simple site-level tracking tool to facilitate reporting on management effectiveness of Protected Areas. It has been built around the Framework illustrated in Table 38. The Scorecard facilitates a basic level of assessment, and it requires little or no additional data collection. As shown in Table 38, the Scorecard focuses on the context of the PA along with the appropriateness of planning, inputs and processes of management. Because it relies largely on available data (through literature searches and informed opinions of site managers and/or independent assessors) this tool:

- takes a short period of time,
- costs little,
- issues are broadly covered, but
- depth of analysis is generally low.

It is recommended that the scorecard should be completed by PA Staff. Ideally, local stakeholders should be involved in the exercise to validate the scoring.

6.9.2 Scoring

The Scorecard consists of 34 Questions, arranged under the same 6 headings (Elements of Evaluation) listed in Table 38. A typical example is found in the section headed:

> **Context: Where are we now? Assessment of important threats and the policy environment**

In this section, Question 6 asks:

> **Resource Inventory – Is there enough information to manage the area?**

Under this question, there are 5 descriptors, with appropriate scores in each case:

- There is little or no information available on the biophysical, socio-cultural and economic conditions associated with the protected area (0 points)

- Information on the biophysical, socio-cultural and economic conditions associated with the protected area is not sufficient to support planning and decision making (1 point)

- Information on the biophysical, socio-cultural and economic conditions associated with the protected area is sufficient for key areas of planning / decision making but the necessary survey / M&E work is not being maintained (2 points)

- Information on the biophysical, socio-cultural and economic conditions associated with the protected area is sufficient for key areas of planning / decision making (3 points).

The user of the scorecard selects the applicable descriptor and the corresponding points are entered in the appropriate column. Provision is also made for additional points and for comments to be entered to allow a clearer understanding of the choice of descriptor. The scores are totalled to give a “snapshot” of conditions at the time of scoring.

TABLE 38: FRAMEWORK FOR THE M & E SCORECARD

(From documentation provided by ESDU. See Appendix E)

Elements of Evaluation	Explanation	Criteria that are Assessed	Focus of Evaluation
Context	**Where are we now?** Assessment of importance, threats and policy environment	Significance. Threats. Vulnerability. National context.	Status
Planning	**Where do we want to be?** Assessment of protected area design and planning	Protected area legislation and policy. Protected area system design. Reserve design Management planning.	Appropriateness
Inputs	**What do we need?** Assessment of resources needed to carry out management	Resourcing of agency. Resourcing of site. Partners.	Resources
Process	**How do we go about it?** Assessment of the way in which management is conducted	Suitability of Management processes.	Efficiency Appropriateness
Output	**What were the results?** Assessment of the implementation of management programmes and actions: delivery of products and Services	Results of management Actions. Services and products.	Effectiveness
Outcome	**What did we achieve?** Assessment of the outcomes and the extent to which they achieved Objectives	Impacts: effects of Management in relation to objectives.	Effectiveness Appropriateness

6.9.3 Limitations

According to the documentation in Appendix E, the Score Card tool has been adapted / developed to provide a quick overview of the initial state of management efforts and subsequent progress, over a period of years, in improving the effectiveness of management in a given marine protected area. Specifically, it is noted that:

< The tool does not allow a detailed evaluation of outcomes, but rather serves to provide a quick overview of the status of management steps;

< Therefore, the use of the scorecard should not replace more thorough methods of assessment for the purposes of adaptive management.

Of particular importance, it is noted that the whole concept of "scoring" progress is fraught with difficulties and possibilities for distortion. The current system assumes, for example, that all the questions cover issues of equal weight, whereas this is not necessarily the case. Accuracy might be improved by weighting the various scores, although this would provide additional challenges in deciding differing weightings.
In our professional practice, Ecoengineering has had extensive experience in the assigning of importance weights to environmental components, and we fully agree that there will be some challenges in assigning a system of weights to the various components. However, we do not believe that it would be either impossible or undesirable to do so. Indeed, we have seen examples where unweighted checklists have skewed the final decision in a particular (and not necessarily a desirable) direction. What we would recommend is the following:

- The present unweighted scorecard should be used when marine PAs are established, and for a period of perhaps 5 to 7 years thereafter.

- After this initial period, it is expected that the PA staff and key stakeholders will be sufficiently familiar with the scorecard to upgrade it to a weighted scorecard.

- Weightings should be assigned on a site-specific basis, to reflect local ecological and socio-economic conditions as well as local sensitivities.

- The actual importance weights should be assigned by the PA Staff and Key Stakeholders themselves, using a system of structured approach (such as the Delphi System), moderated by an experienced environmental / socio-economic practitioner. Our experience suggests that a regional practitioner is more likely to be effective in this work than an extra-regional practitioner.

7 STRENGTHS, WEAKNESSES, OPPORTUNTIES AND THREATS

SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis is an extremely useful tool with which data is subjectively assessed and organized into a logical order. By identifying Strengths, Weaknesses, Opportunities and Threats associated with the Tobago Cays Marine Park (TCMP), it will be easier to identify appropriate measures for protecting the environment and specifically for addressing potential adverse impacts. In any SWOT Analysis, it is important to note that the categories are not mutually exclusive. It is quite possible for a single aspect to be associated with a strength and also with a threat.

7.1 SWOT Identification

The first step in the SWOT analysis involved an open discussion involving all members of the Study Team (except Ms. Cumberbatch) to identify Strengths, Weaknesses, Opportunities and Threats relevant to the TCMP. Table 39 lists the results of the SWOT Identification. The remaining sections of this chapter each discuss one category.

7.2 Strengths

The strengths are discussed under the following headings as itemized in Section 7.1 above:

- World-renowned Reef,
- Largely uninhabited,
- Isolated,
- Buy-in from Stakeholders,
- Islands owned by Government, and
- Water Taxi System.

TABLE 39: SWOT IDENTIFICATION

STRENGTHS	WEAKNESSES
World-renowned Reef	Management Structure
Largely uninhabited	Park Patrols
Isolated	Lack of Equipment
Buy-in from Stakeholders	Ambiguous Boundaries
Islands owned by Government	Lack of Infrastructure
Water Taxi System	Diseased coral / Damaged coral
	"Familiarity breeds contempt"*
	Language Barrier
	Water taxis Attitudes
	Fee Structure
	Absence of local visitors
OPPORTUNITIES	**THREATS**
Water Taxi / Vendor Income	Popularity vis-à-vis Carrying Capacity
Transportation of solid waste to shore	Wastes from Yachts and Cruise ships
Monitoring / Training of locals	Overexploitation (Overfishing / Out of Season Harvesting / Spear fishing
Diving	Disturbance to Turtles
Turtle grazing / nesting	Walking on Reefs
	Anchor damage to Reef

Note: * The Phrase "Familiarity breeds contempt" conveys the fact that many of the visitors to the Cays have been to the site for many years and have as a result of their familiarity with the site formed bad habits which could be considered a weakness.

7.2.1 World-Renown Reef

The horseshoe reef which is a barrier reef encloses four of the five islands which make up the Tobago Cays. This reef is a popular diving sites for diving enthusiasts all over the world (as are other reefs in the general area). The islands in the TCMP are considered a "must-visit" on the itinerary of most yachts which visit the southern Caribbean. Dive sites advertised in tourism offices in Canada, United Kingdom and the United States include: Horseshoe Reef, Sail Rock and Mayreau Gardens. Indeed, as noted in Section 5.1.4.2, approximately 30% of all yachts visiting St. Vincent and the Grenadines also visit TCMP. Similarly, approximately 25% of passengers aboard cruise ships visiting St. Vincent and the Grenadines visit the TCMP.

International recognition brings with it some level of respect. It is more likely that visitors to the region would obey the rules at an internationally recognized environmental asset (such as the TCMP) than a relatively unknown asset. In like manner, it is more likely that local residents would treasure and protect an internationally recognized environmental asset than one which is only recognized locally.

7.2.2 Largely Uninhabited

The islands which make up the Tobago Cays (namely Petit, Tabac, Petit Bateau, Baradal and Jamesby) are uninhabited. Mayreau is inhabited (approximate population of 250 persons), and the eastern coastline of this island is the western boundary of the TCMP. The populated section of the island is located on the western coastline and is separated from the TCMP by a ridge.

The fact that the majority of the Park area is uninhabited provides the following strengths:

- < There are no permanent anthropogenic sources of pollution within the TCMP.
- < There is no pressure for housing or agricultural land.

The proposed 100 m buffer zone along the eastern shoreline of Mayreau (see Section 6.3.6) is expected to support these strengths.

7.2.3 Isolated

These islands are located within the Grenadines chain between St. Vincent and Grenada (see Section 4.2), approximately 4.8 km to the north east of Union Island, 4.8 km to the south west of Canouan and 2 km east of Mayreau. The TCMP is not within any shipping lanes. This isolation benefits the TCMP since it again reduces the potential for land-based sources of pollution to negatively affect the quality of the reefs. Liquid wastes (for example, sewage) will be greatly diluted over those distances. Even thought floating solid wastes can be transported over such distances, such waste is less likely to reach the TCMP than areas closer to their source.

7.2.4 Buy-In from Local Population

Another strength of the development of the Tobago Cays as an MPA is the level of support expressed from the local population. During our surveys, an overwhelming majority (98%) were in favour of the TCMP (see Section 5.3). In addition, the hotels and restaurant owners (although acknowledging the inconvenience in having to pay user fees to visit the Park), all agreed that the development of the Tobago Cays as an MPA was a positive step.

This level of buy-in by local residents is critical in not only the management of the resources but also in preserving the environment upon which this MPA must rely. Without local buy-in, there is little chance for the TCMP to succeed. Examples are available regionally where facilities have been vandalized and rules flagrantly disobeyed where the local population does not support a particular policy decision.

7.2.5 Islands Owned by Government

Land tenure can create quite a barrier in trying to establish an MPA if the land owner is private and not inclined to cooperate. In this instance, the land was purchased by the Government of St. Vincent and the Grenadines and therefore the inherent problems of incompatible use do not apply here.

7.2.6 Water Taxi System

As noted in Section 5.1.4.6, the water taxis are sometimes the only means for the yachters to obtain grocery items etc. from Union Island without having to be inconvenienced to come ashore for them. This service is therefore invaluable to the TCMP since it is at least a 20 – 30 minute boat ride from Union Island to the Tobago Cays.

7.3 Weaknesses

The weaknesses are discussed under the following headings as itemized in Section 7.1 above:

- Management Structure,
- Park Patrols,
- Lack of Equipment,
- Ambiguous Boundaries,
- Lack of Infrastructure,
- Diseased Coral / Damaged Coral,
- "Familiarity breeds contempt",
- Language Barrier,
- Water Taxi attitudes,
- Fee Structure, and
- Absence of local visitors.

7.3.1 Management Structure

The management structure of the marine park has undergone some significant changes since the TCMP was first created. At present, the Park operates under a Tobago Cays Marine Park Board which has responsibility for the day-to-day running of the Park. Critics of this system indicate the lack of effective local participation in the Park although at least two of the existing Board members are representative of NGOs or CBOs on Union Island. This is an interesting comment, in light of the generally high level of buy-in to the Park Concept by area residents and business-people (see Section 7.2.4).

The result of this lack of cohesiveness in management is similar to having ambiguous boundaries (see Section 7.3.4). As long as there is a perception that local people do not have a meaningful say in decision-making, there will not be compliance with rules of the Park. This, in turn, can negatively impact on the natural environmental assets within the TCMP.

Section 11.2 of the draft Management Plan discusses this issue of park management and suggests two options for management. Whichever option is chosen, the perception of effective inputs by local residents must be fostered or this issue will continue to be a weakness.

7.3.2 Park Patrols

One of the weaknesses of the development of the TCMP is the limited nature of park patrols. This is directly related to the limited number of rangers employed by the TCMP Board. At present only four rangers are employed to patrol the entire TCMP on a day-to-day basis. This number is inadequate to cover the extent of the Park. In addition, the arrangement at present has the rangers collecting the fees for use, entry and visits to the Park. The fact that these visitors are frequently aboard yachts anchored over a wide area means that the rangers are forced to spend the majority of their time in fee collection. This is exacerbated during the high season when a significant number of yachts, cruise ship passengers and day trippers enter and leave the Park on a daily basis.

The limitations on park patrols were raised by most of the persons interviewed. In addition, this issue was clearly demonstrated when the Ecoengineering team was on-site. During that visit, one of the four rangers was assigned to our diver and therefore could not perform other duties. This left the park short-staffed for fee collection and general monitoring.

The present arrangement also leaves the park un-patrolled after “normal office hours”, and particularly in the evenings and at night. This lack of patrols means that violations of park rules may go undetected thus placing the natural assets (reefs and sea grasses) at some risk of damage or deterioration. The proposal to employ more staff (see Section 6.7) will go some way to strengthening the patrolling of the TCMP.

7.3.3 Lack of Equipment

Also related to the inadequate number of personnel (see Section 7.3.2, above) is the lack of sufficient equipment. A simple example of this is boats for park patrols. The TCMP owns three boats, but at present only one is available for patrols. The other two are currently in the need of repairs. Compounding this is the fact that the available boat is a small vessel which offers no protection from the elements. This lack of equipment can greatly impede the ability of the rangers and other staff to function at the jobs.

The proposal in the draft Management Plan to increase the complement of boats as well as to outfit the boat with additional equipment is intended to address this weakness.

7.3.4 Ambiguous Boundaries

The original designation of the TCMP in 1987 included the island of Mayreau within the Park, and this has led to some conflict with residents of that island. In discussions with various agencies (including the TCMP) it is understood that there is a bid to change to western boundary of the Park from its current position enclosing the entire island of Mayreau to end at the eastern coastline of Mayreau. However, until this ambiguity is sorted out, management of the Park will be less effective (due to conflict with residents) and this can impact negatively on Park resources. This ambiguity with respect to the Park boundaries is discussed in Section 12 of the draft Management Plan, and even within the existing boundaries the zonation recommended in the Plan (see Section 6.3) is intended to address this weakness.

7.3.5 Lack of Infrastructure

Existing Park infrastructure includes an administrative office, two boats, installed marker and mooring buoys. The TCMP is a multi-use area consisting of several environmental assets which the management plan seeks to protect. However inadequate infrastructure within the MPA makes it difficult to protect these assets. There is a need for more moorings near to areas that are to be protected e.g. sea grass beds and coral reefs, to deter yachters and boaters from dropping anchors in these areas (see Section 6.3.3).

While the establishment of permanent structures is prohibited on the Cays, there are two groups whose wastes need to be managed within the Cays: Vendors and Visitors.

7.3.5.1 Vendors

Vending is only permitted on Petit Bateau and vendors are usually there for the day. The issue of solid wastes will be discussed in Section 7.4.2 below so this discussion is specific to sewage. The absence of toilets on this island results in the use of the bushes and the sea. The numbers of vendors using the area is small enough that the provision of toilet facilities is enough to eliminate this activity.

7.3.5.2 Visitors

Visitors to the Cays include yachtsmen, cruise ship passengers and charter boat passenger. As noted in Section 5.1.4.4, the estimated number of cruise ship passengers expected to visit the Park in the 2006-07 season was 15,890. This number represents just one subset of the expected Park visitors. It is therefore important to implement a plan for management of wastes from the cruise ships, yachts and charter boats.

Without proper disposal of wastes from these vessels the impact on the environment may be the following:

- Reduced water clarity and quality leading to loss of corals;
- Enrichment of the water, leading to increased algal growth;
- Reduce bathing water quality which can lead to infections.

Again, recommendations concerning moorings and toilet facilities will be made in Chapter 7 of this report.

7.3.6 Diseased Coral / Damaged Coral

The reefs of the TCMP, in particular Horseshoe reef (see Section 7.2.1) offer a diversity of habitats and great biodiversity and are quite popular internationally, providing excellent snorkelling and diving. However, stressors on the reef have taken away from the appeal they once had. Stressors on the reef include physical storm damage (associated with the passage of hurricanes and tropical storms), anchors, and fishing gear, as well as from white-band disease, other diseases, and localized nutrient pollution from yachts (Wells, 1988; Smith et al, 1997). Synergies of these stressors have contributed to the phenomenon of coral community deterioration affecting Caribbean reefs. Diseased coral heads are a common on the reefs, and include diseases such as blackband disease, white plague disease, white banding, yellow blotch disease, and bleaching.

Physical storm damage to the reef coral grazing are not mitigable, but other sources of physical damage (stemming from reef walking, spear fishing, over fishing, and anchor damage) can be controlled (or, if possible, eliminated). Further, anthropogenic sources of organic pollution into the reefs have resulted in algal bloom in some areas, resulting in coral smothering. This is exacerbated during the peak season when a significant number of yachts, cruise ship passengers and day trippers enter and leave the Park on a daily basis.

Inadequate staffing and equipment (see Sections 7.3.2 and 7.3.3) have impeded the ability of the rangers to monitor the reefs. There are several factors which have been recommended in the draft Management Plan which will mitigate these issues (see Sections 7.3.2 and 7.3.3).

7.3.7 "Familiarity Breeds Contempt"

As noted in the sections above, Tobago Cays has been an attractive yachting destination for visitors to the Caribbean for many years. As a result, the visitors have had a long time to establish habits (some of them bad habits) from repeated visits to the area. These habits which can negatively impact of the reef include:

- Anchoring / Use of Moorings
- Use of local Dive Shops;
- Snorkelling;
- Spearfishing.

7.3.7.1 Anchoring / Use of Moorings

Traditionally, anchoring has been favoured over moorings in the Tobago Cays. Yachts have been able to find good anchoring locations over the sand bottoms that are available within the shelter afforded by the Horseshoe reef. Additionally, yachters have expressed the opinion that anchoring to moorings which are not properly maintained is a legal risk for them since their insurance companies will not cover them if their vessel is damaged due to the failure of a mooring. Unfortunately, there are also those who are quite willing drop anchor anywhere that it is convenient to them.

There is no question that anchoring on the reefs and on the seagrass beds result in significant physical and ecological damage. In fact, one study estimates that a cruise ship may destroy coral reef areas as large as 3,150 m^2 during only one stop (French Mission for Cooperation, 1995). Even though that study was based on cruise ships of a larger size than those that anchor in the Cays, the concern is valid at the TCMP. Continued anchoring on sensitive area will continue to contribute to the deterioration of the reef.

The proposal in the draft Management Plan for specific zones for anchoring along with the provision of moorings (see Section 6.3.3) should significantly reduce this habit. To further change the culture of "anchor anywhere", the effects of anchor damage (including evidence of actual damage at TCMP or elsewhere in the Caribbean) should be a focus of the educational material (brochures, website, handbook, etc, described in Section 6.8.1) prepared for the Park.

7.3.7.2 Use of Local Dive Shops

Another tradition which the visitors to the Park seem disinclined to stop is diving without the use of the local dive shops. While a fair percentage of the divers are certified divers, many are novices who wish to take the opportunity to 'practice' in an isolated environmental like the Cays. This practice has lead to physical damage to the reefs due to reef walking and harvesting of corals for souvenirs. The implementation of the Park system with the permit for diving (which requires that divers must be accompanied by a local dive master) has reduced this practice noticeably but not completely stopped it.

7.3.7.3 Snorkelling

Snorkelling is also a very popular activity within the TCMP. Both adults and children can be seen snorkelling over some of the shallow reefs and the seagrass beds on any given day within the Park. However, inexperienced snorkellers who get out of their depth are observed standing on the reefs. This practice can create significant physical damage to the reef. This is especially a problem in the 'high season' when there are hundreds of un-supervised snorkellers in the water.

7.3.7.4 Spear Fishing

All fishing, including spear fishing, is prohibited within the TCMP. However, members of Ecoengineering's team observed persons conducting this illegal activity within the TCMP. Spear fishing in the vicinity of the coral reefs can result in physical damage to the corals. This can also result in a change in the physical behaviour of the fish making them 'shy' which impacts on the ability for other Park visitors to view them. Additionally, spear fishing can also lead to a scarcity of the fish and, if unregulated, to a loss of the very fish species that snorkellers want to see (French Mission for Cooperation, 1995).

This activity has been blamed for some of damage seen on the coral reefs within the Park by the fishermen. Fishermen interviewed (see Section 5.2.2.1) indicated that while they use to spear fish in the Cays, since the setting up of the Park as an MPA they no longer spear fish in the Cays.

Since this activity is already legally prohibited, what is needed is enforcement. The proposal for increasing the numbers of rangers (see Section 6.7) and other measures recommended in Section 19 of the draft Management should reduce this issue.

7.3.8 Language Barrier

The renown of the Tobago Cays and the reefs that surround them has attracted several visitors from different parts of the world. The influx of primarily non-English speaking visitors into the Tobago Cays creates communication barriers between the visitors and managers of the Park. Park rangers have indicated the difficulties that this presents in collecting fees as well as conveying the rules and restrictions in using the MPA to users. There is a need for the MPA managers (rangers, etc.) to acquire some language skills to ensure the effective management of the TCMP.

7.3.9 Water Taxi Attitudes

Charuk in his paper "The Usual Suspects, 2004" acknowledges the fact that the vendors / water taxi operators play an important role in the functioning of the TCMP. However, he, like other stakeholders interviewed (see Section 5.2.3.1.2), has expressed some negative views on the aggressive tactics of some of these operators. Unfortunately, the Tobago Cays has been infamously labelled as "Boat Vendor Central" (Charuk, 2004). This is in acknowledgment of the numbers and competitiveness of the operators. This attitude, if it continues, can reduce the number of tourists willing to visit the Park in the

future. This will, in turn, lead to a loss of direct revenue for these very water taxi operators some of whom are the only income earners for their families (see Section 5.2.2.5.2). Additionally, a reduction of tourists visiting will reduce the fees collected by the TCMP.

It would appear that training as customer relations would benefit both the Water Taxi Operators and the TCMP itself. In addition, the proposal to educate the public by way of signage, brochures, etc (see Section 6.8.1) assist in alleviating this issue as a weakness.

7.3.10 Fee Structure

The fee structure at the TCMP (like the boundaries discussed in Section 7.3.4 and the management structure discussed in Section 7.3.1) has also been a source of conflict. A new fee structure was introduced when the Park was re-launched in December 2006 (see Table 40 below). This fee structure was implemented at that time to capture the beginning of the high season for the TCMP. Unfortunately, the fee structure has come under criticism by many of the present users of the Park.

TABLE 40: TCMP LICENSE FEES, PERMITS AS AGREED BY CABINET

TYPE OF FEE / PERMIT	RATE	AMOUNT ($EC)	AMOUNT ($US)
Entry Fees (includes visitors on private yachts, charter boats, cruise ships, for diving etc)	Per person	$10 per day (up to 24 hours)	$3.74
Moorings (where used, anchoring also proposed to be allowed at no charge inside anchoring zones)	Yachts 40 ft and under	$40 per 24 hours	$14.98
	Yachts 41-70 ft	$50 per 24 hours	$18.72
	Yachts 71-100 ft	$60 per 24 hours	$22.47
	Dinghies	$15 per 24 hours	$5.61
	Dives	$10 per 24 hours	$3.74

TYPE OF FEE / PERMIT	RATE	AMOUNT ($EC)	AMOUNT ($US)
Local operators licenses	Vendors	$20 per month or $200 per year	$7.50 per month or $74.90 per year
	Water Taxis	$30 per month or $300 per year	$11.23 per month or $112.36 per year
	Charter Boats	$40 per month or $400 per year	$14.98 per month or $149.81 per year
	Dive Shops	$25 per week or $80 per month or $800 per year	$9.36 per week or $29.96 per month or $299.62 per year
Permits	Filming	$300 per permit (terms and provisions to be prescribed)	$112.36 per permit (terms and provisions to be prescribed)
	Wedding Ceremonies	$300 per ceremony	$112.36 per ceremony
	Local excursion	$2 per person	$0.75 per person
	Duplicate permit	¾ of original fee	
Barbeque		$25 for a barbeque for up to 10 persons, or 10$ per person for larger sized groups	$9.36 for a barbeque for up to 10 persons, or $3.74 per person for larger sized groups

Some of the stakeholders interviewed expressed the opinion that they would be disinclined to return to the Park if the fee structure as it stands is not reviewed (see Section 7.3.10). As before, this will reduce the fees collected by the TCMP and thus affect the sustainability of the TCMP.

The draft Management Plan in Section 15 discusses the issue of fees and raises some of the concerns and positive feedback from stakeholders. The actions proposed in the draft Management Plan should go a long way toward eliminating this issue as a weakness:

- Implementation of the Park user fee system will require a computerised database system and competent data manager and data entry clerk. Such system should

be able to provide prompt and up to date information to the rangers as to which visiting yachts, excursions, day charterers etc have paid on any given day.

- A credit card merchant account should be established at the TCMP Office to facilitate direct payment of the entry fees by visitors. The TCMP web site should also be re-established to include an on-line, advance payment facility.

