

**Title:**

**Integrated Water Resources and Coastal Areas Management.  
Economic Valuation and Management Effectiveness of Marine Parks in  
the Caribbean**

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*Everything should be as simple as possible, but not simpler.*

– Albert Einstein

**Background of the ReefFix Project:** The Marine Ecosystem Services Valuation Program (ReefFix) assists small island developing states through a valuation of ecosystem goods and services activity in 9 case study sites. The initiative was hatched at a Council meeting of the IABIN (Inter American Biodiversity Information Network) whereby the Caribbean Countries within IABIN established a marine park data base called the Caribbean Protected Areas Database Initiative – CPADI (<http://www.oas.org/dsd/Events/english/08.03.10.htm>)

IABIN is an international initiative that is working to make the Americas' biodiversity data accessible through the internet for scientific advancement. IABIN and its many partners work to mobilize the data, and to improve search mechanisms, data and metadata standards, web services, and the other components of a web-based information infrastructure for biodiversity. IABIN makes available data that are shared by hundreds of data providers from around the world. These data are exchanged according to the IABIN Data Use Agreement, which includes the provision that users of any IABIN data will always give credit to the original providers.

The IABIN Search Portal offers metadata descriptions, data discovery, and basic online ecological workflows from associated distributed systems from IABIN thematic networks (TNs), who share millions of ever-growing records made available through [www.iabin.net](http://www.iabin.net). This knowledge is provided by the 35 OAS member States, NGOs, academia, natural history museums, and biodiversity organizations throughout the Americas. The portal focuses on web-based computational developments to assist users in locating biodiversity scientific data through the use of the IABIN's interfaces. IABIN web site can be surfed to get biodiversity informatics resources, such as:

- Metadata and published literature citations from a multilingual Catalog.
- Common names and taxonomic hierarchies of specimens and species.
- Species integrated descriptions, proxies, and occurrences records.
- Invasive species' tools, metadata, and associated data set.
- Pollinator's data, occurrences, and ecological niche models.
- Ecosystem's classification with extended information and mapping layouts.
- Protected areas' ancillary data enabled by geospatial interfaces.
- Web-based GIS tool applied to analyze conservation status on ecosystems.

**ReefFix** is an ICZM (integrated coastal zone management) tool that has multi-level linkages that trains participating countries in (i) ecosystem goods and services valuation methodologies (ii) cost effective interventions to improve marine ecosystem health, and (iii) revenue raising techniques of cost recovery and user pays/polluter pays principles.

**ReefFix Outputs:**

- Strengthen management frameworks that regulate coastal activities and develop a plan for coral reef and mangrove adaptation to climate change effects.
- improved ecosystem valuation technical capacity of individual Caribbean countries to collect and manage their protected areas data in a way that meets their specific needs and context;
- improved individual country's protected areas data management systems based on output from several case study sites;
- Centralized data management system for the Caribbean region (drawing from protected areas databases where they exist or from other sources of protected areas information) which serves as a regional node for input to the Americas Database on Protected Areas and the World Database on Protected Areas (WDPA).

ReefFix Phase 2 will include (i) Cost effective analysis of most efficient interventions such as sewage treatment vs watershed management such as reforestation and solid waste management and (ii) Cost recovery mechanisms such as hotel bed tax, user fees, or conservation fee (e.g. 1% of tourism revenue in a conservation fund for environmental protection.)

**Justification:** Coral reefs are sometimes referred to as “canaries of the sea” because of their early warning ability to forecast near-shore oceanic stress. Because of their biological diversity, they are also called “rainforests of the sea”. Coral reefs are vital to the well being of millions of people. Tropical marine and coral reef ecosystems, including mangroves and sea grasses, are vulnerable environmental resources that provide significant economic goods and services. The health of these resources is critical to human well-being. By accounting for coastal marine and coral reef ecosystem economic values in management decisions, Small Island Developing States (SIDS) can sustain their flow of goods and services in the interest of current and future generations. Compared to just a few decades ago, the ever-increasing number and strength of forces affecting coastal ecosystems require coastal managers to respond and adapt to ensure the sustainability of valued ecosystem services and products. One of the major challenges in the Caribbean region is strengthening the resilience of coastal ecosystems to the climate change-induced sea level rise and temperature increases.

**Grenada Commits to expand marine and terrestrial parks under effective management to 25% of the Country by 2020.**

Inspired by the Micronesia Challenge, in Curitiba, Brazil on March 31, 2006, the nation of Grenada pledged to put 25 percent of near-shore marine and 25 percent of terrestrial natural resources under effective conservation by 2020. The Declaration, approved by Grenada's Cabinet, will lead to a nine-fold increase in protection of Grenada's marine environment and more