As noted in Table 41 below, the system of fees proposed for the TCMP is far more detailed than those of marine parks in the region. Additionally, a comparison of fees charged for divers (which is common to all the parks) shows that the fee charged for diving in the TCMP is at the lower end of the range of fees for diving in marine parks in the region. To ensure that the optimal fees are being charged, a 'willingness to pay' study may be undertaken.

TABLE 41: USER FEES AT OTHER MARINE PARKS IN THE REGION

Source: www.roatanmarinepark.com/newsletter-April-2005.htm

MARINE PARK LOCATION	TYPE OF FEE	DAILY FEE (US$)	ANNUAL FEE (US$)
Bonaire Marine Park, Netherlands Antilles	Diver	-	25
	Mooring	US $5.40/vessel/night for vessels <18 m US $8.10/vessel/night for vessels >18 m	
Soufriere Marine Park, St. Lucia	Diver	4	12
Saba Marine Park, Netherlands Antilles	Diver	3	-
Cozumel Marine Park, Mexico	Diver	2	-
Pigeon Island Park, St. Lucia	Diver	5	15
Half Moon Caye, Belize	Diver	5	-
Hoi Chan, Belize	Diver	2	-
Isla Bastimentos, Panama	Diver	10	-
West End Sandy Bay Marine Park, Honduras	Diver		10
West End Sandy Bay Marine Park, Honduras	Cruise Shippers	3	-

7.3.11 Absence of Local Visitors

As noted in Section 3.5.4, many of the residents approached for interviews had no interaction with the Tobago Cays. In fact, many could not remember the last time they had ventured that far offshore. The current fee system seems to exclude local visitors from the Park. Although, on the one hand there is 'buy-in' by the local community to the development of the Tobago Cays as an MPA, on the other hand the continued marginalization of the local community will negatively impact on the resource. Although, the local community has taken a 'hands-off' approach to the day-to-day management of the Park, they are still unwilling to see foreign management of the Park. This was evidenced by the public outcry against a proposal by a foreign-based firm for management of the Tobago Cays.

The lack of local visitors to the reef could impact negatively on the park by an eventual erosion of their positive attitude toward the establishment of the TCMP. If locals are able to appreciate the reefs and island apart from those who gain a direct income, then they may be better able to endorse measures which may be implemented to protect the environmental resources.

7.4 Opportunities

Opportunities identified through the establishment of the TCMP include:

- Water Taxi / Vendor Income,
- Transportation of Solid Waste to Shore,
- Monitoring / training of locals,
- Diving, and
- Turtle grazing / nesting.

7.4.1 Water Taxi / Vendor Income

The attitudes of the water taxi operators were discussed as a weakness in Section 7.3.9. However, the livelihoods of the water taxi operators as well as vendors that frequent the Park are directly linked to the success of the TCMP. In particular, the service provided by the water taxis is a niche that will continue to ensure their sustainability. The water taxis are sometimes the only means for the yachtsmen to obtain grocery items, etc, from Union Island without having to be inconvenienced to come ashore for them. This service is therefore invaluable to the TCMP since it is at least a 20 – 30 minute boat ride from Union Island to the Tobago Cays.

The establishment of the Park and the implementation of the various recommendations raised in the draft Management Plan should increase the sustainability of the livelihoods of the water taxi operators and the vendors. It is therefore an opportunity that will arise from the establishment of the TCMP.

7.4.2 Transportation of Solid Wastes to Shore

The removal of solid waste to shore from either the yachts or from bins specifically set up on the islands for solid waste collection is an opportunity for an entrepreneur. At present, yachts that are willing to pay the sometimes high fees allow the water taxi operators to take their waste to shore on Union Island. There they are disposed in a communal location along with other land-based waste. Additionally, the park rangers collect solid waste dumped on the island by visitors and transport this to shore. What is proposed (see Section 17.4 of the draft Management Plan) is for a concession to be granted to a private contractor to collect and dispose of solid waste associated with the TCMP. This provides an opportunity for a local operator to provide this service.

7.4.3 Monitoring / Training of Locals

The establishment of the TCMP is an excellent opportunity for the inclusion of the local communities in jobs associated with the Park. At present there are 4 park rangers, a park manager and an office assistant who are directly employed by the TCMP Board. Additionally there are plans to increase the number of rangers. It is also our understanding that the rangers have been trained in various reef monitoring exercises including AGGRA and Reef Check. There are also opportunities for locals to be employed in other capacities as discussed in Sections 6.8.2 and 6.8.3.

7.4.4 Diving

Although the actions of inexperienced divers have been identified as threats to the establishment of the TCMP, diving as an activity is also an opportunity. As noted in Section 14.4 of the draft Management Plan, diving within the Cays is prohibited without the use of a local dive master. This creates an opportunity by including the local divers and dive shops in the Park.

7.4.5 Turtle Grazing / Nesting

The only significant seagrass beds located within the TCMP are along the southeast coastline of Baradal (see Section 4.2.3). This site is popular due to the presence of turtles which forage within the seagrass beds and occasionally nest onshore. The establishment of the TCMP will result in some form of protection of this site and an eventual increase in the population of turtles in this area. Support for this is evidenced by the yachts anchoring away from the seagrass beds under pressure from the Park rangers to do so.

In addition to observing the turtles browsing in the sea grass beds, there may also be an opportunity to observe turtle nesting and hatching on the cays. Experience in Trinidad suggests that this is a very interesting experience, and there is good evidence (again in Trinidad) that villagers who formerly slaughtered marine turtles and harvested their eggs now lead the turtle-watching teams. This is done in conjunction with a government agency which issues passes to the restricted beaches for the purpose of observing turtle nesting. At the TCMP, this opportunity must be carefully analysed before it is exploited. Turtles nest at night, and at present the park patrols do not operate at night. As such, regulation of turtle watching groups will be difficult at present. A proper regulatory system must be put in place before turtle watching during nesting is encouraged at the Cays.

The turtles are one species which present an opportunity to the TCMP, but are also under threat due to the operation of the Park. As discussed in Section 7.5.3, the harassment of turtles is a problem at this Park which needs to be addressed. Therefore, the concept of the turtles as an attraction for visitors (in particular snorkelers) must be counterbalanced against meaningful activities to protect the turtles.

No definitive numbers on the population of sea turtles foraging or nesting in the Tobago Cays are available. However, discussions with the park rangers indicate that the numbers of turtles observed in the Park have decreased over the past five years. Given the importance of these visible and interesting animals to the snorkelling experience at TCMP, it is important that better records of populations and nesting activity should be kept by the park management. A specific recommendation on this monitoring will be made in Chapter 7.

7.5 Threats

Threats identified in establishing the TCMP include:

- Popularity *vis-a-vis* Carrying Capacity;
- Wastes from Yachts and Cruise Ships;
- Overexploitation (Overfishing / Out of Season Harvesting / Spear fishing);
- Disturbance to Turtles;
- Walking on Reef; and
- Anchor Damage to Reef.

Figure 8 shows the potential threats to the environmental assets within the TCMP.

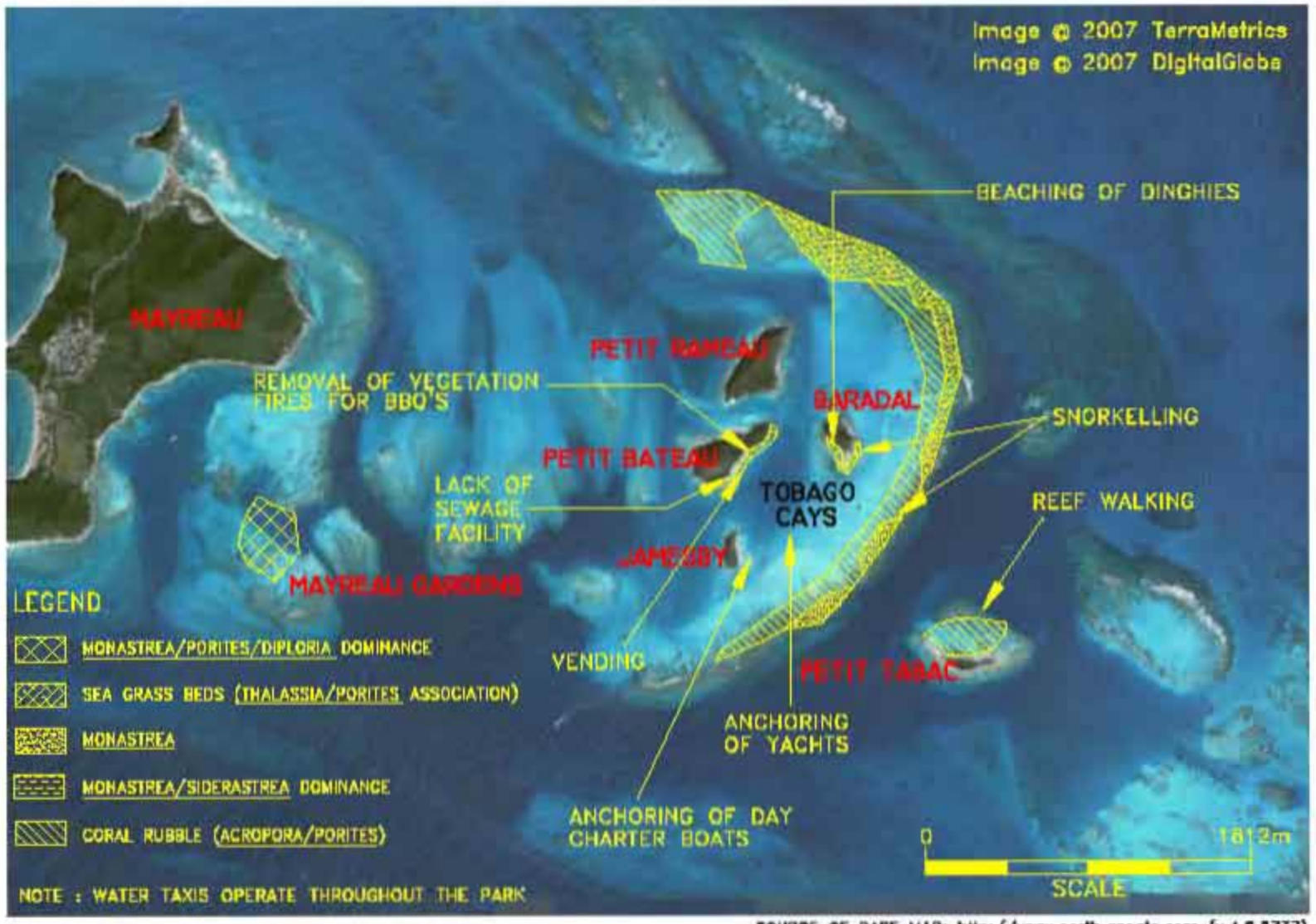
7.5.1 Popularity / Carrying Capacity

In Section 7.2.1, the popularity of the reefs within the Tobago Cays as “world-renown” was discussed as a strength. However, this popularity can also be considered a threat. The popularity of the reef has resulted in increased numbers of visitors from yachts, charter boats and cruise ships. This in turn will encourage more vendors and water taxi operators to enter the Park to cater to the larger numbers of visitors.

This increased visitorship creates the following threats:

- Increased potential for physical damage to the reef,
- Increased disturbance of marine life by snorkellers and divers,
- Increased potential for deteriorating water quality from improperly disposed sewage; and
- Improper disposal of garbage.

The proposals itemized in Section 7.3.7 are also expected to reduce the threat resulting from increased popularity of the TCMP.



SOURCE OF BASE MAP: http://www.earth.google.com (v.4.0.2737)

Ecoengineering Caribbean Ltd.	Eco Report No. 06/2007	CLIENT: OECS -ENVIRONMENT AND SUSTAINABLE DEVELOPMENT UNIT	FIGURE NUMBER 8
	Date: 31/07/07	PROJECT: TOBAGO CAYS SITE REPORT ST. VINCENT AND THE GRENADINES	
		DWG. NAME: POTENTIAL THREATS TO ENVIRONMENTAL ASSETS	

7.5.2 Wastes from Yachts and Cruise ships

The wastes generated from yachts, cruise ships and charter boats can cause deterioration of the water quality and water clarity and by extension the reefs and other marine life. Recommendations to mitigate this threat will be discussed in Section 8.2.1 below.

7.5.3 Disturbance to Turtles

Three species of turtles are known to occur within the TCMP, Hawksbill Turtles (*Eretmochelys imbricate*), Leatherback Turtles (*Dermochelys coriacea*), and Green Turtles (*Chelonia mydas*). The latter are the most common and often seen grazing within the sea grass beds within the TCMP and especially along the coastline of Baradal Island (see Section 4.2.3). The establishment of the TCMP will result in some form of protection of these sites however, it has become common practise for groups of snorkellers to chase after and disrupt the turtles while they are either attempting to graze or rest. This is a direct threat to the survival of the turtles themselves and would conflict with any proposal to use the area for conservation of biodiversity. There have also been instances (though not observed at this Park) of snorkellers feeding the turtles to encourage them to congregate in one location. Again, this practice disrupts the habit of the turtles while allowing them to become too comfortable to humans which can leave them more vulnerable to predation. Park rangers indicated that they have begun to note Green Turtles moving away from the main turtle nesting area in Baradal, to more remote sea grass beds.

In Section 7.4.5, the presence of grazing and nesting turtles were discussed as an opportunity. This fragile resource can easily be threatened if measures to limit to the disturbance of these species are not implemented. Measures such as those discussed in Section 14.4 of the draft Management Plan will reduce the threat posed by snorkellers to turtles.

7.5.4 Reef Walking / Reef Standing

Many of the fringing reefs within the TCMP are shallow (1-3 m deep) and in some instances coral heads are occasionally submerged by water. In several instances reef walking by snorkellers was observed on the reefs around Baradal, Petit Tabac and Petit Bateau (see Section 7.3.7.3). In several instances park rangers had to instruct inexperienced snorkellers who get out of their depth not to stand on the reefs (see Section 7.3.7.3). Park Rangers also indicated that coupled with storm damaged, the damage to the reefs around Petit Tabac was exacerbated by the reef walking at this

popular snorkelling area. It takes several years for corals to recover from the physical damage as a result of reef standing or reef walking. This is especially a problem in the 'high season' when there are hundreds of un-supervised snorkellers in the water. This activity is difficult to control the number of snorkellers exacerbated by the absence of regular patrols.

Measures recommended to increase patrols (see Section 7.3.2) are expected to reduce the incidence of reef walking and reef standing.

7.5.5 Anchor Damage to Reef and Seagrass Beds

The anchoring of boats onto corals or sea grass beds contributes significantly to the deterioration of these sensitive areas (see Section 7.3.7.1). Although, moorings have been placed in strategic locations within the reef to mitigate the problem, they are not maintained. Resistance to the use of these moorings were discussed in Section 7.3.7.1. While there are some yachters who will resist the construction of moorings as recommended in Section 14.7 of the draft Management Plan, information from the stakeholder consultation indicates that those are in the minority.

The TCMP board has successfully been able to police this activity and ensure that most yachters and boatmen do not anchor in sensitive marine areas. However, the measures proposed in Section 8.2.2 should significantly reduce this threat.

7.5.6 Overexploitation

All fishing within the TCMP is prohibited; and the harvesting of conchs, lobsters, turtles and turtle eggs is restricted during the closed season. However, illegal fishing continues and overfishing in the area is attributed to both local fishermen and visiting yachts (particularly in the use of spear guns) for both sport and commerce.

Fish stocks have been depleted in the marine park to the extent that fishing is no longer considered sustainable. Additionally, as is noted in Section 5.2.2.1, many fishermen approached indicated that due to the restrictions they no longer fish in the Park. Targeted species include demersals such as parrotfish, groupers, snappers and turtles. The scarcity of adults and dominance of juveniles within the reefs also suggest over-fishing of these species in the area.

No additional measures are proposed on fishing within the TCMP as this already prohibited by law, however, increased patrols as discussed in Sections 6.6 and 7.3.2 should reduce the instances of spear fishing within the TCMP.

8 ANALYSIS OF IMPACTS AND MITIGATION MEASURES

This chapter describes potential environmental impacts of the establishment of the TCMP and the use of the resources by various stakeholders on the natural and socio-economic environment. Both adverse and beneficial impacts are identified in this chapter along with appropriate mitigation measures. Impacts are rated on a systematic basis both before the application of mitigation measures as well as after the successful implementation of mitigation measures. For convenience, impacts are divided into the following:

I Impacts associated with environmental assets, and
II Impacts associated with the socio-economic environment.

The final section of the chapter is a summary of the classification of impacts.

8.1 Classification of Impacts

Having established the significance of impact, it was classified on a structured basis. The Classification method (see Appendix B) was based on three criteria: extent, intensity, and nature. Based on this, impacts (both without and with mitigation) were classified as low, moderate or high. Where adverse impacts were considered to be insignificant, no classification was applied. The Classification of each impact is indicated in the respective sub-section of this chapter, and a summary of the Classification is provided in Section 8.4.

8.2 Impacts Associated with Environmental Assets

The environmental assets within the TCMP were identified and discussed in Section 4.2. Impacts associated with use of these assets will be described under the following headings:

- Water Quality,
- Coral Reefs,
- Seagrass Beds,
- Fish and Other Aquatic Fauna,
- Terrestrial Vegetation, and
- Other Fauna.

8.2.1 Impaired Water Quality

Water quality impacts arise from anthropogenic uses of the TCMP. As noted in Section 7.5.2, poor water quality in the TCMP is related to the following sources:

- Lack of sewage facilities on the cays; and
- Disposal of Sewage from yachts and other vessels.

8.2.1.1 Lack of Sewage Facilities

Many visitors to the Cays have commented that part of the appeal of the islands is the lack of structures and the unspoilt nature. However, this same lack of toilet facilities has resulted in sewage directly entering the marine environment (see Section 7.3.5). This has resulted in a decrease of the clarity of the water as well as an increase in algal blooms. Divers (see Section 5.2.2.3.5 and charter boat operators (see Section 5.2.2.4.5 both indicated that they have also seen a deterioration of the water quality within the TCMP. If no measures are recommended to reduce the disposal of sewage into the marine environment, the classification of this impact is expected to be:

EXTENT	INTENSITY	NATURE	CLASSIFICATION
ON-SITE	MEDIUM	REVERSIBLE	LOW

The draft Management Plan proposes the provision of toilet facilities on Petit Bateau to reduce the impact of no sewage facilities for use by visitors. However, these facilities must be easily maintained and some arrangement for regular disposal must be made (as noted in Section 9.7). The plan goes on to indicate that these facilities may have to be implemented at some later date. Once toilets are provided on Petit Bateau and properly maintained, the impact of lack of sewage facilities on the water quality of the TCMP can be classified as:

EXTENT	INTENSITY	NATURE	CLASSIFICATION
ON-SITE	VERY SMALL	REVERSIBLE	LOW

8.2.1.2 Sewage from Vessels

Sewage from yachts, tour boats and other vessels has been a significant contributor to water pollution within the TCMP. In fact, this was suggested as the reason why the reefs around Jamesby were considered the worse impacted as this island is directly downstream from the main anchorage in the lagoon (Espeut, 2006). There is also the potential for this to increase given the anticipated increase in visitors to the TCMP. Another factor in this is the fact that many of these yachts are not equipped with holding tanks.

If these activities are allowed to continue the expected impact on water quality is:

EXTENT	INTENSITY	NATURE	CLASSIFICATION
ON-SITE	MEDIUM	REVERSIBLE	LOW

Measures recommended in the draft Management Plan to mitigate this impact include:

- No tenders of cruise ships to operate in any part of the park except Saline Bay and Twassante Bay on Mayreau.
- No entry to the park by cruise ships or local excursions except where such visits are schedule in advance and approved by the park manager.
- No more than one large cruise ship or local excursion to visit the park each day.
- The prohibition of discharge of wastes from yachts within the TCMP or the establishment of a separate anchoring zone for those yachts without holding tanks; and
- The employment of additional rangers to ensure round-the-clock patrols.

If these measures are properly implemented and enforced the classification of the impact of waste disposal from vessels within the TCMP on water quality is:

EXTENT	INTENSITY	NATURE	CLASSIFICATION
ON-SITE	MINOR	REVERSIBLE	LOW

8.2.2 Coral Reefs

As noted in Section 4.2.1 corals reefs are the main environmental asset within the Tobago Cays. The main reef system is the Horseshoe Reef as well as reefs associated with the islands of Petit bateau, Petit Tabac, Baradal and Mayreau (see Sections 4.2.2.1 to 4.2.2.5). These reefs have deteriorated in the past few years through physical damage (passage of hurricanes and tropical storms, anchoring by yachts, reef walking by divers and snorkellers and spear fishing) as well as from deteriorating water quality as a result of pollution from yachts (see Sections 7.5.2). Additionally, coral reefs throughout the Caribbean including within the TCMP have experienced bleaching as a result of the increase in sea temperatures. The decrease in water quality on the environmental assets within the TCMP was discussed in Section 8.2.1. If the activities that have been known to damage the coral reefs in the past are allowed to continue, the classification of the impacts of the present use of the coral reefs is expected to be:

EXTENT	INTENSITY	NATURE	CLASSIFICATION
ON-SITE	MEDIUM	IRREVERSIBLE	MODERATE

The following mitigation measures listed in the draft Management Plan are recommended to reduce the impacts of users on the reefs within the TCMP:

- No diving in the TCMP except through a [registered] diving club or diving shop, and on payment of appropriate fees.
- No snorkelling or scuba diving in conservation exclusion zones (to be identified).
- No wind surfing except in defined zones away from coral areas (see proposed zone to north of Petit Bateau, but inside reef edge).
- No damaging or impairing the growth of any flora or fauna.
- No damaging the substrata, or causing pollution of the air or sea.
- Provision of adequate moorings within the TCMP.
- Only allow anchoring within the proposed anchoring zones.
- Prohibit spear fishing in the TCMP.
- Increase the number of patrols to enforce proposed zonation.
- Employ more rangers to ensure round-the-clock patrols.

The following additional measures are recommended to reduce the impact of divers on the reef:

- Provision of rules for diving within the TCMP;
- Practice good neutral buoyancy to keep from banging into the reef and thus inadvertently causing damage to coral.
- Secure any dangling straps and be conscious of where fins are.

- If neutral buoyancy skills are weak, ensure that divers take a refresher before diving the reef.

Once these measures are implemented, the classification of use of the coral reefs on the reef systems is expected to be:

EXTENT	INTENSITY	NATURE	CLASSIFICATION
ON-SITE	VERY SMALL	IRREVERSIBLE	LOW

8.2.3 Seagrass Beds

The only significant sea grass beds within the TCMP are located off the coastline south of Baradal (see Section 4.2.3 and Figure 4). This seagrass community is relatively small (approximately 0.3 km^2). However, this area is especially significant as it is the foraging grounds for the green turtles that nest on Baradal. The seagrass has been scarred by the anchors of yachts (see Sections 4.2.3 and 7.3.7.1). This has reduced the size of the seagrass beds and therefore reduced the number of turtles that forage there. If this is allowed to continue the classification of this impact is expected to be:

EXTENT	INTENSITY	NATURE	CLASSIFICATION
ON-SITE	MEDIUM	REVERSIBLE	LOW

The following measures as listed in the draft Management Plan are proposed to reduce the impact of anchor damage on the seagrass beds:

- Provision of adequate moorings within the TCMP.
- Only allow anchoring within the proposed anchoring zones.
- Increase the number of patrols to enforce proposed zonation.
- Employ more rangers to ensure round-the-clock patrols.

Of note is the fact that the rangers have successfully prevented yachters from anchoring there by encouraging them to anchor in the sandy areas to the south of the seagrass beds.

Once these measures are implemented, the classification of the impact of anchoring on the seagrass beds is expected to be:

EXTENT	INTENSITY	NATURE	CLASSIFICATION
ON-SITE	VERY SMALL	REVERSIBLE	LOW

8.2.4 Fish and Other Aquatic fauna

A total of 45 fish species and 24 other aquatic species (including mollusc, sponges, echinoderms, crustaceans and tube worms) were observed during the dive surveys in the cays. As expected, fishing is the activity that has the potential for having a major impact on the fishing population within the TCMP. Information gathered during stakeholder consultation revealed that the majority of fishermen no longer fish within the TCMP since the regulations prohibited this activity. This has resulted in a marked reduction in fishing within the boundaries of the TCMP. However, many fishermen indicated that spear fishing is still practiced to some extent on the reefs within the TCMP. This practice, though prohibited, is considered economically viable. While impacts related to physical damage to the reefs from spear fishing is discussed in Section 8.2.2, spear fishing also has an impact on the behaviour of the fish species targeted (see Section 8.2.4). Since spear fishing is already an illegal activity within the TCMP classification of this activity will be inappropriate. However, the following additional measures are recommended to reduce this activity:

- Employ more rangers to ensure round-the-clock patrols.
- Educate fishermen on the impact of spearfishing on the fisheries.

The need to employ additional rangers is already addressed in the draft Management Plan and in fact, the TCMP board has already indicated its intension to employ more rangers to bring the number up to 6. While the draft Management Plan discusses the need to train TCMP staff, specific training for the fishermen may be necessary to reduce the incidence of spear fishing.

8.2.5 Terrestrial Vegetation

The vegetation found on the islands within the TCMP is considered typical for tropical islands. At present, the activities that occur on these islands that threaten the vegetation on these islands include:

- Clearing of vegetation by vendors and clearing of vegetation for beach barbeques; and
- Fires lit for beach barbeques.

Vendors are concentrated on Petit Bateau. Since there are no permanent facilities available for these vendors, they are forced to clear vegetation in ‘prime’ areas to accommodate their wares. Beach barbeques are a common occurrence on Petit Bateau. The indiscriminate clearing of vegetation to accommodate pits and the scarred areas left by improperly doused fires have contributed to the loss of vegetation. While the actual clearing is considered small in the context of the vegetation on all the islands,

the activity should be prohibited. Finally, there are numerous walking trails throughout the islands within the TCMP which Hoggarth in his draft Management Plan recommends should be maintained.

If no mitigation measures are recommended to remove the activities that result in vegetation loss, the classification of this impact is expected to be:

EXTENT	INTENSITY	NATURE	CLASSIFICATION
ON-SITE	MINOR	REVERSIBLE	LOW

While the draft Management Plan does not propose any specific measures to reduce the impact of these activities, the following are recommended:

- Consult with the vendors and water taxi operators on the locations for setting up their sites.
- Clear only vegetation necessary to maintain the walking trails.
- Ensure that if any replanting is to be conducted that only native species are used.

Once these measures are properly implemented, the classification of the loss of vegetation is expected to be:

EXTENT	INTENSITY	NATURE	CLASSIFICATION
ON-SITE	VERY SMALL	REVERSIBLE	LOW

8.2.6 Fauna

The cays are home to a number of faunal species that are considered rare or endangered. While two are marine turtles, two are terrestrial, the iguana and the red-necked pigeon. Information from visitors to the islands suggests that red-necked pigeons can no longer be found on the cays while iguanas are considered to be extremely rare (see Section 4.4.3). Although no measures are proposed to mitigate the loss of these animals, it is recommended that the cays be monitored to identify whether they are present on the cays and their abundance. Additionally, it is recommended that monitoring with a view toward conservation of these species be implemented and coordinated with existing regional initiatives (see Section 9.9).

8.3 Impacts Associated with the Socio-Economic Environment

The socio-economic environment including consultation with stakeholders was discussed in Chapter 4. Impacts associated with the socio-economic environment will be described under the following headings:

- Fishermen,
- Yachters / Tourists,
- Divers,
- Charter Boat Operators
- Water Taxi Operators,
- Vendors,
- Residents, and
- Hotels / Restaurants.

8.3.1 Fishermen

As noted in Section 5.1.4.1.1, while the number of fishermen on Union Island is difficult to accurately determine, for the purposes of this report, the numbers used will be those provided by the Fisheries Division. A total of 4 fishermen were interviewed during this survey period. This represented 15% of the fishermen on Union Island. The establishment of the TCMP with the fishing prohibition has resulted in the majority of fishermen moving from their traditional fishing grounds within the Cays to other fishing grounds which are usually further offshore. While all the fishermen approached acknowledged this fact, they also indicated that they have grown accustomed to the new arrangements. Therefore, it was difficult to interview fishermen who actually still fished within the Cays (see Section 3.5.4). Those fishermen interviewed indicated that apart from fishing they possessed other skills such as security guards, boat builders, labourers and electricians. While it is an established fact that the establishment of the TCMP meant that there is a total ban on fishing, it has not resulted in a significant change in the livelihood of the fishermen since the have been able to fish in other areas.

The one fishing activity that is still ongoing in the TCMP is illegal spear fishing. While the 4 fishermen interviewed did not admit to spear fishing, other stakeholders expressed the opinion that this activity is responsible for significant physical damage to the reefs (see Section 5.2.2.4.5). Measures recommended to reduce the incidence of spear fishing include:

- Increase the number of patrols to enforce proposed zonation.
- Employ more rangers to ensure round-the-clock patrols.
- Train fishermen on the dangers of spear fishing.

8.3.2 Yachters / Tourists

As noted in Section 5.1.4.2, the numbers of yachters that visit the Tobago Cays varies and has actually decreased in the past few years. Generally, on a slow day there could be 60 yachts anchored in the TCMP, and maybe 120 on a busy day (Espeut, 2996). The impacts of these visitors on the environmental assets are discussed in Sections 8.2.2, 8.2.3 and 8.2.4). The establishment of the TCMP is expected to have a positive impact on the numbers of visitors who visit the reef as the majority of visitors interviewed indicated that developing the Tobago Cays into an MPA would be beneficial. Additionally, the tourists interviewed indicated that the establishment of the Tobago Cays as an MPA would have no impact on their visits to the area. However, while no tourists / yachters identified any negative impacts associated with the establishment of the MPA, tour boat operators expressed the view that the existing fee structure may result in a reduction in visitors to the area.

8.3.3 Divers

Diving in the Tobago Cays is a significant income earner. While there is only one dive shop on Union Island, dives are also organised out of SVG, Canouan and Bequia. The establishment of the TCMP with the attendant rules means that visiting divers can only dive within the TCMP with a local master diver or through a local dive shop. This has been a positive impact on the local dive shops.

However, while the establishment of the TCMP has had a positive impact on diving within the Cays, the activities of divers on the reefs (such as reef walking) has contributed to some of the physical damage observed (see Section 7.5.4).

8.3.4 Charter Boat Operators

Like diving, operation of charter boats is a significant income earner in the Tobago Cays. There is one main provider of Charters to the cays located on Union Island while other smaller operators originate from Bequia or St. Vincent. During the 'peak season' tours can carry a significant number of visitors to the park (see Section 5.1.4.5). The establishment of the TCMP has impacted these operators through the implementation of the fee structure. Of the two operators interviewed, one was in disagreement with what was termed 'excessive fees'. As noted in Section 7.3.10, the fee structure as it presently stands provides for several tiers of fees beginning with an entry fee to fees for individual passengers. This operator expressed the view that his passengers were already unhappy with this arrangement. It is recommended that this fee structure be

reviewed again with the key stakeholders. Apart from this impact, neither operator indicated that they experienced any constraint with using the TCMP and both operators agreed that the establishment of the TCMP would not greatly affect their businesses.

8.3.5 Water Taxi Operators

The total number of water taxi operators is unclear, however, studies indicate that the number could possibly be between 12 and 40. Our discussions with the Water taxi association suggest that the number is closer to the former. On this assignment, 7 water taxi operators were interviewed which represents approximately 58%. The water taxi operators are directly related to the TCMP in that the majority of their business is catering to yachting traffic (see Section 5.1.4.6). The service provided by the water taxis is considered a niche market being sometimes the only means for yachters to obtain grocery items. The fact that the yachts are usually found in the TCMP means that any changes in the TCMP will affect the water taxi operators.

The establishment of the TCMP has resulted in a formalising of the operations of the water taxis. There is now a formal organisation, the Southern Grenadines Water Taxi Association as well as a licensing system for *bona fide* members. While all water taxis are not members of the association, there is now the opportunity for representation of the issues associated with their business since the association is represented on the TCMP Board. Therefore the establishment of the TCMP has benefited the livelihood of the water taxis.

Discussions with other stakeholders have revealed that aggressiveness of some of these operators in interacting with customers (the majority of whom are foreigners) can threaten their livelihoods since this aggressiveness has turned off many visitors.

Measures to mitigate these negative impacts include:

- Provide training to water taxi operators on public interactions;
- Provide material on the importance of the TCMP to the economy of not just SVG but to the water taxi operators themselves.
- Training of resource-users in environmental sustainability and business issues

8.3.6 Vendors

While there is no information available on the total number of vendors that sell on the Cays, discussions with vendors indicate that their numbers have been dwindling. This has been directly linked to the fees that they are required to pay. At present, vendors are required to pay EC $200.00 per year to sell in the Cays. As noted in Section 5.2.2.6.2, the majority of vendors were the main income earners in their households and were mainly female. If no measures are put in place to mitigate the impact of the establishment of the TCMP on the livelihood of the vendors, the impact of the establishment of the TCMP on the livelihood of the vendors is expected to be:

EXTENT	INTENSITY	NATURE	CLASSIFICATION
LOCALISED	MEDIUM	REVERSIBLE	MODERATE

The measures recommended to mitigate the impact of the establishment of the TCMP on the vendors include:

- Undertake ongoing consultation with the vendors on the issue of payment of fees;
- Provide training of vendors in alternative livelihoods.
- Undertake ongoing consultation with vendors on the issue of infrastructure on the island (Petit Bateau).

If these measures are implemented, the classification of the impact of the establishment of the TCMP on the vendors is expected to be:

EXTENT	INTENSITY	NATURE	CLASSIFICATION
LOCALISED	VERY SMALL	REVERSIBLE	LOW

8.3.7 Residents

While the number of residents on Union Island, Palm Island and Mayreau is 2,189, most residents did not have any interaction with the Cays. In fact, it became apparent on conducting interviews that residents were unable to contribute any information on the Cays. As a result they were reluctant to be interviewed. The establishment of the TCMP may result in a further alienation of locals from visiting and participating in the area. At present, while there is an entry fee, there is no indication whether this fee includes locals or whether (as in done elsewhere) locals are exempt from fees for entry into the park.

If no measures are implemented to address the lack of local interaction in the Tobago Cays, the classification is expected to be:

EXTENT	INTENSITY	NATURE	CLASSIFICATION
NATIONAL	MEDIUM	REVERSIBLE	MODERATE

Measures to mitigate this include:

- Public awareness campaign to encourage the local population to visit the TCMP.
- Consultation with the local population on an entry fee.

EXTENT	INTENSITY	NATURE	CLASSIFICATION
NATIONAL	MINOR	REVERSIBLE	MODERATE

8.3.8 Hotels and Restaurants

A total of 5 hotels are located on Union Island, 2 on Mayreau and one on Palm Island. Interviews were conducted with 4 hotels on Union Island and the one hotel on Palm Island. While many of their guests did visit the Cays, the hotels were not directly impacted by the establishment of the TCMP. Instead, the on-site restaurants that usually obtained their fish and lobster from fishermen who fished the Cays, no longer continued this practice. Unfortunately, no information was provided on the location of the new source of these products.

8.4 Summary of Impact Classification

Table 42 below provides a summary of the classification of potential adverse environment impacts.

TABLE 42: SUMMARY OF CLASSIFICATION

Note: * denotes a difference in intensity

CLASSIFICATION OF POTENTIAL ADVERSE IMPACTS					
ENVIRONMENTAL COMPONENT / STAKEHOLDER	WITH MITIGATION				WITHOUT MITIGATION
	EXTENT	INTENSITY	NATURE	CLASSIFICATION	CLASSIFICATION
Water quality (lack of onland sewage facilities)	onsite	very small	reversible	low	low
Water quality (sewage from vessels)	onsite	minor	reversible	low	low
Coral reefs	onsite	very small	irreversible	low	moderate
Seagrass beds	onsite	very small	reversible	low	low
Fish and other aquatic fauna	onsite	very small	reversible	low	low
Terresterial flora	onsite	very small	reversible	low	low
Vendors	localised	very small	reversible	low	moderate
Residents	National	minor	reversible	moderate	moderate

9 RECOMMENDATIONS AND COMMENTS

This chapter proposes recommendations based on the SWOT Analysis conducted and documented in Chapter 7 and the discussion of impacts and mitigation measures in Chapter 8. These recommendations are discussed under the following headings:

- Existing Management Structure;
- Park Boundaries;
- Fishing in the Management Zone;
- Conservation Exclusion Zones;
- M & E Tool;
- Provision of Toilets;
- Disposal of wastes from Yachts, Cruise ships and Charter Boats;
- Training;
- Monitoring;
- Vending;
- Review of Fee Structure; and
- Livelihood Assessment.

The final section in this chapter is the application of a matrix adapted from the Canadian Environmental Assessment Act.

9.1 Existing Management Structure

The present structure for the management of marine protected areas in St. Vincent and the Grenadines is a hindrance for the successful management of these areas. As noted in the draft Management Plan for the TCMP, the overall responsibility for national parks is under the Ministry of Tourism, while the responsibility for marine areas lies under the Ministry of Agriculture, Land and Fisheries. This situation is further complicated by the fact that a Marine Parks Bill is now being reviewed which proposes a new Marine Parks Authority which is separate from the proposed National Parks Authority. What this means for the management of the TCMP is the potential for significant conflict with respect to activities and future development. It is therefore recommended that the jurisdictions of these various agencies be clearly defined.

9.2 Park Boundaries

The Tobago Cays was designated a Marine Park under the Marine Parks (Tobago Cays) Declaration Order (1997). Under this Order, only the islands were included in the park and none of the surrounding sea area. The existing boundaries of the TCMP were agreed by the Marine Parks Board in 2006 (Hoggarth, 2007) which is shown in Figure 7. This demarcation includes the boundaries as established by the 1987 Fisheries Conservation Area. Discussions with members of the TCMP Board suggest that there is some disagreement with the western boundary. It is our understanding that this boundary is expected to shift to 61E23'40". As noted in Section 7.3.4, until the boundaries of the Park are formally sorted out, management of the park inclusive of the surrounding sea area will not be effective. A change in the boundaries will also affect the proposed zonation of the park in the draft Management Plan (see Section 6.3). It is therefore recommended that this ambiguity be cleared up before the finalization of the Management Plan.

9.3 Fishing in the Management Zone

As discussed in Section 9.2 above, the question of the change in the western boundary of the TCMP has implications for the proposed zonation of the park. At present, no fishing is allowed within the TCMP. This has created some conflict for one sector of the fishing community, the Mayreau fishermen. As noted in Sections 3.5.4 and 8.3.1 fishermen who traditionally fished within the cays have already moved away to other deep sea fishing grounds or to other alternative livelihoods. The Mayreau fishermen have however expressed dissatisfaction with this arrangement. The Mayreau fishing area is located to the west of the island of Mayreau and away from the sensitive coral reefs and seagrass beds. It is therefore recommended that fishing could be allowed within the Management Zone as proposed in the draft Management Plan. If the western boundary of the TCMP is shifted to the eastern coastline of the island of Mayreau and the redundant Fisheries Conservation area is removed, there would be no barrier to fishing to the west of the island of Mayreau.

9.4 Conservation Exclusion Zones

Conservation Exclusive Zones (CEZs) provide significant protection to rare, endangered or vulnerable species, habitats and sites within the MPA. These areas should not be open to the public nor allow any conflicting activities. Research may occur within the CEZ, but the research must be relevant to and a priority for management and cannot be conducted elsewhere. Further, CEZs should not be in conflict with uses in adjacent zones, such as anchoring and boating that would undermine its objectives.

The TCMP board recognizes the need for conservation within the MPA; however no CEZs were identified in the draft Management Plan. Species to be considered include the Green Turtles, while habitats of importance include seagrass beds and pristine and regenerating reef systems.

Several studies have been conducted on Horseshoe Reef and the fringing reefs, and several have also recognized the need for the conservation of the marine environment within from further degradation. Areas of high habitat diversity and biodiversity include the reefs around Mayreau Gardens, Petit Tabac and Horseshoe Reef. The findings of the 2007 survey indicate that Mayreau gardens and Horseshoe Reef should be conserved. The location of Mayreau gardens in more turbulent waters offers it some protection from visitors to the reef. The draft Management Plan has recognized the potential user conflicts in the area around Horseshoe reef, and has demarcated an area outside of the reef for anchoring and mooring.

Some protection is afforded to endangered terrestrial species such as the Iguanas (*Iguana iguana*), because most of the islands are uninhabited. However, the lack of comprehensive surveys on the vegetation, birds, reptile and other resources make it difficult to determine the measures necessary for the protection of land based biological diversity.

9.5 M & E Scorecard

Ecoengineering anticipates that the new information gathered as part of this assignment will considerably assist TCMP staff and key stakeholders in applying the M & E Scorecard described in Section 6.9. This section identifies questions in the Scorecard to which the information in this report is particularly applicable, and comments on on-going data-collection to continually update this information. Throughout this section, reference to the ESDU Scorecard refers to a scorecard evaluation undertaken by ESDU (prior to this assignment). That scorecard is included in Appendix E.

9.5.1 Context

The following questions appear under the Section of the Scorecard headed:

“Context: Where are we now? Assessment of Important Threats and the Environmental Policy.”

9.5.1.1 Unsustainable Human Activities

Question 2 asks whether unsustainable human activities (eg poaching) are controlled within TCMP. The ESDU Scorecard indicates that "Mechanisms for controlling unsustainable human activities in the protected area exist but there are many problems in effectively implementing them".
Examples of unsustainable human activities include:

- Disturbance to Turtles by visitors to the TCMP, resulting in changes to the behaviour of the turtles (see Section 7.5.3).

- Reef Walking and Standing, resulting in damage to the coral (see Section 7.5.4).

- Anchor Damage to Reef and Seagrass Beds, indicating a resistance to using the fixed moorings which are provided (see Section 7.5.5).

- Overexploitation of Fish Stocks by conventional fishermen and spear fishermen, even though all fishing is prohibited in the TCMP.

Changes in the occurrence of such activities will have to be tracked over time to allow future updates of the scorecard.

9.5.1.2 Law Enforcement

Question 3 asks whether rules are effectively enforced, and the ESDU Scorecard indicates that "there are major deficiencies in capacity / resources and activities to enforce protected area legislation and regulations". The most obvious example noted in this study is fishing and spear fishing within the PA, even though it is prohibited. As before, changes in these activities will have to be tracked over time to allow future updates of the scorecard.

At the TCMP, where there is tourism and residential activity on Mayreau (see Chapter 5), this concern should be extended to planning regulations as well. For example, the proposal to prohibit construction of houses, beach facilities and other structures in the Buffer Zone on Mayreau (see Section 6.3.6) must be policed and enforced.

9.5.1.3 Boundary Demarcation

Question 4 asks whether boundaries of the PA are known and demarcated. The ESDU Scorecard indicates that "the boundary of the protected area is known by the management authority but not by other stakeholders". In fact, the results of this study indicated a more fundamental disagreement between key stakeholders on the boundaries to this PA (see Section 9.2). Specifically, the inclusion of the entire island of Mayreau within the boundaries of the TCMP is a source of conflict with residents of that island.

9.5.1.4 Resource Inventory

Question 6 asks whether there is enough information to manage the protected area. The ESDU Scorecard indicates that "Information on the biophysical, socio-cultural and economic conditions associated with the protected area is sufficient for key areas of planning / decision making but the necessary survey / M&E work is not being maintained". Ecoengineering considers this to be a fair evaluation prior to the current assignment, and we are confident that the information gathered on this assignment has strengthened the data-base. It cannot be over-emphasized, however, that continual updating of the data-base is essential both to keep current the description of conditions within TCMP and also to track changes with a view to addressing and rectifying adverse changes.

9.5.1.5 Stakeholder Awareness and Concern

Question 7 asks whether stakeholders are aware and concerned about resource conditions and concerns. The ESDU Scorecard indicates that "Approximately 50% - 75% of stakeholders are aware or concerned about the resource conditions and threats". The attitudes assessed on this assignment indicate that this evaluation is pessimistic. Indeed, almost 80% of residents noted the importance of reefs, and 75% supported restrictions on fishing (see Section 5.2.2.8).

9.5.2 Management Plan

The second Section of the Scorecard is headed:

"Planning: Where do we want to be? Assessment of Protected Area design and planning."

In this section, Question 9 asks whether a management plan exists and is being implemented. The ESDU Scorecard indicates that "a management plan is being prepared or has been prepared but is not being implemented". Clearly, this has moved to the stage where a management plan has been prepared, but it is too early to comment on implementation. Ecoengineering supports the approach in that plan to zone the TCMP, with different activities being permitted in different zones.

9.5.3 Survey and Research

The third Section of the Scorecard is headed:

"Input: What do we need? Assessment of resources needed to carry out management."

In this section, Question 10 asks whether there is a program of management-oriented survey and research work. This is an extremely apposite question in the context of protected areas, where the attraction is nature itself. The ESDU Scorecard indicates that "there is some ad hoc survey and research work". Ecoengineering expects that the new information gathered on this assignment, and the methods used in that data-gathering, will form the basis for a more structured program of on-going data collection within TCMP (see Section 9.9).

9.5.4 Context

A series of questions pertaining to Education, Communication, Staffing and Equipment appear under the Section of the Scorecard headed:

"Process: How do we go about management? Assessment of the way in which management is to be conducted."

Information on these topics is summarized in the following sections of this report:

- Building awareness among Stakeholders and Community Involvement in Section 6.8.

- Staff Training in Section 9.8.

- Infrastructure in Sections 9.6 and 9.7.2.

- Monitoring in Section 9.9.

9.6 Provision of Toilets

The draft Management Plan raises the question of whether a toilet should be provided for vendors on Petit Bateau Cay. This will provide a useful amenity for those workers, and will reduce the possibility of localized faecal contamination on that Cay. The draft Management Plan recommends that a simple but effective 'Ventilated Improved Double Pit' latrine (VIDP) could be installed. However, the plan comments that this should be considered for some future date yet does not provide any suggestions as to what should be done in the interim.

If the construction of such a toilet is decided upon, responsibilities are recommended as follows:

< The Management of the TCMP would commission the design and construction of the toilet.

< Once the toilet has been installed, the vendors should be assigned the responsibility for keeping it clean and effecting minor repairs. Since they will be the users of the facility, this is not an unusual arrangement.

< The Park Management should arrange for inspection of the facility at least once per month, so that the cleaning and minor maintenance by the vendors can be verified.

< The Park Management should also be responsible for major repairs, should such become necessary.

9.7 Disposal of Wastes from Yachts, Cruise Ships and Charter Boats

Waste from Yachts and Cruise Ships consists of solid waste and toilet waste. The recommended approach to each of these types of waste is presented in the following sub-sections.

9.7.1 Solid Waste

Recommendations for the management of solid waste differ for the cruise ships and the yachts. Because of the volume of solid waste typically produced on Cruise Ships, it is recommended that solid waste should remain on the ships in the TCMP. The exception would be solid waste generated by cruise ship passengers visiting the cays. In contrast, the solid waste management system for the TCMP could cater to the collection and removal of solid waste from yachts – at a fee.

The draft Management Plan endorses recent arrangements for licensed water taxi operators who belong to the Southern Grenadines Water Taxi Association to collect garbage from yachts. A standard fee of E.C. $5.00 has been agreed upon for the removal of each garbage bag. Based on experience in other West Indian countries, Ecoengineering considers it likely that the following will apply:

- Yachtsmen will pay directly for garbage delivered to the water taxis.
- The TCMP will pay for garbage collected from bins on the Cays, using income from the user fees.
- The cost of garbage collection on the Cays should be structured to include a general clean-up around the bins at each collection.

Although, the draft Management Plan suggests that incorrect disposal of garbage will result in the offenders license, other fines for violations are described in Section 9.7.3, below.

9.7.2 Toilet Waste

The recommendation regarding toilet waste and other waste water (bilges) from both cruise ships and yachts is the same: enforcement of a "zero tolerance" policy for dumping within the TCMP. In this approach, all vessels must keep this waste water in their holding tanks until they leave the Park. Again, the park regulations must include a system of fines for violations. In recognition that there are many yachts that do not have a holding tank, the draft management plan suggests that a special zone for these yachts may be considered away from the sensitive areas. Studies must be conducted to determine the best area for locating such a zone.

9.7.3 Fines for Violations

Even with a very effective public education program, provision must also be made for the (hopefully few) irresponsible visitors who will violate the rules by discharging waste water or dumping garbage within the TCMP. The following are recommended in setting the fines:

- The system must clearly define the "responsible party" when a violation occurs. It may be prudent to define the "responsible party" as the Master and/or the Owner of the vessel. The "and/or" definition allows the TCMP to levy against either party should the other party prove to be a "man of straw" in the legal sense of that term.
- Court prosecution should not be necessary before fines are levied. However, a clear appeal process must be established for persons who feel that fines are imposed unfairly or without justification.
- Fines should be large enough to act as a deterrent. For example, if the fines for illegal dumping are only slightly larger that cost of having the garbage collected by the water taxi operators, this would be a disincentive to the use of the water taxis.
- The system of fines should be progressive. Repeat offenders should be fined higher amounts than first-time offenders. This will require the creation and maintenance of a data-base of offenders who have been fined.
- The fines should also be linked to a provision where multiple repeat offenders can be banned from entering the TCMP.

< In the case of flagrant violations (such as the discharge of oily waste), the regulations should allow the TCMP to recover the cost of actual damage to environment assets or the cost of remediation (clean-up measures), in addition to the fine.

< Also in the case of flagrant violations, the regulations should allow the TCMP approach the courts to hold ("arrest") a vessel against the cost of environmental damage or of environmental remediation.

9.8 Training

Critical to the management of the park is the need for extensive training of park staff. The Management Plan proposes the following staff members for running of the MC/CNP:

- Park Manager,
- Head Ranger / Park Warden,
- 6 Rangers
- Secretary
- Accounting Assistant
- Office Attendant
- Natural Resources Officer / Marine Biologist
- Education / Public Relations Officer

Training has been discussed as an opportunity in Section 7.4.3 as a result of the SWOT Analysis. The recommendation for a program of training can be separated into two categories:

- Administrative Training, and
- Biological Assessment.

9.8.1 Administrative Training

In order for the rangers to effectively function, the following training needs to be conducted on a continuous basis:

- First Aid / CPR,
- Lifeguard,
- Certified Diving,
- Boat Maintenance, and
- Repair / Navigation.

9.8.2 Biological Assessment

A comprehensive monitoring programme to assess the status of the biological resources within the TCMP is critical. To properly assess these resources the rangers need to be trained in biological monitoring (see Section 9.8.3).

9.8.3 Training Needs Assessment

A Protected Areas Training Needs Assessment study (Parsram, 2007) was conducted for this project and the training recommendations made by the consultant should be implemented.

The key training required at the national level includes:

- Policy analysis, development and Implementation
- Technical writing and report structures
- Change Management
- Proposal writing
- Strategic Planning
- Co-management
- Stakeholder analysis and facilitation skills
- Protected areas regulation for protection and enforcement
- Conflict resolution, mediation and negotiation techniques
- Information technology
- Financial management
- Tourism policy and planning
- Tourism and sustainable livelihoods management
- Education, awareness and outreach strategies and tools
- Communications
- Protected areas financing options / resource mobilization
- Business plan development
- Identifying and building partnerships, networking techniques
- Project monitoring and evaluation
- Site operations and management
- Integrated conservation and development planning
- Participatory processes
- Protected areas planning methods and management plan development
- Enforcement project management

At the site level, the training needs include:

- Business planning
- Co-management
- Project monitoring and evaluation
- Community outreach and management
- Technical writing
- Conflict resolution
- Site operations and management
- Marketing
- Financial management
- Team building
- Organizational management and leadership
- Board and senior management relationship and effectiveness

TCMP Sustainable Livelihoods Stakeholders should be trained as appropriate in:

- Business management
- Conflict Management
- Food Safety (Standards, equipment, etc)
- Collaboration and Partnerships
- Legislation and enforcement
- Marketing
- Operational Planning
- Protocol and diplomacy
- Customer relations
- Tour guiding
- Conservation
- Sustainable livelihoods
- Administration and Accounting systems
- Boat building and sailing for youth
- Boating and fishing gear and equipment operation and maintenance
- Fundraising options, Resource Mobilization
- Event management training
- Information technology
- Communications
- Safety and survival at sea

9.9 Monitoring of Natural Assets

Section 23.1 of the draft Management Plan discusses the need for continuous monitoring of the biological resources within the TCMP. Monitoring of the following species is considered critical for the success of the TCMP:

- Water Quality
- Marine Turtles,
- Coral Reefs and seagrass beds,
- Fish Populations,
- Terrestrial Fauna, and
- Terrestrial Flora.

The monitoring plans developed for the TCMP should also be in keeping with the already existing regional efforts of these broader initiatives such as the WIDECAST Sea Turtle Project; the Coral Reef Monitoring initiative and the FAO project.

9.9.1 Water Quality

As a means of measuring change in the water quality over time, continuous monitoring should be conducted throughout the TCMP. As noted in Section 4.1.3 marine water quality sampling and testing was conducted within the Cays in 2006. This monitoring occurred at three locations, Egg Reef, Petit Bateau and Petit Tabac. It is recommended that this programme be expanded to include locations at Jamesby, Baradal and Mayreau Gardens. This information should be collected in the dry season as well as in the wet season to account for the changes that occur. As a first instance monitoring of water quality within the TCMP should be on a quarterly basis. After the first year of monitoring, a report should be generated to determine the changes in the water quality over time. It is at this time that the frequency of monitoring and the monitoring parameters should be re-assessed before any changes are made.

9.9.2 Marine Turtles

Green Turtles (*Chelonia mydas*) are reported as breeding and feeding in the sea grass beds off the south-eastern coast of Baradal Island. Along with the other sea turtles that are found in the TCMP {(Hawksbill Turtles (*Eretmochelys imbricate*) and Leatherback Turtles (*Dermochelys coriacea*)}, this species is classified as endangered.

Baradal is an uninhabited island and no fishing occurs in the water surrounding it. However it is a popular snorkelling site to visitors (see Sections 7.3.7.3, 7.4.5 and 7.5.3). The designation of the Tobago Cays as a marine park and restrictions on catching sea turtles and the harvesting of eggs, have benefited the sea turtle population. In fact informal observations by park rangers have indicated an increase in the green turtle population in the Cays, however there has been no formal monitoring of this change.

The inclusion of such environmentally sensitive areas within a Conservation Exclusion Zone (see Section 6.3.5) of the TCMP would engender scientific research into the health of the turtles and the sea grass beds. Tagging exercises could also be undertaken to monitor the migration patterns of the turtles and population dynamics.

9.9.3 Coral Reefs

The coral reefs within the Tobago Cays are the basis for the attraction of visitors to the reef. This important resource has been deteriorating at alarming rates. The park rangers have been trained in the Reef Check method for monitoring abundance of key reef species. The major objective of this program is to provide rapidly available data on overall reef health and condition, with an emphasis on visible effects of human impact. Data are obtained on substrate composition, target and indicator species of fish and invertebrates, coral condition (including bleaching and signs of disease) and obvious signs of human impact (garbage, anchor damage, abandoned fishing line, etc.). This monitoring provides a quantitative view of the extent of human impacts on reefs considered to be in the “best” condition.

The use of this method is suitable for the TCMP since local divers are trained in the method. The use of the original sampling locations will provide useful comparisons with the monitoring results from 2005 and 2006.

It is recommended that the park rangers also be trained in the AGGRA method. This method was first used by Deschamps et al in 2003.

9.9.4 Fish Populations

Reef fishes are conspicuous and essential components of coral reef ecosystems. Reef fish within the TCMP are under threat from a variety of anthropogenic and natural stressors including overfishing, habitat loss, and environmental changes. Although the park has been designated a no fishing zone, monitoring data is intended for park managers who are and will continue to be asked to make decisions to balance environmental protection, fishery sustainability and park use by visitors.

To conduct reef fish population and community assessments, monitoring programs must collect abundance and size-frequency distribution data for distinct fish taxa. Concurrently collected data on benthic habitat and water quality are desirable as well, and can be assimilated in a survey design to improve survey performance.

The method of measurement should establish a constant search area for a sample unit (e.g. transect, fixed radius cylinder) and obtain an accurate representation of the reef fish community within the sample unit, tempered by the time required to obtain the sample. The choice of measurement method depends on the species or species-complex, life history stages, and habitat chosen for sampling.

Underwater visual census methods are ideal for assessing reef fishes because of prevailing good visibility and management concerns requiring the use of non-destructive census methods. The most well known visual census methods are the belt transect and the stationary visual census.

The main goal of sample surveys is to obtain accurate, high-precision estimates of population and community metrics at a minimum of cost.

Sampling locations for fish populations should be decided in consultation with the relevant stakeholders such as the fishers, the park rangers and the Fisheries Division.

9.9.5 Terrestrial Fauna

There are four TCMP species listed as 'threatened, rare or endangered' indicators of global biodiversity significance:

- iguana (*Iguana iguana*),
- red-necked pigeon (*Colomba squamosa*)
- hawksbill turtle (*Eretmochelys imbricata*); and
- leatherback turtle (*Dermochelys coriaces*)

Monitoring of turtles is discussed in Section 9.9.2 above. It is recommended that the cays with the possible exception of Petit Bateau (which experiences disturbances from visitors and vendors) be included within CEZ. The inclusion of environmentally sensitive areas within a Conservation Zone (see Section 9.4) of the TCMP would further reinforce the need for conservation of the iguana and the red-necked pigeon and engender further scientific research into its status.

9.9.6 Terrestrial Flora

As noted in Section 4.4.2, the principal vegetation types on the cays include beach vegetation and dry forest. There has already been some level of disturbance on Petit Bateau due to vending, visitors, hiking and fires. Although none of the species observed on these cays were found to be rare or endangered, it is recommended that the vegetation be monitored. This vegetation is important for stabilising the sand on these islands.

9.10 Review of Fee Structure

As noted in Section 7.3.10, the fee structure as it currently stands is considered too stringent by many of the stakeholders interviewed. In fact some of the tourists/yachters interviewed indicated that they would not return if the fees currently proposed are not reviewed. At the end of July, the present fee structure will have been in existence for 8 months. It is therefore recommended that, given the complaints by users, a 'willingness to pay' study should be conducted to determine the level of satisfaction by stakeholders about the fee structure as it currently stands.

9.11 Future Studies

Arising out of the field studies conducted for this project as well as the information provided in the Management Plan, the following future studies are recommended for sustainability of the TCMP:

- Carrying Capacity Studies;
- Water Quality Assessment;
- Oceanographic Patterns; and
- Disaster Management Plan.

9.11.1 Carrying Capacity Studies

The popularity of the cays as a tourist destination has resulted in an increase in the number of visitors (see Section 7.2.1). This has led to overcrowding of the beaches and the lagoon where yachts anchor during the peak season (see Section 7.5.1). It therefore recommended that carrying capacity studies be undertaken to determine how to regulate uses within the CNP. These studies must focus on the following:

- Yachts,
- Tour Boat Operators,
- Water taxis,
- Vendors,
- Cruise Ship visitors, and
- Users of trails.

9.11.2 Water Quality Assessment

As noted in Section 7.5.2, water quality within the TCMP has been affected by wastes from yachts and cruise ships. Poor water quality in turn has been identified as one of the reasons for the degradation of the environmental assets within the TCMP. As was discussed in Section 9.9.1, monitoring of water quality is critical to management of the resources of the TCMP, however, a water quality assessment should be conducted to form the basis of continuous water quality monitoring within the MC/CNP. The objective of this exercise would be:

- to determine the ambient water quality of the seawater in the TCMP;
- to identify the sources of pollution entering the marine environment,

In order to meet these objectives it is recommended that sampling and testing of the marine environment be conducted.

Ambient Marine Water Quality

In order to determine the present water quality within the TCMP, ambient water quality monitoring should be conducted. Sampling undertaken should include but not be limited to a range of parameters including pH, temperature, salinity, turbidity, conductivity, total and faecal coliforms, BOD, COD, nitrates and phosphates. This information should be conducted in the dry season as well as in the wet season to account for the changes that occur. This information will be the baseline data that can be compared to a comprehensive continuous monitoring programme that was discussed in Section 9.9.1.

9.11.3 Assessment of Physical Oceanographic Conditions

In conjunction with the assessment of water quality, a study should be conducted to determine the physical oceanographic conditions that presently exist within the TCMP. A description of the oceanographic conditions within the project area would include:

- Current velocities and directions at different tidal states;
- Tidal heights and capacity for tidal flushing of nearby rivers and wetlands;
- Capacity for tidal flushing of the mouth of any existing rivers
- Prevailing wind/wave directions and heights.

The information collected above would be useful in determining the dispersion of effluents within the TCMP. This in turn would inform decision making processes.

9.12 Livelihoods Assessment

A livelihood assessment of the demonstration sites conducted by Peter Espeut in 2006 identified new sustainable livelihoods such as:

- Estimation of the carrying capacity of the TCMP for tourism-related activities (see Section 9.11.1);
- Training in the production of high quality (sustainable) art and craft (see Section 9.12.1);
- Development of a craft area where zoning permits (on Petit Bateau);

- Training in tour-guiding skills, including species identification; and
- Placement of signage on the Tobago Cays, including labelling of species (see Section 9.12.2).

As indicated in Section 3.5.4 a limited number of respondents were interviewed in each category. With such a limited snapshot, any assessment of livelihoods is indicative as opposed to representative. Nonetheless, it is clear that the water taxis, tour operators and the vendors currently take the most advantage of the livelihood opportunities that the presence of the resource offers. Moreover, there is some indication that an increase in these activities would be of benefit to the islands given the increases in population and the need to bring down unemployment rates. In the absence of fishing, tourism is the obvious sector for focus. However, as noted in Section 7.5.1, the issue of carrying capacity must be central.

Supportive of the position are the results of the livelihood assessment of the demonstration sites that was conducted by Peter Espeut in 2006. One recommendation was the need to estimate the carrying capacity of the TCMP for tourism related activities. This study would support such a recommendation and the information contained in Sections 4.2 and 4.4 provide some of the data required for the assessment.

Nothing in this study contradicts these findings. However, critical to an effective livelihoods assessment would be a more participative approach to determining the extent to which stakeholders want to increase their involvement in the tourism sector and in what areas. While it is possible that a focus on art and craft would be beneficial, there are possibly other areas or approaches that could be beneficial. Factors such as improved destination marketing, fostered through specific festivals, whether sports-related such as regattas or cultural such as music and art events could stem the decline in the numbers of yachts that has been experienced recently.

9.12.1 Training in Production of High Quality Art and Craft

During the site visit to the Cays and especially on the island of Petit Bateau (the only island where vending is allowed), craft items were observed being sold. Additionally, some of the vendors that no longer sell on the cays have started selling their craft items on Mayreau and Union Island. There is therefore an established tradition of craft manufacture. If as expected the number of visitors to the TCMP increases, there will be the potential for increased demand for art and craft items from local material. Interested persons will require training in the use of suitable local material for making saleable

items. This activity therefore provides opportunities for trainers, person employed to make the art and craft items and vendors. However, the comment should be made that products within the cays will not be permitted to be used in making craft items. This trend which exists now will have to be discouraged strongly.

9.12.2 Signage within the Cays

The need for adequate signage was discussed throughout the draft Management Plan in association with the following:

- Demarcation of zones and boundaries,
- Communication of park regulations; and
- Identification of hazards.

It is recommended that additional signs be included to identify interesting floral species as well as to indicate some of the fauna that may be encountered within the Park. This activity therefore provides opportunities for a local group such as a school to research the species found on the islands within the cays and then for someone to be employed to make the appropriate signs.

9.13 Evaluation Matrix

Matrices have been developed under the Canadian Environmental Assessment Act (CEAA) to evaluate Environmental Issues, Social Issues and Livelihood Issues. Notes on the use of these matrices have been prepared by the Canadian International Development Agency (CIDA, 2002), and an excerpt from these notes forms Appendix F of this report.

Tables 43, 44 and 45, adapted from the CEAA originals, evaluate environmental issues, social issues and livelihood issues, respectively. The Project Undertakings in each case are the actions in the Management Plan and Livelihood Reports for the Tobago Cays Marine Park. The ratings for each project undertaking are shown on the appropriate matrix .

TABLE 43: MATRIX FOR EVALUATING ENVIRONMENTAL ISSUES (Matrix adapted from the Canadian Environment Assessment Act)

Blank	A	B	C	D	E
No Significant negative environmental effect and there is no significant public concern	**Significant positive environmental effect**	**Significant negative environmental effect that can be mitigated**	**Potential significant negative environmental effect unknown**	**Significant public concern**	**Significant negative environmental effect that cannot be mitigated**

		PHYSICAL							BIOLOGICAL														
For additional help, please refer to the User Notes or to the help notes included in the e-form		Climate	Air Quality	Waves and Currents	Sea Water Quality	Natural Hazards	On-Shore Erosion	Noise	Cay Vegetation	Wetlands	Coral Reefs and Seagrass Beds	Fish Stocks	Wildlife, Marine	Wildlife, Avian	Wildlife, Terrestrial	Biodiversity	Ecosystem Functions, Marine	Rare Species / Ecosystems	Protected Areas		Interactive Effects	Cumulative Effects
PROJECT UNDERTAKINGS																						
Park Development																						
Undertake Carrying Capacity Studies			A		A		A	A	A		A		A	A	A		A	A				
Complete Zoning of the TCMP			A		A			A	A		A	A	A	A	A	A	A	A	A			
Deploy Buoys to mark Reefs											A					A	A		A			
Deploy Fixed Moorings									A		A											
Install Signage on Cays									A					A	A	A						
Staffing and Equipment									A		A	A	A	A	A	A	A	A	A			
Public Awareness Program (Radio, TV, Print Media, Website, etc)									A		A		A	A	A			A				
Collect Waste from Yachts					A																	
Reforest Cays (especially burnt-out areas)							A		A					A	A	A	A					
Improve Trains on the Cays							A		A						A			A				
Develop a Craft Area on Petit Bateau							C	C	C													
Barbecue / Picnic Area on Petit Bateau			C		C		C	C	C					C	C							
Toilet Facilities at Petit Bateau			A		A				C													
Brief Divers and Snorkellers											A		A				A					
Monitoring and Policing																						
Deploy facilities and equipment for Surveillance and enforcement			A		A		A	A	A		A	A	A	A	A			A	A			
Establish a Database of Flora and Fauna											A	A	A	A	A			A				
Monitor high-use Reef Areas											A								A			
Fishermen																						
Develop Sustainable Fisheries Plan (outside TCMP)												A				A	A					

TABLE 44: MATRIX FOR EVALUATING SOCIAL ISSUES (Matrix adapted from the Canadian Environment Assessment Act)

Blank		**A**						**B**					**D**							**E**						
No Significant negative social effect and there is no significant public concern		**Significant positive social effect**						**Significant negative social effect that can be mitigated.**					**Significant public concern**							**Significant negative social effect that cannot be mitigated**						
		SOCIAL											**CULTURAL**													
For additional help, please refer to the User Notes or to the help notes included in the e-form		Gender equity	Community participation	Stakeholder participatio	Partner collaboration	Training	Public Education	Disabled	Community conflict	Vandalism	Noise		Politics	Educational	Religious practices	Health practices	Recreational customs	Medicinal	Historic sites	Community traditions	Community knowledge				Interactive Effects	Cumulative Effects
PROJECT UNDERTAKINGS																										
Park Development																										
Complete Zoning of the entire TCMP									A								C			C						
Deploy Buoys to mark Reefs							A			C																
Install signage on the Cays			A	A			A		B								C			C						
Staffing and Equipment		A	A	A	A	A																				
Public Awareness Program (RadIo, TV, Print Media, Website, etc)							A														A					
Monitoring and Policing																										
Deploy facilities and equipment for Surveillance and enforcement									B								C			C						
Fishermen																										
Develop Sustainable Fisheries Plan (outside TCMP)			A	A													B			B						
Other Employment																										
Training in Art and Crafts	A	A	A	A	A																					
Train in Tour Guiding Skills	A	A	A	A	A																					

TABLE 45: MATRIX FOR EVALUATING LIVELIHOOD ISSUES (Matrix adapted from the Canadian Environment Assessment Act .)

Blank	**A**						**B**						**C**					**D**					**E**					
No Significant negative livelihood effect and there is no significant public concern	**Significant Livelihood positive effect**						**Significant negative livelihood effect that can be mitigated.**						**Potential significant negative livelihood effect unknown**					**Significant public concern**					**Significant negative livelihood effect that cannot be mitigated.**					
	SOCIAL												**ECONOMIC**															
For additional help, please refer to the User Notes or to the help notes included in the e-form		Traditional livelihoods	Gender	Co-management	Information	History of site area	Partnership mechanisms	Responsive of community/group/area	Households	Cultural assets			income	Food security	Employment	Fishing	handicraft	Investments	Alternative Products	Natural assets	Access to credit	Physical assets				Interactive Effects	Cumulative Effects
PROJECT UNDERTAKINGS																											
Park Development																											
Complete Zoning of the entire TCMP		B											C	C	C	C											
Staffing and Equipment													A		A												
Collect Waste from Yachts													A		A			A									
Reforest Cays (especially burnt-out areas													A		A												
Improve Trains on Cays													A		A												
Develop a Craft Area on Petit Bateau													A		A		A	A	A								
Toilet Facilities on Petit Bateau													A		A												
													A		A												
Monitoring and Policing																											
Deploy facilities and equipment for Surveillance and enforcement													A		A												
Monitor high-use Reef Areas													A		A												
Fishermen																											
Develop Sustainable Fisheries Plan (outside TCMP)		B	A										A		A	A											
Other Employment																											
Training in Art and Crafts													A		A		A	A	A								
Training in Tour-Guiding Skills													A		A												

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APPENDIX A

STRUCTURED QUESTIONNAIRE TEMPLATES

ATTITUDE SURVEY - DIVERS

ECOENGINEERING CARIBBEAN LIMITED

STUDIES FOR OPAAL DEMONSTRATION PROJECTS

ATTITUDE SURVEY - DIVERS

Date: _____ Name of Interviewer: _____

We are working on the OECS Protected Areas and Associated Livelihoods Project which aims to collect information that will help OECS member states to better manage their coral reefs, fish and other natural resources. This project is being coordinated by the OECS ESDU. Our firm, Ecoengineering has been asked to collect information to put together a baseline on the environment, social and economic situation in this area and to identify any possible impacts that could affect the resources.

The purpose of this survey is to gather social data on divers who use the reef, which will enable us to determine how managing the protected area might have an impact on you. Are you available for an interview?

RESPONDENT INFORMATION

Name *(optional)*:_____

Gender: ☐ Male ☐ Female

Age: ☐ 18 – 25 ☐ 26 – 35 ☐ 36 – 45 ☐ 46 – 55 ☐ 56 – 65
☐ > 66 ☐ No response

Nationality: _____

What is the highest level of education received?

- ☐ Primary
- ☐ Secondary
- ☐ Technical / Vocational
- ☐ Tertiary

INFORMATION ON CURRENT USE OF THE PROTECTED AREA

1. For what purpose do you dive? *(If for leisure skip next section)*
   ☐ Leisure ☐ Commercial ☐ Other *(please specify)*_____

2. How long have you dived in this area?
   ☐ < 1 year ☐ 1- 5 years ☐ 6- 10 years
   ☐ 11-15 years ☐ 16 – 20 years ☐ > 20 years

3. How often do you go out to dive?
   ☐ once a day ☐ several times a day ☐ 1 – 3 times a week
   ☐ 4-7 times a week ☐ once a month ☐ more than once a month
   ☐ No response

4. Is the reef your primary diving ground?
   _____

5. How do you access the reef?
   ☐ Private boat ☐ Water taxi ☐ Other ☐ No response

HOUSEHOLD INFORMATION

6. Are you the main income earner in your household?

   ☐ Yes ☐ No ☐ No response

7. How many people are reliant on your income? _____

9 Do all of these persons reside in one household?

   ☐ Yes ☐ No *(please indicate no. of households)*_____ ☐ No response

Please indicate their ages:

AGE GROUP	GENDER		TOTAL
	Female	Male	
0 to 5 years			
6 to 11 years			
12 to 17 years			
18 to 29 years			
30 to 45 years			
46 to 60 years			
More than 60 years			
Total			

9. Number of adults in the family currently employed outside of the household:_____

10. Type of occupation:

Member of Household	Occupation/ Skill	Duration in Occupation	Location of Workplace

11. Number of children/young adults currently at school _____

Please indicate level:
☐ ____ Kindergarten / Pre-school
☐ ____ Primary
☐ ____ Secondary
☐ ____ Technical / Vocational
☐ ____ Tertiary

ACTIVITIES

12. What activities are you interested in other than diving?
_____

13. What activities have you noticed other people doing when you go on your dives?

☐ Snorkelling
☐ Reef Walking
☐ Swimming/Sea Bathing
☐ Anchoring
☐ Mooring
☐ Natural Impacts
☐ Collecting coral (souvenier)
☐ Glass-Bottomed Boating
☐ Water Skiing
☐ Wind Surfing
☐ Over-fishing
☐ None
☐ No Response
☐ Other (specify _____

QUALITY

14. Has the quality of the reef changed since you started diving?

☐ Yes ☐ No ☐ Don't know ☐ No response

Please describe the changes noticed:

_____
_____
_____
_____

☐ Coral Bleaching
☐ Algae
☐ decrease in water quality
☐ decrease in water clarity
☐ reef breakage
☐ None
☐ No Response
☐ Other (specify) _____

15. What activities might have contributed to these changes?

_____

MANAGEMENT

16. How do you think having a marine protected area would impact the reef?

_____

ATTITUDES AND PERCEPTIONS

Indicate degree of agreement with the following statements using the scale: agree strongly (5); agree (4); neither agree nor disagree (3); disagree (2); strongly disagree (1)

	1	2	3	4	5	NR
The reefs are important for protecting land from storm waves						
Coral reefs are only important if you fish or dive						
In the long run fishing wound be better if we cleared the coral						
Fishing should be restricted in certain areas just to allow the fish and coral to grow						
Future generations should be able to enjoy the coral reefs						
We should restrict development in some coastal areas even if no one ever fishes in those areas just to allow the fish and coral to grow						
Seagrass beds have no value to people.						

17. If the reef becomes a marine protected area (MPA) what impact do you think it would have on your livelihood?

_____
_____
_____

18. Do you think the reef should become a marine protected area?

☐Yes ☐No ☐No Response

THANK YOU FOR YOUR COOPERATION

ATTITUDE SURVEY - VENDORS

ECOENGINEERING CARIBBEAN LIMITED

STUDIES FOR OPAAL DEMONSTRATION PROJECTS

ATTITUDE SURVEY – VENDORS

Date: _____ Name of Interviewer: _____

We are working on the OECS Protected Areas and Associated Livelihoods Project which aims to collect information that will help OECS member states to better manage their coral reefs, fish and other natural resources. This project is being coordinated by the OECS ESDU. Our firm, Ecoengineering has been asked to collect information to put together a baseline on the environment, social and economic situation in this area and to identify any possible impacts that could affect the resources.

The purpose of the survey is to gather social data on vendors who operate in this area, which will enable us to determine how managing the protected area might impact on you. Are you available for an interview?

RESPONDENT INFORMATION

This questionnaire seeks information on how you think management of the protected area would affect you.

Name (optional):_____

Gender: ☐ Male ☐ Female

Age: ☐ 18 – 25 ☐ 26 – 35 ☐ 36 – 45 ☐ 46 – 55 ☐ 56 – 65
☐ > 66 ☐ No response

Address: _____

What is the highest level of education received?

- ☐ Primary
- ☐ Secondary
- ☐ Technical / Vocational
- ☐ Tertiary

Do you have any other skills?

☐No ☐Yes (*Please Specify*) _____

HOUSEHOLD INFORMATION

The next set of questions concerns your household. This is basic demographic data, the sort that is normally collected by the Central Statistical Office during a Census.

1. Are you the main income earner in your household?

   ☐ Yes ☐ No ☐ No response

2. How many people are reliant on your income? _____

3. Do all of these persons reside in one household?

   ☐ Yes ☐ No *(please indicate no. of households)*_____ ☐ No response

   Please indicate their ages:

AGE GROUP	GENDER		TOTAL
	Female	Male	
0 to 5 years			
6 to 11 years			
12 to 17 years			
18 to 29 years			
30 to 45 years			
46 to 60 years			
More than 60 years			
Total			

4. Number of adults in the family currently employed outside of the household:
   _____

5. Type of occupation:

Member of Household	Occupation/ Skill	Duration in Occupation	Location of Workplace

6. Number of children/young adults currently at school _____

Please indicate level:
☐ ____ Kindergarten / Pre-school
☐ ____ Primary
☐ ____ Secondary
☐ ____ Technical / Vocational
☐ ____ Tertiary

INFORMATION ON CURRENT USE OF PROTECTED AREA

The next set of questions seeks to identify the current use of the reef.

7. Type of product being sold
☐ T-shirts ☐ Souvenirs ☐ Craft items
☐ Other _____ ☐ No response

8. How long have you been vending in this area?
☐ less than 5 years
☐ 5 to 10 years
☐ more than 10 years but less than 20 years
☐ more than 20 years but less than 30 years
☐ more than 30 years
☐ no response

9. What is the average amount of customers daily? _____

10. What months of the year do you have the most amount of visitors to the reef?

_____
_____
_____

11. How has your business changed within the last ten years:

☐ Increased ☐ Decreased ☐ Stayed the Same ☐ More Operators
☐ Other (specify):_____

12. For what purpose do you use the reef?

_____

13. How do you access the reef?
☐ Private boat ☐ Water taxi ☐ Other (specify) _____
☐ No response

14. Are you faced with any constraints in using the protected area?

_____

ACTIVITIES

15. Please describe the activities that you know takes place at the Reef:

_____
_____
_____
_____

☐ Diving
☐ Snorkelling
☐ Reef Walking
☐ Swimming/Sea Bathing
☐ Anchoring
☐ Mooring
☐ Natural Impacts
☐ Collecting coral (souvenier)
☐ Glass-Bottomed Boating
☐ Water Skiing
☐ Wind Surfing
☐ Over-fishing
☐ None
☐ No Response
☐ Other (specify) _____

16. What activities have negatively impacted on the quality of the reef?

_____
_____
_____

17. What efforts have been made to protect this area?

_____
_____
_____

QUALITY

18. Has the quality of the reef changed?

☐ Yes ☐ No

If yes, please describe the changes noticed:

_____
_____
_____
_____

☐ Coral Bleaching
☐ Algae
☐ decrease in water quality
☐ decrease in water clarity
☐ reef breakage
☐ None
☐ No Response
☐ Other (specify) _____

MANAGEMENT

19. What measures do you recommend to protect the quality of the coral reef?

_____
_____
_____
_____

20. Do you think that making the reef into a marine protected area (MPA) would help protect the coral reefs?

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

ATTITUDES AND PERCEPTIONS

Indicate degree of agreement with the following statements using the scale: agree strongly (5); agree (4); neither agree nor disagree (3); disagree (2); strongly disagree (1)

	1	2	3	4	5	NR
The reefs are important for protecting land from storm waves						
Coral reefs are only important if you fish or dive						
In the long run fishing wound be better if we cleared the coral						
Fishing should be restricted in certain areas just to allow the fish and coral to grow						
Future generations should be able to enjoy the coral reefs						
We should restrict development in some coastal areas even if no one ever fishes in those areas just to allow the fish and coral to grow						
Seagrass beds have no value to people.						

21. Do you think the reef should become a marine protected area?

☐Yes ☐No ☐No Response

THANK YOU FOR YOUR COOPERATION

ATTITUDE SURVEY FOR TOURISTS

ECOENGINEERING CARIBBEAN LIMITED

STUDIES FOR OPAAL DEMONSTRATION PROJECTS

ATTITUDE SURVEY FOR TOURISTS

Date: _____ Name of Interviewer: _____

We are working on the OECS Protected Areas and Associated Livelihoods Project which aims to collect information that will help OECS member states to better manage their coral reefs, fish and other natural resources. This project is being coordinated by the OECS ESDU. Our firm, Ecoengineering has been asked to collect information to put together a baseline on the environment, social and economic situation in this area and to identify any possible impacts that could affect the resources.

The purpose of the survey is to gather social data on your community, which will enable us to determine how managing the protected area might impact on you. Are you available for an interview?

RESPONDENT INFORMATION

This questionnaire seeks information on how you think management of the protected area would affect tourists who visit this location.

Name:(optional)_____

Gender: ☐ Male ☐ Female

Age: ☐ 18 – 25 ☐ 26 – 35 ☐ 36 – 45 ☐ 46 – 55 ☐ 56 – 65
☐ > 66 ☐ No response

Nationality: _____

INFORMATION ON CURRENT USE OF THE PROTECTED AREA

1. Is this your first visit to this country?
☐ Yes ☐ No ☐ Don't Know ☐ No Response

If the response is yes, please skip question 2.

2. How often have you visited this particular country?
_____

3. What is the purpose of your visit?
☐ Pleasure ☐ Work
☐ Other

4. How did you hear about this place?
☐ Travel agent ☐ Friends / Family ☐ Internet ☐ Television
☐ Newspaper / Magazine ☐ Other

5. Number of people currently with you: _____

6. How many nights are you staying in the country? _____

7. Type of occupation:

Male / Female	Occupation/ Skill	Duration in Occupation

ACTIVITIES

8. What type of activities do you normally engage in when you visit this country?
_____
_____
_____

9. What activities on the reef have you noticed in the duration of your stay?
_____
_____
_____
_____

☐ Diving
☐ Snorkelling
☐ Reef Walking
☐ Swimming/Sea Bathing
☐ Anchoring
☐ Mooring
☐ Natural Impacts
☐ Collecting coral (souvenier)
☐ Glass-Bottomed Boating
☐ Water Skiing
☐ Wind Surfing

☐ Over-fishing
☐ None
☐ No Response
☐ Other (specify _____

QUALITY

10. Have you visited the reef during your visit ?

☐ Yes ☐ No
(If No, skip to next section

11. By what means did you visit the reef?

☐ Tourboat ☐ Diving ☐ Snorkeling ☐ Catamaran
☐ Other _____

12 What did you enjoy most about the reef?
_____
_____
_____

13 Has the quality of the reef changed since the last time you visited?
☐ Yes ☐No

Please describe the changes noticed:
_____
_____
_____

☐ Coral Bleaching
☐ Algae
☐ decrease in water quality
☐ decrease in water clarity
☐ reef breakage
☐ None
☐ No Response
☐ Other (specify) _____

MANAGEMENT

14. Do you think that making the reef into a marine protected area (MPA) would help protect the coral reefs?

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

15. Do you think that the development of a marine park management system will improve the quality of the coral reefs?

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

ATTITUDES AND PERCEPTIONS

Indicate degree of agreement with the following statements using the scale: agree strongly (5); agree (4); neither agree nor disagree (3); disagree (2); strongly disagree (1)

	1	2	3	4	5	NR
The reefs are important for protecting land from storm waves						
Coral reefs are only important if you fish or dive						
In the long run fishing wound be better if we cleared the coral						
Fishing should be restricted in certain areas just to allow the fish and coral to grow						
Future generations should be able to enjoy the coral reefs						
We should restrict development in some coastal areas even if no one ever fishes in those areas just to allow the fish and coral to grow						
Seagrass beds have no value to people.						

16. If the reef becomes a marine protected area (MPA) what impact do you think it would have on your vacation experience?

_____
_____
_____

17 Do you think the reef should become a marine protected area?

☐Yes ☐No ☐No Response

THANK YOU FOR YOUR COOPERATION

ATTITUDE SURVEY - TOUR BOAT OPERATORS

ECOENGINEERING CARIBBEAN LIMITED

STUDIES FOR OPAAL DEMONSTRATION PROJECTS

ATTITUDE SURVEY – TOUR BOAT OPERATORS

Date: _____ Name of Interviewer: _____

We are working on the OECS Protected Areas and Associated Livelihoods Project which aims to collect information that will help OECS member states to better manage their coral reefs, fish and other natural resources. This project is being coordinated by the OECS ESDU. Our firm, Ecoengineering has been asked to collect information to put together a baseline on the environment, social and economic situation in this area and to identify any possible impacts that could affect the resources.

The purpose of the survey is to gather social data on your community, which will enable us to determine how managing the protected area might impact on you. Are you available for an interview?

RESPONDENT INFORMATION

This questionnaire seeks information on how you think management of the protected area would affect you.

Name (optional):_____

Gender: ☐ Male ☐ Female

Age: ☐ 18 – 25 ☐ 26 – 35 ☐ 36 – 45 ☐ 46 – 55 ☐ 56 – 65
☐ > 66 ☐ No response

Address: _____

What is the highest level of education received?

- ☐ Primary
- ☐ Secondary
- ☐ Technical / Vocational
- ☐ Tertiary

Do you have any skills other than tour boat operations?

☐No ☐Yes (*Please Specify*) _____

HOUSEHOLD INFORMATION

The next set of questions concerns your household. This is basic demographic data, the sort that is normally collected by the Central Statistical Office during a Census.

1. Are you the main income earner in your household?

   ☐ Yes ☐ No ☐ No response

2. How many people are reliant on your income? _____

3. Do all of these persons reside in one household?

   ☐ Yes ☐ No *(please indicate no. of households)*_____ ☐ No response

   Please indicate their ages:

AGE GROUP	GENDER		TOTAL
	Female	Male	
0 to 5 years			
6 to 11 years			
12 to 17 years			
18 to 29 years			
30 to 45 years			
46 to 60 years			
More than 60 years			
Total			

4. Number of adults in the family currently employed outside of the household: _____

5. Type of occupation:

Member of Household	Occupation/ Skill	Duration in Occupation	Location of Workplace

6. Number of children/young adults currently at school _____

   Please indicate level:
   ☐ ____ Kindergarten / Pre-school
   ☐ ____ Primary
   ☐ ____ Secondary
   ☐ ____ Technical / Vocational
   ☐ ____ Tertiary

INFORMATION ON CURRENT USE OF PROTECTED AREA

The next set of questions seeks to identify the current use of the reef.

7. How long have you been a tour-boat operator in this area?
   - ☐ less than 5 years
   - ☐ 5 to 10 years
   - ☐ more than 10 years but less than 20 years
   - ☐ more than 20 years but less than 30 years
   - ☐ more than 30 years
   - ☐ no response

8. Do you own your own boat?
   ☐ Yes ☐ No ☐ No response

   If yes how many? _____

9. What material is your boat made of?
   ☐ Fibreglass ☐ Wood ☐ Both ☐ Other ☐ Don't know ☐No response

10. How is your boat propelled?
    ☐ Motorised ☐ Non-motorised ☐ Other ☐ No response

11. Are the boat(s) licensed?

    ☐ Yes ☐ No ☐ Don't Know ☐ No Response

12. What is the average amount of people per trip? _____

13. How many trips do you make daily?

    ☐ 1 ☐ 3 ☐ Don't Know
    ☐ 2 ☐ > 3 ☐ No Response

14. What is the length of a trip (hours)?

    ☐ 1- 1hr. 30 mins
    ☐ 1 hr. 30 mins – 2 hrs
    ☐ 2 hrs – 2hrs 30 mins
    ☐ 2 hrs 30 mns – 3 hrs
    ☐ > 3 hrs

15. What months of the year do you have the most amount of visitors to the reef?

    _____
    _____
    _____

16. What is your primary route?

_____

17. Are you faced with any constraints in using the protected area?

_____

18. What is your rate? _____

ACTIVITIES

19. Please describe the activities that you know takes place at the Reef:

_____
_____
_____
_____

☐ Diving
☐ Snorkelling
☐ Reef Walking
☐ Swimming/Sea Bathing
☐ Anchoring
☐ Mooring
☐ Natural Impacts
☐ Collecting coral (souvenier)
☐ Glass-Bottomed Boating
☐ Water Skiing
☐ Wind Surfing
☐ Over-fishing
☐ None
☐ No Response
☐ Other (specify) _____

20. What activities have negatively impacted on the quality of the reef?

_____
_____
_____

21. What efforts have been made to protect this area?

_____
_____
_____

22. How has the of reef tour business changed within the last ten years:

☐ Increased ☐ Decreased ☐ Stayed the Same ☐ More Operators
☐ Other (specify):_____

QUALITY

23. What makes this reef attractive to reef touring?

_____
_____
_____

24. Has the quality of the reef changed?

☐ Yes ☐ No

If yes, please describe the changes noticed:

_____
_____
_____
_____

☐ Coral Bleaching
☐ Algae
☐ decrease in water quality
☐ decrease in water clarity
☐ reef breakage
☐ None
☐ No Response
☐ Other (specify) _____

MANAGEMENT

25. What measures do you recommend to protect the quality of the coral reef?

_____
_____
_____
_____

26. Developing the reef into a marine protected area (MPA) would help protect the coral reefs.

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

ATTITUDES AND PERCEPTIONS

Indicate degree of agreement with the following statements using the scale: agree strongly (5); agree (4); neither agree nor disagree (3); disagree (2); strongly disagree (1)

	1	2	3	4	5	NR
The reefs are important for protecting land from storm waves						
Coral reefs are only important if you fish or dive						
In the long run fishing wound be better if we cleared the coral						
Fishing should be restricted in certain areas just to allow the fish and coral to grow						
Future generations should be able to enjoy the coral reefs						
We should restrict development in some coastal areas even if no one ever fishes in those areas just to allow the fish and coral to grow						
Seagrass beds have no value to people.						

27. Do you think the reef should become a marine protected area?

☐Yes ☐No ☐No Response

THANK YOU FOR YOUR COOPERATION

ATTITUDE SURVEY - RESIDENTS

ECOENGINEERING CARIBBEAN LIMITED

STUDIES FOR OPAAL DEMONSTRATION PROJECTS

ATTITUDE SURVEY – RESIDENTS

Date: _____ Name of Interviewer: _____

We are working on the OECS Protected Areas and Associated Livelihoods Project which aims to collect information that will help OECS member states to better manage their coral reefs, fish and other natural resources. This project is being coordinated by the OECS ESDU. Our firm, Ecoengineering has been asked to collect information to put together a baseline on the environment, social and economic situation in this area and to identify any possible impacts that could affect the resources.

The purpose of this survey is to gather social data on your community, which will enable us to determine how managing the protected area might have an impact on you. Are you available for an interview?

RESPONDENT INFORMATION

Name: _____

Gender: ☐ Male ☐ Female

Age: ☐ 18 – 25 ☐ 26 – 35 ☐ 36 – 45 ☐ 46 – 55 ☐ 56 – 65
☐ > 66 ☐ No response

Family Status: ☐ Mother ☐ Father ☐ Other (specify) _____

Address: _____

What is your highest level of education received?

- ☐ Primary
- ☐ Secondary
- ☐ Technical / Vocational
- ☐ Tertiary

HOUSEHOLD INFORMATION

The next set of questions concerns your household. This is basic demographic data, the sort that is normally collected by the Central Statistical Office during a Census.

1. How long has your family lived at this address?
   - ☐ less than 5 years
   - ☐ 5 to 10 years
   - ☐ more than 10 years but less than 20 years
   - ☐ more than 20 years but less than 30 years
   - ☐ more than 30 years
   - ☐ no response

2. No. of people in this household: _____

3. Please indicate the number of persons in your household within the following groups:

AGE GROUP	GENDER		TOTAL
	Female	Male	
0 to 5 years			
6 to 11 years			
12 to 17 years			
18 to 29 years			
30 to 45 years			
46 TO 60 years			
More than 60 years			
Total			

4. Number of adults in the family currently employed outside of the household _____

5. Type of occupation:

Member of Household	Occupation/ Skill	Duration in Occupation	Location of Workplace

6. Number of children/young adults currently at school _____

   Please indicate level:
   - ☐ ____ Kindergarten / Pre-school
   - ☐ ____ Primary
   - ☐ ____ Secondary
   - ☐ ____ Technical / Vocational
   - ☐ ____ Tertiary

INFORMATION ON CURRENT USE OF THE PROTECTED AREA

7. How often do you visit the reef?

☐ Daily ☐ monthly ☐ yearly
☐ weekly ☐ never ☐ No response

8. Do you visit the reef at a particular time of the year?
☐ No ☐ Yes , (*Please specify*) _____
☐ no response

9. How do you access the reef?
☐ Private boat ☐ Water taxi ☐ Other ☐ No response

ACTIVITIES

10. Please describe the activities that you engage in when you visit the reef:

_____
_____
_____
_____

☐ Diving
☐ Snorkelling
☐ Reef Walking
☐ Swimming/Sea Bathing
☐ Anchoring
☐ Mooring
☐ Natural Impacts
☐ Collecting coral (souvenier)
☐ Glass-Bottomed Boating
☐ Water Skiing
☐ Wind Surfing
☐ Over-fishing
☐ None
☐ No Response
☐ Other (specify _____

QUALITY

11. The Reef been an ideal location for recreation.

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

12. Has the quality of the reef changed?

☐ Yes ☐ No ☐ Don't know ☐ No response

Please describe the changes noticed:

_____
_____
_____
_____

☐ Coral Bleaching
☐ Algae
☐ decrease in water quality
☐ decrease in water clarity
☐ reef breakage
☐ None
☐ No Response
☐ Other (specify) _____

MANAGEMENT

13. Are there any activities that you think should be prohibited or controlled on the reef?
☐ Yes _____
☐ No ☐ Don't know ☐ No response

If yes, please indicate a reason for your answer:

_____
_____
_____
_____

14. How do you think having a marine protected area would impact the reef?

_____

ATTITUDES AND PERCEPTIONS

Indicate degree of agreement with the following statements using the scale: agree strongly (5); agree (4); neither agree nor disagree (3); disagree (2); strongly disagree (1)

	1	2	3	4	5	NR
The reefs are important for protecting land from storm waves						
Coral reefs are only important if you fish or dive						
In the long run fishing wound be better if we cleared the coral						
Fishing should be restricted in certain areas just to allow the fish and coral to grow						
Future generations should be able to enjoy the coral reefs						
We should restrict development in some coastal areas even if no one ever fishes in those areas just to allow the fish and coral to grow						
Seagrass beds have no value to people.						

15. If the reef becomes a marine protected area (MPA) what impact do you think it would have on your livelihood?

_____
_____
_____

16. Do you think the reef should become a marine protected area?

☐Yes ☐No ☐No Response

THANK YOU FOR YOUR COOPERATION

ATTITUDE SURVEY FOR FISHERMEN

ECOENGINEERING CARIBBAEAN LIMITED

STUDIES FOR OPAAL DEMONSTRATION PROJECTS

ATTITUDE SURVEY FOR FISHERMEN

Date: _____ Name of Interviewer: _____

We are working on the OECS Protected Areas and Associated Livelihoods Project which aims to collect information that will help OECS member states to better manage their coral reefs, fish and other natural resources. This project is being coordinated by the OECS ESDU. Our firm, Ecoengineering has been asked to collect information to put together a baseline on the environment, social and economic situation in this area and to identify any possible impacts that could affect the resources.

The purpose of this survey is to gather social data on the fishermen who live and work in the area, which will enable us to determine how managing the protected area might have an impact on you. Are you available for an interview?

RESPONDENT INFORMATION

Name: _____

Gender: ☐ Male ☐ Female

Age: ☐ 18 – 25 ☐ 26 – 35 ☐ 36 – 45 ☐ 46 – 55 ☐ 56 – 65
☐ > 66 ☐ No response

Family Status: ☐ Mother ☐ Father ☐ Other (specify) _____

Address: _____

What is the highest level of education received?

- ☐ Primary
- ☐ Secondary
- ☐ Technical / Vocational
- ☐ Tertiary

Do you have any skills other than fishing?

☐No ☐Yes (*Please Specify*) _____

HOUSEHOLD INFORMATION

1. Are you the main income earner in your household?

   ☐ Yes ☐ No ☐ No response

2. How many people are reliant on your income? _____

3. Do all of these persons reside in one household?

   ☐ Yes ☐ No *(please indicate no. of households)*_____ ☐ No response

   Please indicate their ages:

AGE GROUP	GENDER		TOTAL
	Female	Male	
0 to 5 years			
6 to 11 years			
12 to 17 years			
18 to 29 years			
30 to 45 years			
46 to 60 years			
More than 60 years			
Total			

4. Number of adults in the family currently employed outside of the household:
   _____

5. Type of occupation:

Member of Household	Occupation/ Skill	Duration in Occupation	Location of Workplace

6. Number of children/young adults currently at school _____

   Please indicate level:
   ☐ ____ Kindergarten / Pre-school
   ☐ ____ Primary
   ☐ ____ Secondary
   ☐ ____ Technical / Vocational
   ☐ ____ Tertiary

INFORMATION ON CURRENT USE OF THE PROTECTED AREA

7. How long have you fished in this area?
☐ < 1 year ☐ 1- 5 years ☐ 6- 10 years
☐ 11-15 years ☐ 16 – 20 years ☐ > 20 years

8. How often do you go out to fish?
☐ Every morning ☐ many times a day ☐ once a month
☐ Every evening ☐ once a week ☐ many times a month
☐ once a day ☐ many times a week ☐ No response

9. What is the location of your primary fishing ground?

☐ Yes ☐ No ☐ Don't know ☐ No response

10. Do you own your own boat?
☐Yes ☐No ☐No response

If yes how many boats do you own? _____

11. What material is your boat made of?
☐ Fibreglass ☐ Wood ☐ Both ☐ Don't know ☐No response

12. How is your boat propelled?
☐ Motorised ☐ Non-motorised ☐ Other *(specify)* _____
☐ No response

13. Are the boat(s) licensed?

☐ Yes ☐ No ☐ Don't Know ☐ No Response

14. Is your fishing seasonal?
☐No ☐Yes (Please specify the particular months)
_____
_____

15. What type of fish do you catch?
_____

16. What is your average catch size per week?
_____

17. Do you use a particular fishing method?

☐ Yes *(please specify):* _____
☐ No ☐ Don't Know ☐ No Response

ACTIVITIES

18. Do you use the reef for any activity other than fishing?
☐ Yes *(please specify):* _____

19. How do you think fishing has impacted on the reef over the period that you have been fishing in this area?

_____
_____
_____

20. Please describe the activities that you know take place at the Reef:

☐ Diving
☐ Snorkelling
☐ Reef Walking
☐ Swimming/Sea Bathing
☐ Anchoring
☐ Mooring
☐ Natural Impacts
☐ Collecting coral (souvenier)
☐ Glass-Bottomed Boating
☐ Water Skiing
☐ Wind Surfing
☐ Over-fishing
☐ None
☐ No Response
☐ Other (specify _____

21. Can you identify any activities that may have a negative impact on the reef?

_____
_____
_____

QUALITY

22. Has your catch size:

☐ Increased ☐ Decreased ☐ Remained the same

since you started fishing?

23. Has the quality of the reef changed since you started fishing?

☐ Yes ☐ No ☐ Don't know ☐ No response

Please describe the changes noticed:

☐ Decrease in fish
☐ Fish Nurseries
☐ Coral Bleaching
☐ Algae
☐ decrease in water quality
☐ decrease in water clarity
☐ reef breakage
☐ None
☐ No Response
☐ Other (specify) _____

MANAGEMENT

24. What measures do you recommend to protect the reef or improve the quality of the reef?
_____
_____
_____
_____

25. How do you think having a marine protected area would impact the reef?
_____
_____
_____

ATTITUDES AND PERCEPTIONS

26. Indicate degree of agreement with the following statements using the scale: agree strongly (5); agree (4); neither agree nor disagree (3); disagree (2); strongly disagree (1)

	1	2	3	4	5	NR
The reefs are important for protecting land from storm waves						
Coral reefs are only important if you fish or dive						
In the long run fishing wound be better if we cleared the coral						
Fishing should be restricted in certain areas just to allow the fish and coral to grow						
Future generations should be able to enjoy the coral reefs						
We should restrict development in some coastal areas even if no one ever fishes in those areas just to allow the fish and coral to grow						
Seagrass beds have no value to people.						

27. If the reef becomes a managed protected area (MPA) what impact do you think it would have on your livelihood?

_____
_____
_____

28. Do you think the reef should become a managed protected area?

☐Yes ☐No ☐No Response

THANK YOU FOR YOUR COOPERATION

ATTITUDE SURVEY - (Yachties)

ECOENGINEERING CONSULTANTS LIMITED

STUDIES FOR OPAAL DEMONSTRATION PROJECTS

ATTITUDE SURVEY-(Yachties)

Date: _____ Name of Interviewer: _____

We are working on the OECS Protected Areas and Associated Livelihoods Project which aims to collect information that will help OECS member states to better manage their coral reefs, fish and other natural resources. This project is being coordinated by the OECS ESDU. Our firm, Ecoengineering has been asked to collect information to put together a baseline on the environment, social and economic situation in this area and to identify any possible impacts that could affect the resources.

The purpose of this survey is to gather social data about the yachters who use this area, which will enable us to determine how managing the protected area might have an impact on you. Are you available for an interview?

RESPONDENT INFORMATION

Name *(optional)*:_____

Gender: ☐ Male ☐ Female

Age: ☐ 18 – 25 ☐ 26 – 35 ☐ 36 – 45 ☐ 46 – 55 ☐ 56 – 65
☐ > 66 ☐ No response

Nationality: _____

INFORMATION ON CURRENT USE OF THE PROTECTED AREA

1. How many nights are you spending in this country? _____

2. How often do you visit this area?
☐ Weekly ☐ Monthly ☐ Yearly ☐ Other _____

3. How many persons traveled on your yacht on this trip? _____

4. Is this your first visit to this country?
☐ Yes ☐ No ☐ Don't Know ☐ No Response

If the response is yes, please skip question 2.

5. How often have you visited this country?

_____

6. How did you hear about this place?
☐ Travel agent ☐ Friends / Family ☐ Internet ☐ Television
☐ Newspaper / Magazine ☐ Other

ACTIVITIES

7. What activities do you engage in while in this country?
☐ beaches ☐ diving ☐ fishing ☐ snorkeling
☐ other *(please specify)* _____

8. How often have you visited the reef on this trip? _____

9. How did you access the reef?

☐ Private boat ☐ Water taxi ☐ Diving ☐ Snorkeling
☐ Catamaran ☐ No response ☐ Other (specify) _____

10. What activities have you engaged in at the reef?

☐ Diving
☐ Snorkelling
☐ Reef Walking
☐ Swimming/Sea Bathing
☐ Anchoring
☐ Mooring
☐ Natural Impacts
☐ Collecting coral (souvenir)
☐ Glass-Bottomed Boating
☐ Water Skiing
☐ Wind Surfing
☐ Over-fishing
☐ None
☐ No Response
☐ Other (specify) _____

QUALITY

11. Has the quality of the reef changed since the last time you visited? (*If this is the first visit, skip this question*)

☐ Yes ☐ No ☐ Don't know ☐ No response

Please describe the changes noticed:

☐ Coral Bleaching
☐ Algae
☐ decrease in water quality
☐ decrease in water clarity
☐ reef breakage
☐ None
☐ No Response
☐ Other (specify) _____

MANAGEMENT

12. Do you think that making the reef into a marine protected area (MPA) would help protect the coral reefs?

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

ATTITUDES AND PERCEPTIONS

Indicate degree of agreement with the following statements using the scale: agree strongly (5); agree (4); neither agree nor disagree (3); disagree (2); strongly disagree (1)

	1	2	3	4	5	NR
The reefs are important for protecting land from storm waves						
Coral reefs are only important if you fish or dive						
In the long run fishing wound be better if we cleared the coral						
Fishing should be restricted in certain areas just to allow the fish and coral to grow						
Future generations should be able to enjoy the coral reefs						
We should restrict development in some coastal areas even if no one ever fishes in those areas just to allow the fish and coral to grow						
Seagrass beds have no value to people.						

13. If the reef becomes a marine protected area (MPA) what impact do you think it would have on you, if any?

_____
_____
_____

14. Do you think the reef should become a marine protected area?

☐Yes ☐No ☐No Response

THANK YOU FOR YOUR COOPERATION

APPENDIX B

CLASSIFICATION OF IMPACTS

APPENDIX B

CLASSIFICATION OF ENVIRONMENTAL IMPACTS

B.1 OBJECTIVE AND APPLICATION

B.1.1 Objective

This system provides a structured method of post-mitigation classification of the environmental impacts related to the establishment of the Tobago Cays Marine Park. The objective is to have a unified classification structure which can then be used to determine the significance of environmental impacts of the proposed project.

B.1.2 Application

While it is recognized that beneficial environmental impacts can also arise from this development, this classification system will be used only to rate adverse environmental impacts. In addition, this system rates impacts both before the application of mitigation measures and after available and realistic mitigation measures have been applied to minimize adverse impacts.

B.2 PARAMETERS

In this system, environmental impacts are rated on the basis of three parameters:

- Extent,
- Intensity, and
- Nature.

B.2.1 Extent

"Extent" describes the geographical area likely to be impacted by the project. In this classification system, four classes of extent (see Figure B-1) have been defined:

On-Site	Within the boundaries of the TCMP.
Localized	Including the islands of Mayreau and Union
National	The country of St. Vincent and the Grenadines

B.2.2 Intensity

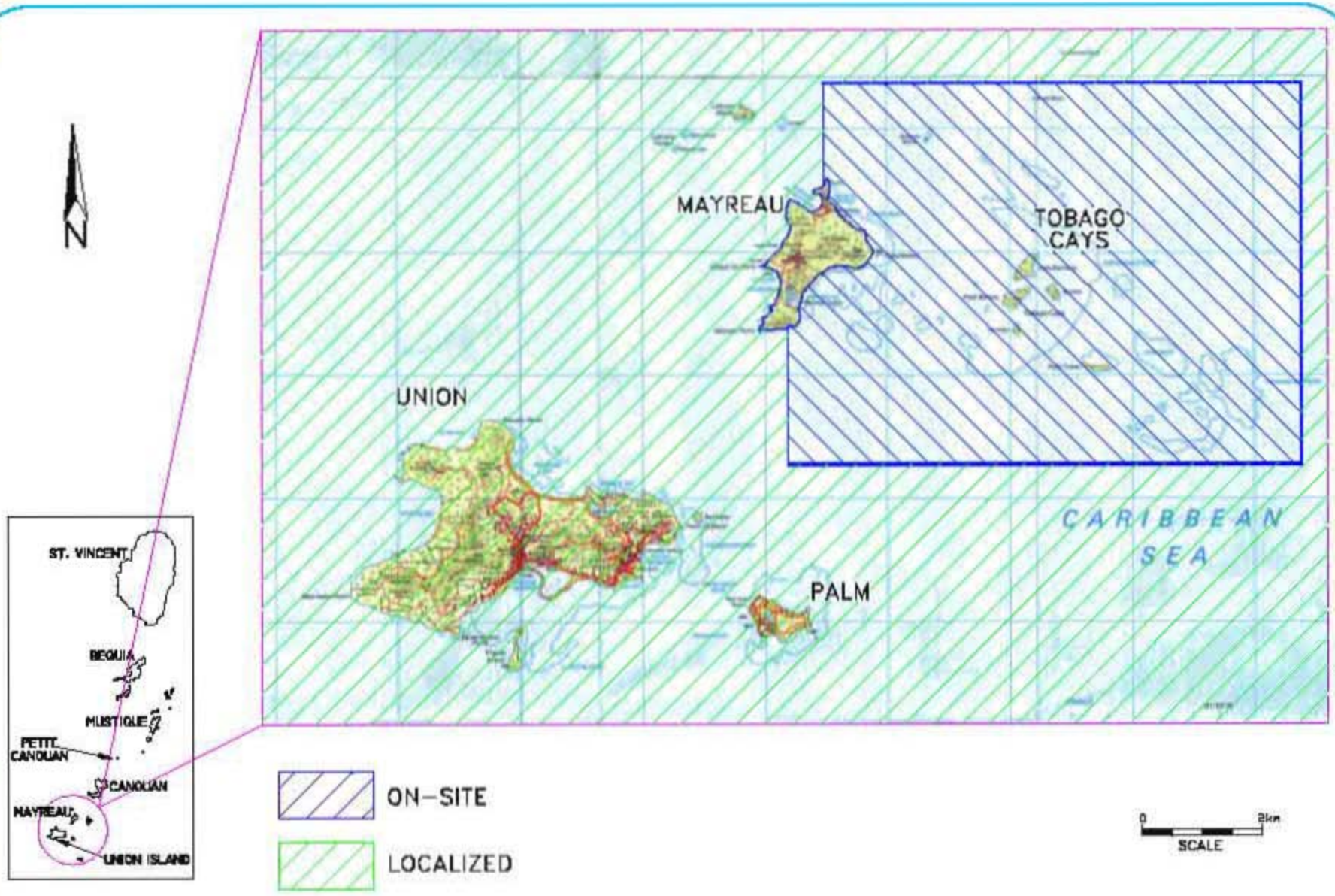
"Intensity" describes the degree of change which may result from the potential impact. In this classification system, intensity has been based on ecosystem effects and the effects to social groups, and four classes have been defined:

Very Small	Effects on a few persons or individual organisms, but no significant effects on the functioning or sustainability of social groups, specific ecosystems or services.
Minor	Marked effects on several individuals, and limited effects on the functioning or sustainability of social groups, specific ecosystems or services.
Medium	Significant effects on the functioning or sustainability of social groups, specific ecosystems or services.
Major	Serious impairment of the functioning or sustainability of social groups, specific ecosystems, or services.

B.2.3 Nature

"Nature" considers the whether the potential impact is expected to be reversible or irreversible. In this classification system, these have been defined as:

Reversible	Impacts which can be reduced or modified.
Irreversible	Impacts which are considered to be unavoidable and cannot be reduced or modified.



Ecoengineering Caribbean Ltd.	Eco Report No. 06/2007	CLIENT: OECS -ENVIRONMENT AND SUSTAINABLE DEVELOPMENT UNIT
	Date: 31/07/07	PROJECT: TOBAGO CAYS SITE REPORT ST. VINCENT AND THE GRENADINES
		DWG. NAME: CLASSES OF EXTENT
		FIGURE NUMBER B-1

B.3 CLASSIFICATION OF IMPACTS

Tables B-1and B-2 indicate the classification of impacts on a scale of "Low", "Moderate", "High" and "Extreme", based on extent, intensity and nature. However, the following are rated as "Extreme" regardless of extent, intensity or nature:

- impacts which exceed the limits set in environmental standards or rules,
- impacts which violate St. Vincent and the Grenadines international commitments, and
- impacts which affect environmentally sensitive areas or species.

TABLE B-1: CLASSIFICATION OF REVERSIBLE IMPACTS

INTENSITY	AREA		
	On-Site	Localized	National
Very Small	LOW	LOW	MODERATE
Minor	LOW	LOW	MODERATE
Medium	LOW	MODERATE	MODERATE
Major	MODERATE	MODERATE	HIGH

TABLE B-2: CLASSIFICATION OF IRREVERSIBLE IMPACTS

INTENSITY	AREA		
	On-Site	Localized	National
Very Small	LOW	MODERATE	MODERATE
Minor	MODERATE	MODERATE	HIGH
Medium	MODERATE	HIGH	EXTREME
Major	HIGH	HIGH	EXTREME

Environmental Impacts are evaluated following the implementation of appropriate mitigation and control practices. Assigning a consequence severity and likelihood to each event qualitatively rates the risk of each environmental impact. The risk level is determined by the position on the risk matrix where the event falls. An appropriate response and prioritization to each environmental risk has been developed:

- Extreme: Intolerable environmental risk with significant and urgent actions required to reduce risk.
- High and Moderate: Implement actions necessary to reduce risk to as low a level as reasonably practical.
- Low: Monitor and manage risk to the extent necessary.

APPENDIX C

SPECIES LISTS AND NOTES OF AQUATIC FLORA AND FAUNA

APPENDIX C:

SPECIES LISTS AND NOTES OF AQUATIC FAUNA AND FLORA

This appendix contains the following:

- Lists of fish fauna noted in the TCMP,
- List of coral noted in the TCMP,
- List of other fauna noted in the TCMP,
- List of aquatic flora noted in the TCMP, and
- Notes on fish fauna in the TCMP (Annex).

The fauna are separated into the following headings:

- Fish,
- Corals, and
- Other fauna

The flora is separated into the following headings:

- Seagrass, and
- Algae, and

C.1 Aquatic Fauna

C.1.1 Fish

A total of 6 roving diver surveys were conducted for this study and a total of 45 species were noted. Table C-1 below lists the fish fauna within the Tobago Cays. The species notes to these species are present in the annex to this appendix.

TABLE C-1: LIST OF FISH FAUNA IN TCMP (ECOENGINEERING 2007)

FISH SPECIES	SCIENTIFIC NAME	SITES				
		1	2	3	4	5
American White spotted Filefish	*Cantherhines macrocerus*		X			
Banded Butterflyfish	*Chaetodon striatus*	X			X	
Bar jack	*Caranx ruber*	X	X	X		X
Bicolor damsel	*Stegastes partitus*	X	X	X	X	X
Blue Chromis	*Chromis cyanea*	X	X			X
Blue Tang Surgeonfish	*Acanthurus coeruleus*	X	X	X	X	X
Blueheaded Wrasse	*Thalassoma bifasciatum*	X	X	X	X	X
Caribbean Sharpnose Puffer	*Canthigaster rostrata*	X				X
Cleaning Goby	*Gobiosoma genie*	X		X		X
Clown Wrasse	*Halichoeres maculipinna*		X	X	X	
Doctorfish	*Acanthurus chirurgus*	X		X		
Fairy Basslet	*Gramma loreto*	X	X	X		X
Foureye Butterflyfish	*Chaetodon capistratus*	X	X	X	X	X
French Grunt	*Haemulon flavolineatum*	X	X	X		X
Goldspot Goby	*Gnatholepis thompsoni*	X	X	X	X	X
Great Barracuda	*Sphyraena barracuda*			X		X
Green Moray	*Gymnothorax funebris*		X			
Grey Angelfish	*Pomacanthus arcuatus*	X	X			
Harlequin bass	*Serranus tigrinus*		X	X		X
Lane Snapper	*Lutjanus synagris*	X	X	X	X	X
Long spine Squirrelfish	*Longspine squirrelfish*	X	X	X		X
Nassau Grouper	*Epinephelus striatus*		X			
Ocean Surgeon	*Acanthurus bahianus*	X	X	X		X
Porkfish	*Anisotremus virginicus*	X	X			X
Princess Parrotfish	*Scarus taeniopterus*	X	X	X		X
Queen Parrotfish	*Scarus vetula*	X	X	X		X
Redband Parrotfish	*Sparisoma aurofrenatum*	X	X	X		X
Rock Beauty	*Holacanthus tricolor*					X
Schoolmaster Snapper	*Lutjanus apodus*					X
Sergeant Major	*Abudefduf saxatilis*					X

FISH SPECIES	SCIENTIFIC NAME	SITES				
		1	2	3	4	5
Slippery Dick	*Halichoeres bivittatus*	X	X			
Small mouth Grunt	*Haemulon chrysargyreum*	X	X	X	X	
Smooth Trunkfish	*Lactophrys triqueter*			X	X	
Spotfin Porcupinefish	*Diodon hystrix*	X	X	X	X	
Spotted Goatfish	*Pseudupeneus maculatus*	X	X			X
Squirrelfish	*Holocentrus adscensionis*	X	X	X		X
Stoplight Parrotfish	*Sparisoma viride*	X	X	X	X	X
Striped Parrotfish	*Scarus iseri*				X	
Threespot damsel	*Stegastes planifrons*	X	X	X		X
Trumpetfish	*Aulostomus maculatus*	X				X
Yellow Goatfish	*Mulloidichthys martinicus*	X	X	X		X
Yellow tail Damsel	*Microspathodon chrysurus*	X	X	X	X	X
Yellow tail Hamlet	*Hypoplectrus chlorurus*		X	X	X	

1. Horseshoe Reef
2. Petit Bateau
3. Petit Tabac
4. Baradal
5. Mayreau Gardens

C.1.2 Corals

A total of 6 roving diver surveys were conducted for this study and a total of 22 species were noted. Table C-2 below lists the corals within the Tobago Cays.

TABLE C-2: LIST OF CORALS IN TCMP (ECOENGINEERING 2007)

COMMON NAME	SCIENTIFIC NAME	SPECIES NOTES
Staghorn Coral	*Acropora cervicornis*	Colonies form antler-like racks of cylindrical branches. Most common on reefs, preferring shallow to intermediate depths between 10-60 ft in clear, calm water.
Elkhorn coral	*Acropora palmata*	Colonies form flattened branches resembling the horns of moose or elk. Surface covered with small, protruding, tubular corallites. They prefer shallow areas of constant water movement. Branches usually orient

COMMON NAME	SCIENTIFIC NAME	SPECIES NOTES
		parallel to surge direction.
Fused Staghorn	*Acropora prolifera*	Colonies similar to *A. cericonis*, however toward the tips of large branches, a spray of shorter branches fuse forming flattened ends. They prefer areas of surge, on for reefs.
Finger Coral	*Porites porites*	Colonies of this genus form smooth branches, with embedded corallites. *P. porites* has stout, irregular, stubby branches with blunt and often enlarged tips. *P. divaricata* has finger-like, widely spaced branches that often divide near the tip. *P. furcata* has finger-like, tightly compacted branches. All three forms are common to most reef environments and depths. Brittlestars, sea urchins and chitons often live among tightly compacted braches.
Thin Finger Coral	*Porites divaricata*	
Branched Finger coral	*Porites furcata*	
Yellow Pencil coral	*Madracis mirablis*	Colonies form densely packed clumps of small pencil-sized branches with blunt tips. Common to the Caribbean and generally inhabit deeper, clear water, outer reefs.
Lamarck's Sheet Coral	*Agaricia lamarcki*	A common Caribbean species, this coral inhabits sloping reef faces and walls. It is one of the most abundant coral on deep reefs and walls. Colonies form large, thin sheets or flattened plates that often overlap. Colonies' undersides have no polyps and are quite smooth.

COMMON NAME	SCIENTIFIC NAME	SPECIES NOTES
Star coral	*Madracis pharensis*	Thinly encrusting oral, spreading in long ribbons or may form numerous small knobs. This coral grows in dark areas and most common in water deeper than 60ft.
Ten-ray Star coral	*Madracis decactis*	Usually thinly encrusting forming small colonies with tightly bunched lobes and knobs. Inhabit most reef environments and form irregular encrustations in shaded, protected areas of the reef.
Boulder Star Coral	*Montastrea annularis*	A very common and often predominant coral species to reef environments and the Caribbean. Surface densely covered with small, protruding corallites. Colours range from green to brown to yellow-brown to gray.
Boulder Brain coral	*Colpophyllia natans*	Generally inhabiting reef tops and seaward reef slopes. Colonies generally form runded domes, but also encrust constructing large rounded plates. The surface is covered with convoluted system of ridges and va lleys.
Starlet Coral	*Siderastrea siderea*	Both species are common to the Caribbean and inhabit reef environments. *S. siderea* tends to inhabit shallow to moderate reefs, generally in protected areas of shallow reefs and all deep reef environments. Coral heads tend to form rounded boulders or domes, generally symmetrically round and pitted corallites. *S. radians* usually form flat
Lesser Starlet Coral	*Siderastrea radians*	

COMMON NAME	SCIENTIFIC NAME	SPECIES NOTES
		colonies, encrusting plates, and occasionally grow in small irregular and rounded domes. They usually inhibit areas shallower than *S. siderea*, in shallow reefs and back reefs.
Grooved Brain Coral	*Diploria labrinthiformis*	Colonies form hemispherical heads with deep, narrow, polyp bearing valleys. Valleys are highly convoluted and often interconnected. These inhabit seaward slope of reefs, most common between 15-50 ft.
Symmetrical Brain Coral	*Diploria strigosa*	An abundant reef coral, they inhabit many marine environments. Most commonly between 20-40 ft. Colonies form contoured plated with long valleys, often connected and convoluted. Green to brown, yellow-brown and bluish gray with valleys often brighter or of contrasting colour.
Rose Coral	*Manicina areolata*	Common to coral reefs with colonies that grow in two patterns. The more common elliptical colonies and the less common hemispherical heads. Both patterns exhibit different habitats and behaviours.
Golfball Coral	*Favia fragum*	A common coral, which inhabits shallow reefs and rocky substrates. They usually form hemispherical domes and occasionally encrusting. Easily distinguished from similar Elliptical and start corals by colonies' smaller size and less protrusion of corallites.

COMMON NAME	SCIENTIFIC NAME	SPECIES NOTES
Blade Fire Coral	*Millepora complanata*	Colonies form thin, upright blades or plates that extend from an encrusting base. M. *complanata* inhabits shallow water reef tops, usually in areas with some water movement and most common in areas with constant surge.
Branching Fire Coral	*Millepora alcicornis*	This hydrocoral forms colonies of multiple branching structures, often encrusting and overgrow gorgonian colonies and taking their shape. They inhabit all marine environments and common in depths greater than 30 ft.
Bipinnate Sea Plume	*Pseudopterogorgia biplinnata*	Colonies generally inhabit moderate to deep, clear water patch reefs. Branches most commonly purple to violet occasionally bright yellow to whitish.
Common Sea Fan	*Gorgonia ventalina*	Common in the Caribbean, this species prefers clear water with some movement. Inhabits the seaward side of shallow slopes and patch reefs. Colonies form large fans that grow in single planes. Fans are composed of meshed interconnected network of branches that are round or slightly flattened on the outer surface.

C.1.3 Other Fauna

SPONGES

Branching Tube Sponge (*Pseudoceratina crassa*)
Yellow tube sponge (*Aplysina fistularis)*
Brown tube sponge (*Agelas conifera)*
Brown clustered tube sponge (*Agelas wiedenmyeri*)
Pink Vase Sponge (*Niphates digitalis)*
Loggerhead sponge (*Spheciospongia verparium*)

TUBE WORMS

Christmas Tree Worm (*Spirobanchus giganteus*)
Red-Spotted Horseshoe Worm (*Protula sp.*)

CRUSTACEANS

Scarlet-striped Cleaning Shrimp (*Lysmata grabhami*)
Caribbean Spiny lobster (*Panulirus argus*)

MOLLUSCS

Queen Conch (*Strombus gigas*)
Flamingo tongue (*Cyphoma gibbosum*)
Caribbean Reef Squid (*Sepioteuthis sepiodea*)

ECHINODERMS

Cushion Sea Star (*Oreaster reticulates*)
Long-spine (*Diadema antillarum*)
Slate-pencil Urchin (*Eucidaris tribuloides*)
West Indian Sea Egg (*Tripneustes ventricosus*)

C.2 Flora

C.2.1 Seagrass

Turtle Grass (*Thalassia testudinum)*: A very abundant sea grass to sandy bottoms and areas of mixed sand and coral rubble. The leaves are generally erect, flat, ribbon-shaped and green with rounded tips. Leaves are usually covered with sediment and encrusting organisms.

Manatee Grass (*Syringodium filiforme*): Manatee grass shares the same habitat as Turtle grass, and is generally found mixed in with the latter. Leaves are erect, thin, stem-like, green and cylindrical.

C.2.2 Algae

Sargassum Algae (*Sargassum sp*): *Sargassum* is a very common reef alga. They attach to substrate and grow in a bushy, upright form. Leaves are long, oval shaped blades and vary from smooth to striated edged. Along the stems are spherical gas filled floats.

Leafy flat blade alga (*Stypopodium zonale*): A bushy brown alga with trap-like blades that have distinctive points along their edges. They grow in most reef environments, attaching to rocky substrates, often in areas exposed to surge.

Y branched alga (*Dictyota sp*): Another alga abundant within the Caribbean, growing in most reef environments. This species grows on rocky substrates, often covering boulders around the base of coral heads and vertical rock faces. They are easily recognised by the fork near their ends. Generally they form mats of dense to loose packed flat leaves that overgrow the substrate.

White Scroll Alga (*Padina jamaicensis*): abundant brown algae that forms large, dense clumps of leafy blades with rounded and often semicircular outer margins. They attach to rocky substrates in most marine environments, especially in shallow reef flats.

Watercress Alga (*Halimeda sp.*): These Green Algae grows in this, profusely branched clumps of rounded, three-lobed or ribbed leaf-like segments. They grow in shallow depressions, cracks and crevices between hard corals. The calcified leaves of this and other species of *Halimeda* are considered major contributors of calcium carbonate to the reefs and sand.

APPENDIX D

SPECIES LISTS AND NOTES OF TERRESTRIAL FLORA AND FAUNA

APPENDIX D:

SPECIES LISTS AND NOTES OF TERRESTRIAL FLORA AND FAUNA

SCIENTIFIC NAME	COMMON NAME (IF AVAILABLE)	SPECIES NOTES
Cnidoscolus urens	Devil Nettle, Spurge Nettle	A stinging herb of tropical America.
Accacia macracanthoides		This species exists as a small tree attaining a height of up to 10m. It is found in successional fields on the edge of roads, thorn-scrub forests, dry forests, savannas, dry deciduous forests from sea level to 1700 m.
Coccoloba uvifera	Sea Grape	A shrubby plant growing on the sandy shores, somewhat resembling the grapevine
Hippomane mancinella L.		Occasional evergreen canopy or subcanopy tree (10-20 m) and an integral component of the vegetation that fringes the sandy coastline. This species is at the same time a dangerous one, due to the large quantities of caustic sap contained in its leaves, twigs, bark, and fruit.
Sesuvium sp.	Sea Purslane	Sesuvium is a succulent perennial herb that has a prostrate and sprawling growth habit. It is a pioneer, sand-colonising plant that grows on the upper beach and seaward slope of the frontal dune or beach ridge. It is very salt tolerant but cannot withstand excessive sand blast and cannot survive complete burial under wind-blown sand.
Cactus broadwayi syn. Melocactus broadwayi		Solitary, round to conical body, up to 8 inches tall (20 cm), up to 8 inches in diameter (20 cm). Blooming Habits: Bright pink flowers followed by pear shaped red fruit.

SCIENTIFIC NAME	COMMON NAME (IF AVAILABLE)	SPECIES NOTES
Randia aculeata	White Indigo Berry	This 6- to 10-foot-tall, evergreen shrub has small, spiny, leathery leaves that are clustered toward the tips of the branches. These leaves and the stiff branching habit of this plant give it a sort of geometric look. The small, white, axillary flowers produced by this plant are fragrant and occur throughout the year. The White Indigo berry also has showy white fruits that give this plant a certain appeal.
Tabebuia pallida / syn. Tabebuia heterophylla	Cuban Pink Trumpet Tree / White Cedar	This is a small- to medium-size, mostly deciduous tree with showy pink flowers. It grows on any soil type and will adapt to poor or degraded soils if moisture is available.
Pisonia fragrans		The tree can attain heights of 10m. It has a dark grey, smooth to slightly rough bark with numerous small lenticels.
Pithecellobium unguis-cati (L.)	Catclaw Blackbead / Bread-and-Cheese	The plant usually has multiple stems arising at or below ground level. The stems and branches are gray and nearly smooth with lenticels and rings at the nodes. The species prefers well-drained soils, but all soil textures appear to be tolerated. With few exceptions, it grows in areas receiving less than 1000 mm of annual precipitation. Because of reduced competition from trees, the species tends to grow on sand dunes, coastal strands and keys, and on shallow rocky soils, sometimes forming thickets. Bread-and-cheese appears to tolerate salt spray and salty groundwater.
Lantana involucrata L.	Wild Sage / Button Sage / Common Sage, / Sea Sage / White Sage /	Wild sage is a shrub commonly 1 to 2 m in height with showy flowers. Wild sage grows on most well-drained soil types.
Ficus laevigata		*Ficus laevigata* is a tree, recorded as reaching a maximum height of 20 meters, but it is usually smaller and sometimes shrub-like. It has smooth bark, soft, weak wood which is not durable.

SCIENTIFIC NAME	COMMON NAME (IF AVAILABLE)	SPECIES NOTES
Cephalocereus nobilus	Royen's Tree Cactus	This cactus can attain great heights of up to 20 feet.
Diospyros inconstans Jacq.		Diospyros is a deciduous tree attaining heights of 10 ft. Recorded officially in Trinidad, northern S. America, and only Tobago Cays and Bequia within the Lesser Antilles.
Rauwolfia lamarckii		This tree, reaches a maximum height of about 20 meters, usually much lower, sometimes shrubby, with smooth foliage, and slender twigs. This species occurs in coastal thickets.
Paspalum arundinaceum		This grass is a perennial which can be 75–150 cm long.
Casearia decandra	Wild Cherry	It is a shrub or small tree usually 2 to 6 m in height and 2 to 8 cm in diameter at breast height. Wild cherry is supported by a strong taproot, somewhat finer lateral roots, and abundant near-surface fine roots.
Panicum maximum	Guinea Grass	This grass is a variable perennial and is commonly seen on waste lands and is propagated by seeds and tillers.
Rhizophora mangle	Red Mangrove	This species can reach heights of 80' ft under favourable conditions, but is often little more than a shrub. Locally it is one of the most important of the species constituting mangrove swamps, occurring where the salinity of seawater is diluted by freshwater at river mouths. It tends to occupy the seaward side of swamps.
Bourreria succulenta	Strongbark	This species is a slow-growing, drought-tolerant tree with a shrubby, cascading, growth habit. It typically reaches a height of approximately 20 feet when fully mature and naturally occurs in pinelands and coastal hardwood hammocks in South Florida, the Keys and islands of the Caribbean.
Caesalpinia bonduc	Gray Nicker	Gray nicker is a native vine of Florida's central and southern coastal dunes. It blooms summer through fall.
Agave caribaeicola		There are several hundreds species of Agave. Agaves are succulent rosettes, often clumping, occasionally on short trunks. They generally have a sharp spine at the end of their leaves.

SCIENTIFIC NAME	COMMON NAME (IF AVAILABLE)	SPECIES NOTES
Croton flavens	Yellow Balsam, Rock Sage, Seaside Sage	*Croton flavens* is native to the Greater and Lesser Antilles and Venezuela, where it grows in dry, rocky coastal areas. It is a shrub, 3 to 5 feet tall, with golden-brown stems, attractive leaves, and a pleasant aroma. The sap is a clear golden color and is used directly on sores and minor injuries. It is also used on a spoonful of sugar for coughs and colds.
Cocos nucifera	Coconut	Coconut), though not indigenous is, economically a very important palm. Coconut originated in South America on the Pacific side and is now widely distributed in the tropical world.

LIST OF AVIFAUNA SPECIES

SCIENTIFIC NAME	COMMON NAME (IF AVAILABLE)	SPECIES NOTES
Zenaida aurita	Zenaida Dove	This robust dove has reddish-brown upperparts with pink or cinnamon around the head, neck, and upper breast. The species may be seen feeding in open areas on the ground, and when flushed, its white-tipped outer tail feathers are conspicuous. The species occurs on most of the island in the eastern Caribbean, though absent from St. Vincent (except as a casual visitor from the neighbouring Grenadines).
Columba squamosa	Red-necked Pigeon	The red-necked pigeon is a dark slate-grey bird. This species, though generally uncommon, is a widespread resident in woodlands on the Virgin Islands and most of the Lesser Antilles. It nests mainly in trees and feeds on fruits and seeds of a wide variety of trees.
Larus spp.	Sea Gulls	Gulls inhabit coastal waters. They have broad wings, square or rounded tails and rather thick, hooked bills. Gulls are more or less omnivorous and are apt to prefer temperate climates.

SCIENTIFIC NAME	COMMON NAME (IF AVAILABLE)	SPECIES NOTES
Fregata spp.	Frigate bird	This species is common in coastal waters. It is a large bird which is usually silent in flight. They feed on fish caught near the surface. Frigate birds commonly attack other seabirds, including boobies, gulls and terns, and force them to disgorge their meals. In harbours frigate birds are scavengers, feeding on offal and refuse of all kinds.
Pelecanus occdentalis	Brown Pelican	This large bird is seen nesting during February to July but may also nest sporadically for the rest of the year. Plunges for food at the surface and will filter the contents of its bill for its food.
Sula leucogaster	Brown Booby	The chocolate brown bird is the most common booby. It can be observed solitary or in small groups in the open sea. They are able to plunge powerfully after fish and can disappear below the surface for several seconds.
Phaeton aethereus	Red Billed Tropic Bird	Tropic birds except in the nesting season are found far out to sea. They are distinguishable from other gull-like bird by the very long, quill-like central tail feathers. Their flight is rapid and direct. They feed on fish and squid which they catch by diving.
Sterna antillarum	Bridled Tern	These birds are coastal, occasionally seen singly or in small groups offshore and in the open sea. Their flight is slow and buoyant and eats fish and squids. Terns differ from gulls by having narrow, pointed wings, forked tails and rather pointed bills. They inhabit coastal regions.
Sterna fuscata	Sooty Tern	
Sterna hirundo	Common Tern	

LIST OF FAUNAL SPECIES

SCIENTIFIC NAME	COMMON NAME (IF AVAILABLE)	SPECIES NOTES
Iguana iguana	Iguana	Iguanas live in the neotropical desert, usually at lower altitudes near a water source (lake, river). They spend most of their time in the higher forest canopy, about 15 meters above the ground. Iguanas mainly like to stay up in the tree tops, away from predators. They also can move very quickly on land and are excellent swimmers. Iguanas as a whole are regarded as omnivores, but usually tend to consume plants, mainly leaves and fruits. Sometimes iguanas (especially younger ones) will eat eggs, insects and other smaller vertebrates.
Eretmochelys imbricata	Hawksbill Turtle	The Hawksbill may be the most tropical of all marine turtles although they occasionally go into colder waters. Hawksbills can climb over reefs, rocks and rubble to nest among the roots of vegetation on beaches that would be inaccessible to larger, less agile sea turtles.
Demochelys coriaces	Leatherback turtle	This turtle is in a family of its own and therefore does not belong to the same family as the other species. This turtle is the most specialized and unique of all sea turtles. It is the largest, reaching a length of 7 ft and weighing up to one ton (1000 kg) with flippers up to 4 feet long. They travel the furthest and are undoubtedly the greatest migrants, traversing thousands of km over the open oceans and fast currents. They nest in tropical waters and yet forage also in cold northern seas.
Chelonia mydas	Green Turtle	The Green Turtle is the largest hard-shelled sea turtle. Adults of this species commonly reach 100 cm in carapace length and 150 kg in mass. Greens occupy three habitat types: high energy oceanic beaches; convergence zones in pelagic habitat; and benthic feeding grounds in relatively shallow, protected waters. Foraging habitats are commonly pastures of seagrasses and/or algae.

APPENDIX E

MONITORING AND EVALUATING SCORECARD

The WWF-World Bank Alliance's Scorecard to Assess Progress in Achieving Management Effectiveness Goals for Marine Protected Areas adapted for Protected Areas of the Organisation of Eastern Caribbean States

Presentation of the Score Card (SC)

The Score Card has been adapted from a tool developed by the World Bank – WWF Alliance for terrestrial Protected Areas(Stolton S. *et al*., 2003) and from other tools (Hocking M. et Al. 2000: Mangubhai S 2003). It is a simple site-level tracking tool to facilitate reporting on management effectiveness of Protected Areas (Pas). It has been built around the application of the WCPA Framework document has provided its basic structure (the WCPA framework aims both to provide some overall guidance in the development of assessment systems and to encourage standards for assessment and reporting).

TABLE 1

Summary of the WCPA Framework

Elements of evaluation	*Explanation*	*Criteria that are assessed*	*Focus of evaluation*
Context	**Where are we now?** Assessment of importance, threats and policy environment	Significance. Threats. Vulnerability. National context.	Status
Planning	**Where do we want to be?** Assessment of protected area design and planning	Protected area legislation and policy. Protected area system design. Reserve design Management planning.	Appropriateness
Inputs	**What do we need?** Assessment of resources needed to carry out management	Resourcing of agency. Resourcing of site. Partners.	Resources
Process	**How do we go about it?** Assessment of the way in which management is conducted	Suitability of management processes.	Efficiency appropriateness
Output	**What were the results?** Assessment of the implementation of management programmes and actions: delivery of products and Services	Results of management Actions. Services and products.	Effectiveness
Outcome	**What did we achieve?** Assessment of the outcomes and the extent to which they achieved Objectives	Impacts: effects of management in relation to objectives.	Effectiveness appropriateness

Source: Hockings et al. (2000)

The WCPA Framework[1] is based on the idea that good protected area management follows a process that has six distinct stages, or elements:

1. context
2. planning
3. inputs
4. processes
5. outputs
6. outcomes

Table 1 contains a very brief summary of the elements of the WCPA Framework and the criteria that can be assessed. The Score Card has been designed to fulfill the elements of evaluation included in the Framework.

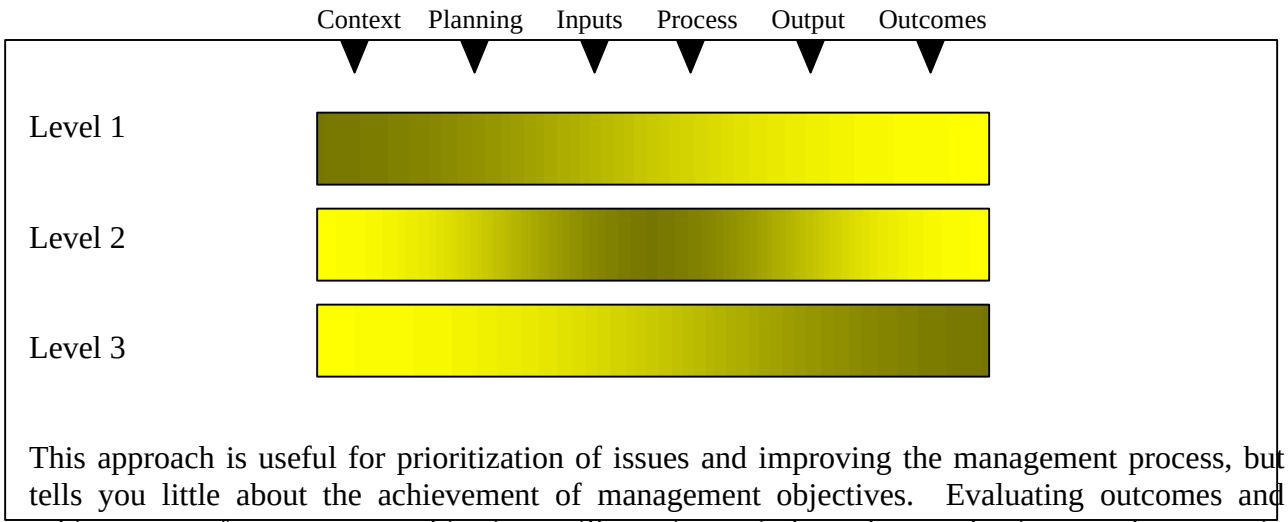
The original version of the Score Card is also available (in English, French and Spanish) online at the following web site: www.mpascorecard.net. Results may also be made available online if PA managers are willing to share them.

Level of detail in the assessment

Hockings *et al.*, 2000 Identified 3 possible levels of evaluation, each requiring different amounts of data collection and financial input. The scorecard presented here is a level 1 assessment (see figure 2). This type of assessment (level 1) requires little or no additional data collection and focuses on the context of the PA along with the appropriateness of planning, inputs and processes of management. It relies largely on available data through literature searches and informed opinions of site managers and/or independent assessors, takes a short period of time and costs little. Issues are broadly covered, but depth of analysis is generally low.

FIGURE 2

Three levels of assessment



This approach is useful for prioritization of issues and improving the management process, but tells you little about the achievement of management objectives. Evaluating outcomes and achievement of management objectives will require an independent evaluation or other more in depth assessment tool (such as the WCPA-Marine/WWF Management Effectiveness Guidelines available at http://effectivempa.noaa.gov).

[1] For a copy of the WPCA Framework or a more detailed summary please visit the WCPA web-site at: www.iucn.org/themes/wcpa

Limitations and disclaimer

The Score Card is aimed at helping managers report progress on management effectiveness from a given baseline. It should not replace more thorough methods of assessment for the purposes of adaptive management. The Score Card tool has been adapted/developed to provide a quick overview of the initial state of management efforts and subsequent progress, over a period of years, in improving the effectiveness of management in a given marine protected area. The Score Card is designed to be filled in the manager or other relevant site staff.

The tool does not allow a detailed evaluation of outcomes, but rather serves to provide a quick overview of the status of management steps identified in the WCPA Protected Area Management Framework, up to and including outputs.

The whole concept of "scoring" progress is fraught with difficulties and possibilities for distortion. The current system assumes, for example, that all the questions cover issues of equal weight, whereas this is not necessarily the case. Accuracy might be improved by weighting the various scores, although this would provide additional challenges in deciding differing weightings. In the current version a simple scoring system is maintained, but the limitations of this approach should be recognized.

Guidance notes for using the Score Card

The Score Card has many uses as an orientation tool to help managers of new protected areas scope out issues to be addressed in establishing an effective PA, or as tracking tool to provide managers with a sense of "where they are" along the management continuum. It also serves as a use-friendly reporting tool on PA status based on information largely already collected without any additional field level research.

The Score Card should be completed by protected area staff and, ideally, local stakeholders to validate the scoring. It is designed to be completed within relatively short period, such as during a staff meeting or other routine meeting, by referencing available reports or datasets.

Further written guidance to facilitate application of the Score Card to assess progress in achieving management effectiveness goals in OECS Protected Areas is given on the following page.

Written Guidance to Facilitate Application of Scorecards to Assess Progress in Achieving Management Effectiveness Goals in OECS Protected Areas

Background:
One objective of the recently completed regional OECS workshop[2] on "Designing Tools for Monitoring and Evaluating the Effectiveness of Protected Areas in the OECS" was to review the utility of the WWF/WB Alliance protected area management tool (scorecard) in measuring management effectiveness in protected areas (PAs). During the workshop, the proposed scorecard was evaluated and a number of suggestions were proposed and agreed in order to enhance the relevance of the methodology to the specific needs of PA sites in OECS generally, and the OPAAL-supported sites, specifically. Following the incorporation of the suggested changes in the scorecard, a main recommendation from the participants was to develop additional guidance in its application supported with a follow-up regional training workshop. The scorecards are projected to be finalized by March 2006.

Objective:
To provide additional written guidance to facilitate the application of scorecards to OECS protected areas.

Score card: a summary
A few brief points to be highlighted with respect to intent and application of PA scorecards. They were developed to be: (i) simple, (ii) easy and quick to use, (iii) applied at the level of the site, (iv) focused on measuring "management effectiveness" measured by predefined parameters, (v) give all questions equal weight, and (vi) filled out by site managers (or similarly trained professionals). There are two sections to the scorecard: (i) a data sheet, and (ii) the scorecard itself. The scorecard in turn, is divided into two parts: (i) Sections A – D which support the data sheet in describing the existing situation (or baseline), and (ii) Sections E – F which are applied at some future date to assess changes over time in management effectiveness. For purposes of OPAAL-supported PAs, after completing the baseline information (Data Sheet and Sections A - D), Sections E - F should be applied in anticipation of mid-term and end of project evaluations.

Approach:
A case study approach (available under separate cover from OECS ESDU) has been adopted based on the hypothetical Paradise Mountain National Park (PMNP), an IUCN Category II protected area, in the mythical country of Serendib. The PMNP has been described in a one page profile (Attachment 1). Based on this description, the scorecard Data Sheet has been filed out (Attachment 2) as have Sections A - D of the scorecard itself (Attachment 3). The Data Sheet plus Sections A-D, provide the baseline or existing situation in terms of management effectiveness in PMNP. From this baseline, a modest investment program to improve PMPA was assumed (Attachment 4). Following the implementation of the investment program, sections E - F of the scorecard were applied and the final scores tallied (Attachment 3).

In addition to the examples described above, further guidance is provided in the "Comments" column of the scorecard. There are three types of comments: (i) Comments based on clarifying/justifying the score selected, (ii) Issues based on possible problems one may encounter in attempting to decide between parameter rankings due in part to the qualitative ambiguity associated with such terms as "adequate", "significant" , "acceptable"), and (iii) Recommendations that may clarify how best to address the associated Issue.

[2] This was held in St. Lucia over the 17th and 18th of January 2006.

Description of forms

After the profile information on the Protected Area has been recorded (attachment 1), two forms need to be completed:

- *Datasheet* (attachment 2)
  The datasheet provides key information on the site, its characteristics and management objectives.
- *Assessment Form* (attachment 3)
  The assessment form includes distinct sections, all of which should be completed.

  - ❖ Questions and scores

    The main part of the assessment form is a series of questions grouped by management stage or element (i.e. context, planning, inputs, processes, outputs, outcomes). Each question should normally be ranked between 0 (low) and 3 (high) based on level of performance. A series of answers is provided for each question to help assessors determine the appropriate ranking.

    Questions that are not relevant to a particular marine protected area should be omitted, with a reason given in the comments section.

    This is, inevitably, an approximate process and there will be situations in which none of the four alternative answers appears to fit conditions in the protected area very precisely. We suggest that users choose the answer that is nearest and use the comments section to elaborate.

  - ❖ Comments
    The comments box allows qualitative judgments to be justified by explaining why they were made (this could range from personal opinion, a reference document, monitoring results or external studies and assessments – the point being to give anyone reading the report an idea of why the assessment was made).

    In this section we also suggest that respondents add any useful information that should be shared with other MPA managers (for example good practices or successful activities).

Final Score

Users will have a score for each of the six elements of evaluation and a final score after completing the assessment form. If some questions are not scored (e.g., not relevant), the maximum score should be changed to an adjusted score (maximum possible score minus points for question that are not applicable). Your final score will be a percentage of your score over the adjusted maximum score.

Investments (attachment 4)

Users will list the investment activities determined as a consequence of the need to improve the management effectiveness score

Attachment 1. Tobago Cays Marine Park (St. Vincent and the Grenadines): a profile
(baseline conditions)

Location and Basic Characteristics: Located in the country of St. Vincent and the Grenadines, the Tobago Cays Marine Park was established in 1997. The Park's/Area's boundaries are not yet demarcated, however the coordinates for the boundaries have already been determined. The total area of the Park/Area is 42-47 km^2 ([number] hectares) and varies in range from sea level to over [TO BE PROVIDED] m above sea level. It is St. Vincent and the Grenadines' only designated national park, to date, and is the [third largest] protected area in the State and includes the islands of Baradal, Petit Tabac, Petit Bateau, Rameau, Jamesby, Mayreau, and the enclosed marine area.

Biodiversity and other significant characteristics: The area includes coral reef, seagrass beds, mangrove, coralline beaches, as well as providing habitats for migratory birds and foraging and nesting areas for the hawksbill (*Eretmochelys imbricata)* and foraging area for green turtles (*Chelonia mydas*). [note other significant geophysical characteristics, habitats (size rated) and animal biological diversity, particularly threatened or endangered species TO BE PROVIDED]

Management Planning: Tobago Cays Marine Park's conservation objectives are equivalent to the IUCN Category: National Park [TO BE INCLUDED] (i.e., a protected area managed mainly for [explain management category]). The terrestrial part has been designated a Forest Reserve pursuant to the Forest Resource Conservation Act (no 47 of 1992), and the marine area is a designated Marine Reserve pursuant to the Fisheries Act (no 8 of 1986). The Marine Parks Act (Tobago Cays) (no # of 1997) made specific provision for designating the area as a marine park. The Tobago Cays Marine Park was designated for historical, cultural, economic, biological diversity conservation, fisheries management reasons.

The area has had a number of draft management plans to date and there has been at least one effort to develop a national systems plan to date. Work has commenced on developing an up to date management plan for the area and in support of this, procurement of services of a consultant has been initiated under the OPAAL project. Enabling regulations exist within the context of the Marine Parks Act (Tobago Cays), as well as the Fisheries Act.

Management Staff: The Area is, at present, managed by a Board of Directors pursuant to the Marine Parks Act (Tobago Cays) and is staffed by a manager, rangers (3), warden (1) secretary/typist (1) office attendant (1). The Area has a specific budget provided by way of a subvention from central government. The Area also benefits from contributions provided by a number of projects further funding is to be forthcoming as a consequence of investments from the OPAAL project. A consultative Site Implementation Entity (SIE) within the context of the OPAAL project, composed of, *inter alia*, representatives of the Board, local communities, Union Island Tourist Board, Water Taxi Association, Charter Boat Companies, Cruise Ship Companies, Dive Shops, Mayreau Environmental Development Organisation (MEDO), as well as other NGOs has been designated by Board of Directors under the authority of Cabinet.

Infrastructure and Equipment: The Area has only one control post at present: the TCMP office on Union Island. One motorised vessel is utilised for the area and procurement of another vessel is currently in process. VHF hand-held radio equipment is available at present for communications, however it is anticipated that improvement to this will be built into the investment plan coming out of the management planning exercise.

Population: The Area has a population that is predominantly Afro-Caribbean.

Land Tenure: Most land areas are State owned while others fall under private ownership; marine areas belong to the State. The private owners have accepted the designation of the area and are represented on the SIE.

Main Economic Activities*:* Tourism (e.g. hotels, day tours, SCUBA, snorkelling, vending, yachting, etc.) and fisheries

Main threats to biodiversity: Tourism development; invasive flora and fauna; vessel anchoring; illegal and unsustainable fishing; grounding and other (human induced) damage to coral; waste water and other forms of pollution; damage by natural hazards.

Attachment 2. Tobago Cays Marine Park **Data Sheet**

Name of the protected area: Tobago Cays Marine Park (TCMP)
Location of protected area: (country and, if possible, map reference): _____
Date PA was established: 1997 Agreed: 1997 Gazetted: 1997
Ownership details (i.,e. owner, tenure rights etc): Most land areas are State owned while others fall under private ownership; marine areas belong to the State

Management Authority: TCMP Board
Contact information and web site (if any): (784) 485 8191
Size of protected area (ha): 42-47
km^2
Percent of PA that is respectively terrestrial/marine (%): terrestrial: ___?__ marine: ____?_____
Number of staff: 9 Permanent: 7 Temporary: 1 Volunteers: 1
Annual budget: EC$ [TDI] (US$)
Designation (IUCN category, World Heritage, Ramsar, etc.): IUCN National Park
Reasons for designation: Resource conservation and environmental protection
The PA is part of a larger management zoning plan: Yes ____ No √
Brief details of World Bank funded project or projects in PA: OPAAL
Brief description of the primary habitats represented in the PA
(e.g. rain forest, wetlands, dryland forest, reefs, seagrasses, mangroves etc.)
Habitat 1: ____ reefs _____
Habitat 2: ___ seagrasses _____
Habitat 3: _____ mangroves _____
Habitat 4: _____ dryland forest _____
Habitat 5: _____wetlands (including salt pond)_____
Two primary protected area objectives:
Objective 1: Sustained economic benefits from the use of existing natural resources;
Objective 2: Enhanced conservation and management of biological diversity;
Two most important threats to the PA (and reasons why):
Threat 1: Ineffective management (including enforcement) and institutional framework
Threat 2: Inadequate capacities and stakeholder participation
Top two critical management activities:
Activity 1: Develop and implement appropriate management plan which incorporates effective administrative and public awareness building frameworks
Activity 2: Institute effective enforcement and revenue collection capability
Top 4 stakeholder groups:
Stakeholder group 1: _____
Stakeholder group 2: _____
Stakeholder group 3: _____
Stakeholder group 4: _____
Resources conditions: Poor _____ Average √ Good _____
Date assessment was carried out: 18/08/2006
Name/s of assessor: Group comprising board and other stakeholders
Role (position): _____
Contact information: _____
Date (s) of previous score card assessments (s): not applicable

SVG

Attachment 3. A. Context: Where are we now? Assessment of important threats and the policy environment

1. Legal status - Does the protected area have legal status? Note: see fourth option for private reserves		***Your Score***	***Comments***
The area is neither gazetted nor given cabinet approval	0		
The government has agreed that the protected area should be gazetted but the process has not yet begun	1		
The protected area is in the process of being gazetted but the process is still incomplete	2		
The protected area has been legally gazetted (or in the case of private reserves is owned by a trust or similar)	3	3	
Additional Point			
a. The PA has received national and/or international recognition for its importance (in the comments column, describe the recognition in detail)	+1	1	TNC, Coral Cay Conservation
2. Protected area regulations - Are unsustainable human activities (e.g. poaching) controlled?		***Your Score***	***Comments***
There are no mechanisms for controlling unsustainable human activities in the protected area	0		
Mechanisms for controlling unsustainable human activities in the protected area exist but there are many problems in effectively implementing them	1	1	
Mechanisms for controlling unsustainable human activities in the protected area exist but there are a few problems in effectively implementing them	2		

Mechanisms for controlling unsustainable human activities in the protected area exist and are being effectively implemented	3		
3. Law enforcement - are enforcement rules effectively enforced?		***Your Score***	***Comments***
No effective capacity/resources and activities to enforce protected area legislation and regulations	0		
There are major deficiencies in capacity/resources and activities to enforce protected area legislation and regulations (e.g. lack of skills, no patrol budget, etc.)	1	1	
Acceptable capacity/resources and activities to enforce protected area legislation and regulations but some deficiencies remain	2		
Excellent capacity/resources and activities to enforce protected area legislation and regulations	3		
Additional Point			
a. There are additional sources of control (e.g. volunteers, national services, local communities, etc.)	+1	1	
b. Infractions are regularly prosecuted and fines levied	+1		
4. Protected area boundary demarcation - Are the boundaries known and demarcated?		***Your Score***	***Comments***
The boundaries of the protected area are not known by the management authority or other stakeholders	0		
The boundary of the protected area is known by authority but is not known by other stakeholders	1	1	

The boundary of the protected area is known by both the management authority and others but is not appropriately demarcated	2		
The boundary of the protected area is known by the management authority and stakeholders and is appropriately demarcated	3		
5. Integration of the PA in a larger management plan - Is the PA part of a PA systems plan?		***Your Score***	***Comments***
There is no discussion about the integration of the PA in a larger management or systems plan	0		
There is some discussion about the integration of the PA into management or systems plan but the process has not yet begun	1	1	Procurement of services has begun under the OPAAL project
The protected area is in the process of being integrated into a larger management or systems plan but the process is still incomplete	2		
The protected area is part of a larger management or systems plan	3		
Additional Point			
a. The PA is part of a network of PAs which collectively sustain larger ecosystem functions	+1	1	
b. The PA is part of a network of PAs which collectively represent the range of bio-geographic variation in a eco-region	+1		
6. Resource inventory - Is there enough information to manage the area?		***Your Score***	***Comments***
There is little or no information available on the biophysical, socio-cultural and economic conditions associated with the			

protected area	0		
Information on the biophysical, socio-cultural and economic conditions associated with the protected area is not sufficient to support planning and decision making	1	1	
Information on the biophysical, socio-cultural and economic conditions associated with the protected area is sufficient for key areas of planning/decision making but the necessary survey/M&E work is not being maintained	2		
Information on the biophysical, socio-cultural and economic conditions associated with the PA is sufficient for key area of planning and decision-making	3		
7. Stakeholder awareness and concern - Are stakeholders aware and concerned about resource conditions and threats?		***Your Score***	***Comments***
Less that 25% of stakeholders are aware or concerned about the resource conditions and threats	0		
Approximately 25% - 50% of stakeholders are aware or concerned about the resource conditions and threats	1		
Approximately 50% - 75% of stakeholders are aware or concerned about the resource conditions and threats	2	2	
Over 75% of stakeholders are aware or concerned about the resource conditions and threats	3		
TOTAL for Context (A):	**13 /26 or adjusted score**		
B. Planning - Where do we want to be? Assessment of protected area design and planning			
8. Protected area objectives - Have objectives been agreed and the area managed to achieve them?		***Your Score***	***Comments***

No firm objectives have been agreed for the protected area	0	0	
The protected area has agreed objectives that are not yet implemented	1		
The protected area has agreed objectives but these are only partially implemented	2		
The protected area has agreed objectives and is managed to meet these objectives	3		
9. Management plan - Is there a management plan and is it being implemented?		***Your Score***	***Comments***
There is no management plan for the protected area	0		
A management plan is being prepared or has been prepared but is not being implemented	1	1	
An approved management plan exists but it is only being partially implemented	2		
An approved management plan exists, includes the agreed objectives and is being implemented	3		
Additional Points for Planning			
a. There is also a long term master plan (at least 5 years)	+1		
b. The planning process allows adequate opportunity for key stakeholders to influence the management plan	+1	1	
c. Stakeholder participation includes representation from the various ethnic, religious and user groups as well as representation from both genders	+1	1	

d. The socioeconomic impacts of decisions are considered in the planning process	+1	1	
e. The local culture, including traditional practices, social systems, cultural features, historic sites and monuments, is considered in the planning process	+1	1	
f. There is an established schedule and process for periodic review and updating of the management plan	+1		
g. The results of monitoring, research and evaluation are routinely incorporated into planning	+1		
h. The management plan is tied to the development and enforcement of regulations	+1		The draft management plan (s) has given consideration to these aspects

TOTAL for Planning (B): 5 /14 or adjusted score

C. Input - What do we need? Assessment of resources needed to carry out management

10. Research - Is there a program of management-oriented survey and research work?		***Your Score***	***Comments***
There is no survey or research work taking place in the protected area	0		
There is some ad hoc survey and research work	1	1	
There is considerable survey and research work but it is not directed towards the needs of protected area management	2		
There is a comprehensive, integrated program of survey and research work which is relevant to management needs	3		
Additional Point			
a. Carrying capacity studies have been conducted to determine sustainable use levels	+1		

11. Staffing - Are there enough people deployed to manage the protected area?		***Your Score***	***Comments***
There are no staff	0		
Staff numbers are inadequate for critical management activities	1		
Staff numbers are below optimum level for critical management activities	2	2	
Staff numbers are adequate for the management needs of the site	3		
12. Current budget - Is the current budget sufficient?		***Your Score***	***Comments***
(In the comments column; please detail of the sources of funding)			
There is no budget for the protected area	0		
The available budget is inadequate for basic management needs and presents a serious constraint to the capacity to manage	1	1	
The available budget is acceptable, but could be further improved to fully achieve effective management	2		
The available budget is sufficient and meet the full management needs of the protected area	3		
Additional Points			
a. There is a secure budget for the protected area and its management needs on a multi-year basis.	+1	1	
b. The budget is not entirely dependent on government funding: instead, funding also comes from NGO contributions, taxes, fees, etc.	+1		

TOTAL for Inputs (C): 5/14 or adjusted score			
D. Process - How do we go about management? Assessment of the way in which management is conducted			
13. Education and awareness program - Is there a planned education program?		***Your Score***	***Comments (list your major communication actions)***
There is no education and awareness program	0		
There is a limited education and awareness program, but no overall planning for this component	1	1	
There is a planned education and awareness program but there are still serious gaps	2		
There is a planned and effective education and awareness program fully linked to the objectives and needs of the protected area	3		
14. Communication between stakeholders and managers - Is there communication between stakeholders and managers?		***Your Score***	***Comments***
There is little or no communication between managers and stakeholders involved in the PA	0		
There is communication between managers and stakeholders but this is not a planned or scheduled program	1	1	
There is a planned communication program that is being used to built support for the PA amongst relevant stakeholders but implementation is limited as yet	2		
There is a planned communication program that is being implemented to build support for the PA amongst relevant stakeholders	3		

Additional Point There is some communication with other PA managers (for example, exchanges of good practices)	+1	1	
15. Stakeholder involvement and participation - Do stakeholders have meaningful input to management decisions?		***Your Score***	***Comments***
Stakeholders have no input into decisions relating to the management of the protected area	0		
Stakeholders have some input into discussions relating to management but no direct involvement in the resulting decisions	1	1	
Stakeholders directly contribute to some management decisions	2		
Stakeholders directly participate in making decisions related to management	3		
Additional Point a. There are clear financial contributions/agreements between PA and tourism operators to recover PA resources rents for local benefits	+1		
16. Indigenous people - Do indigenous and traditional peoples resident or regularly using the PA have input to management decisions?		***Your Score***	***Comments***
Indigenous peoples and traditional users have no input into decisions relating to management of the protected area	0		
Indigenous peoples and traditional users have some input into discussions relating to management but no direct involvement in the resulting decisions	1	1	

Indigenous people and traditional users directly contribute to some decisions relating to management	2		
Indigenous people and traditional users directly participate in making decisions relating to management	3		
17. Staff training - Is there enough training for staff involved in the management of the PA?		***Your Score***	***Comments (list your major training needs)***
Staff are untrained	0		
Staff training and skills are low relative to the needs of the protected area	1	1	
Staff training and skills are adequate, but could be further improved to fully achieve the objectives of management	2		
Staff training and skills are in the tune with the management needs of the protected area, and with the anticipated future needs	3		
18. Equipment - Is the site adequately equipped?		***Your Score***	***Comments***
There are little or no equipment and facilities	0		
There are some equipment and facilities but these are inadequate	1	1	
Most of equipment and facilities are adequate and maintained	2		
There is adequate equipment and facilities and it is well maintained	3		
19. Monitoring and evaluation - Are biophysical, socioeconomic and governance indicators monitored and evaluated?		***Your Score***	***Comments***
There is no monitoring and evaluation of the biophysical, socioeconomic and governance context of the PA	0		

There is limited monitoring and evaluation, but no overall strategy and/or no regular production of results	1	1	
There is an agreed and implemented monitoring and evaluation system but results are not systematically used for management	2		
A planned and effective monitoring and evaluation system exists and is well implemented and used in adaptive management	3		
Additional Points			
a. The PA participates as a site in national or international environmental monitoring programs such CARICOMP, CPACC, GCRMN, AGGRA or similar (Provide the name of the program(s))	+1	1	Reef check, CERMES management effectiveness project
b. There is an Emergency Response Capability in place to mitigate impacts from threats	+1		
TOTAL for process (D): 9 /25 or adjusted score			

E. Outputs - What were the results? Assessment of the implementation of management programs and actions; delivery of products and services

N. B. : The outputs should be assessed based on progress since the last assessment. If this is the first time the Score Card is being used, respondents should assess outputs over the last 3 years. For newly establish PAs, respondents may have to skip this section.

20. Context indicators - have there been improvements in context indicators ?		***Your Score***	***Comments***
a. Legal status has improved (refers to question 1. Legal status)	+2		
b. Regulations have improved (refers to question 2. PA regulations)	+2		
c. Law enforcement has improved (refers to question 3. Law enforcement)	+2		

d. Boundary demarcation has improved (refers to question 4. PA Boundary demarcation)	+2		
e. The PA has been integrated into a PA systems plan (refers to question 5. Integration of the PA)	+2		
f. The resource inventory has improved (refers to question 6. Resource inventory)	+2		
g. Stakeholder awareness and concern has improved (refers to question 7)	+2		
21. Products and services		***Your Score***	***Comments***
a. Signs - signs are now available, or new one have been installed	+1		
b. User related infrastructure and services are now available, or have been installed	+2		
c. Education materials - education materials are available, or new ones have been developed	+1		
22. Mechanisms for stakeholder participation in decision -making and/or management activities (e.g. advisory council) - are mechanisms available to ensure stakeholder participation?		***Your Score***	***Comments***
There are no mechanisms for stakeholder participation in decision-making and/or management activities	0		
There are some mechanism for stakeholder participation in decision-making and/or management activities, but not sufficient	1		
There are sufficient mechanisms for stakeholder participation in decision-making and/or management activities	2		

23. Environmental education and awareness activities for stakeholders (e.g. public outings at the PA)- have education activities been developed for stakeholders?		***Your Score***	***Comments***
There are no education and awareness activities available for stakeholders	0		
There are some education and awareness activities available for stakeholders, but they are not sufficient	1		
There are sufficient education and awareness activities available for stakeholders	2		
24. Management activities - have the two critical management activities (listed in the data sheet) been improved to address threats		***Your Score***	***Comments***
Management activities have not been improved	0		
Some measures have been taken to improve management activities	1		
Management activities have been sufficiently improved	2		
25. Visitor facilities - does the PA have sufficient visitor facilities?		***Your Score***	***Comments***
There are no visitor facilities and services	0		
Visitor facilities and services are inappropriate for current levels of visitation or are under construction	1		
There are some visitor facilities and services, but they could be improved	2		
Visitor facilities and services are sufficient for current levels of visitation	3		

26. Fees - If fees (entry fees - tourism, fines) are applied, do they help protected area management?		*Your Score*	*Comments*
Although fees and/or fines systems exist, they are not collected	0		
The fees/fines are collected, but they go straight to central government and are not returned to the protected area or its environs	1		
The fees/fines are collected, but they are disbursed to the local authority rather than the protected area	2		
There are fees and/or fines for the protected area that help to support this and/or other protected areas	3		
27. Staff Training		*Your Score*	*Comments*
Staff was trained but could be further improved to fully achieve the objectives of management	2		
Staff was trained in tune with the management needs of the protected area, and with anticipated future needs	3		
TOTAL for outputs (E) /33 or adjusted score			

F. Outcomes - What did we achieve? Assessment of the outcome and the extent to which we achieved objectives

28. Objectives - Have PA objectives (listed in the data sheet page) been addressed?		*Your Score*	*Comments*
Management objectives have not been addressed	0		
Management objectives have been addressed somewhat	1		
Management objectives have been sufficiently addressed	2		
Management objectives have been significantly addressed	3		

29. Threats - Have threats (listed in the data sheet page) been reduced?		***Your Score***	***Comments***
Threats have increased	0		
Threats have stayed at approximately the same levels	1		
Threats have been reduced somewhat	2		
Threats have been largely reduced	3		
30. Resource conditions - Have resource conditions improved?		***Your Score***	***Comments***
Resource conditions have declined	0		
Resource conditions have stayed at approximately the same levels	1		
Resource conditions have improved somewhat	2		
Resource conditions have improved significantly	3		
31. Community welfare - Has community welfare improved?		***Your Score***	***Comments (provide some examples)***
Livelihoods and standards of living in the community have declined	0		
Livelihoods and standards of living in the community have stayed approximately the same	1		
Livelihoods and standards of living in the community have improved somewhat	2		
Livelihoods and standards of living in the community have improved significantly	3		

Additional points			
a. PA management is compatible with the local culture, including traditional practices, relationships, social systems, cultural features, historic sites and monuments linked to resources and uses	+1		
b. Resource use conflicts have been reduced	+1	1	
c. Benefits from the PA are equitably distributed	+1		
d. The non-monetary benefits of the resources to society have been maintained or enhanced	+1		
32. Environmental awareness - Has community environmental awareness improved?		***Your Score***	***Comments***
Environmental awareness of resource conditions, threats and management activities has declined	0		
Environmental awareness has stayed approximately the same	1		
Environmental awareness has improved somewhat	2		
Environmental awareness has improved significantly	3		
33. Compliance - Are users complying with PA regulations?		***Your Score***	***Comments***
Less than 25% of users are complying with regulations	0		
25% to 50% of users are complying with regulations	1		
50% - 75% of users are complying with regulations	2		
Over 75% of users are complying with regulations	3		

34. Stakeholder satisfaction - Are the stakeholders satisfied with the process and outputs of the PA?		***Your Score***	***Comments***
Less than 25% of stakeholders are satisfied with the process and outputs of the PA	0		
25% to 50% of stakeholders are satisfied with the process and outputs of the PA	1		
50% to 75% of stakeholders are satisfied with the process and outputs of the PA	2		
Over 75% of stakeholders are satisfied with the process and outputs of the PA	3		
Additional points			
a. Stakeholders feel that they are able to effectively participate in management decisions	+1		
b. Stakeholders feel that they are adequately represented in the PA decision-making processes	+1		
TOTAL for outcomes (F): /27 or adjusted score			

APPENDIX F

EXCERPT FROM USER OTES FOR CIDA'S ENVIRONMENTAL ASSESSMENT FORMS

14. Public Concern

People may be concerned about the effects of a project whether or not the environmental assessment concludes that the effects are significant. If these concerns are substantial, further public consultation, redesign of the project, or referral of the project to a mediator, a review panel, a joint review panel or an advisory committee may be warranted.

All public comments received on a project must be documented in the screening report.

15. Significance of Adverse Environmental Effects

For projects subject to environmental assessment, determinations of how CIDA will proceed are based on an assessment of the significance of likely, adverse environmental effects. Guidelines of the Canadian Environmental Assessment Agency (CEA Agency 1994) identify the following factors that should be taken into account when deciding whether an adverse environmental effect is significant:

(a) Magnitude of the effect;
(b) Geographic extent of the effect;
(c) Duration and frequency of the effect:
(d) Degree to which the effect is reversible; and
(e) The environmental context of the effect. (An effect may be significant if it occurs in areas/regions that are already degraded, or are ecologically fragile with little resilience to stress.)

An adverse environmental effect is significant if, in the judgement of the assessor, it is not insignificant -- there is no middle ground.

The CEA Agency (1994) directs that project proponents should always submit information on the five factors listed above, and that criteria used to determine significance should be based on them. The assessor must use his/her own judgement in determining the significance of environmental effects, based on the above factors (15 (a) - (e)). In addition to the factors listed by the CEA Agency, assessors might also consider if:

Physical components:

- An established standard (e.g., air or water quality) would be exceeded for unreasonable lengths of time.
- The effect would reduce the carrying capacity for biological components of the environment.
- The effect would pose an unacceptable risk to human health or safety.

Biological components

- The effect would be outside the range of natural variation in the size or distribution of the component population.

- The effect would persist for an unreasonable length of time (e.g., longer than one generation).

Resource use components

- The effect represents a reduction in use lasting an unreasonable length of time (e.g., a year or more).
- The effect would result in a significant socio-economic change.

Health components

- The magnitude of the effect would be outside the range of natural variation in the component.

Socio-economic components

- The effect would be of sufficient magnitude and duration that people, communities or governments could not adapt to the effect relatively quickly in a way that leaves them no less well off than they were previously.

Cultural/heritage components

- A locally or regionally important component is permanently affected.

16. Completing the Matrix of Environmental Issues

The purpose of the matrix of environmental issues is twofold:

(a) working methodically through the matrix assists in the assessment of potential effects of a project. Thus, the matrix can be used as a checklist when identifying potential effects for analysis; and

(b) the matrix provides an overview of the results of the assessment.

Completing the matrix of environmental issues involves several steps:

1. Develop a complete list of project undertakings which may cause environmental effects and enter them in the first column of the top part of the matrix. Ensure you consider all project phases (e.g. pre-construction, construction, operation, closure, and accidents and malfunctions). Use more than one matrix if the number of undertakings exceeds the number of rows in the matrix. Assign sequential numbers to each undertaking you list (Column "No."). Example lists of undertakings for different project types are given in Appendix A.
2. Based on the effects analysis, read across the row for each undertaking and code each cell where the undertaking is expected to cause a direct or indirect effect on a biophysical environmental component. Use the codes shown in **Table 1** below (e.g., "B"). Blank columns are provided in the matrix for specifying other biophysical environmental components.

Review each column corresponding to the various biophysical environmental components. Where effects are coded in more than one cell of a column, consider if there will be an interactive effect on that component. If so, code it in the "Interactive Effects" row as above.

3. For each coded biophysical effect where there would be a consequent (i.e., indirect) non-biophysical (NBP) effect, complete the bottom part of the matrix. First, from the examples in **Table 2**, identify the NBP components which might be affected and enter them in the first column. Then, write the relevant undertaking number(s) (Column "No." in the top part of the matrix) in the appropriate NBP cell in the bottom part of the matrix and add the appropriate significance code (e.g., "2B").

   Review each row corresponding to the various NBP components. Where effects are coded in more than one cell of a row, consider if there will be an interactive effect on that component. If so, code it in the "Interactive Effects" column as above.

   Click on the following link to view examples of completed matrices.

Table 1 — Codes Used for the Matrix of Environmental Issues

Code	Meaning
Blank	No significant negative environmental effect *and* there is no significant public concern
A	Significant positive environmental effect
B	Significant negative environmental effect that can be mitigated
C	Potential significant negative environmental effect unknown
D	Significant public concern
E	Significant negative environmental effect that cannot be mitigated

Table 2 — Standard Non-Biophysical (NBP) Environmental Components

Group	Environmental Component
Resource Use	Water Supply / Use
	Agriculture / Animal Husbandry
	Forestry
	Hunting
	Fishing
	Gathering / Trapping
	Visual Features
	Tourism / Recreational Activities
	Land Uses by Aboriginals
	Use of Resources by Aboriginals
	Other (Specify)
Health	Individual / Community
	Occupational
	Services
	Other (Specify)
Socio-Economic	Population / Demographics
	Housing / Accommodation
	Community Infrastructure / Services
	Employment / Incomes
	Education / Training
	Access / Transportation
	Government Costs / Revenues
	Other (Specify)
Cultural / Heritage	Historic Sites / Features
	Archaeological / Paleontological Sites
	Traditional Sites / Uses
	Sites of Architectural Significance
	Other (Specify)

17. Cumulative Environmental Effects

A cumulative environmental effect is an effect that is likely to result from the project *in combination with* effects due to other projects or activities that have been or will be carried out.

The purpose of analyzing cumulative effects is to identify and avoid situations where the effects of discrete projects or activities act together to create significant adverse effects. For example, one tube well project may not effect ground water supply, but should more tube well projects be implemented in the same area, the cumulative effect could be that ground water supplies would not be sustainable.

When a *likely* and *significant* cumulative biophysical effect is expected, code the appropriate cell in the "Cumulative Effects" row in the top part of the matrix. Again, use the codes shown in **Table 1**.

When a *likely* and *significant* cumulative non-biophysical (NBP) effect is expected, code the appropriate cell in the "Cumulative Effects" column in the bottom part of the matrix.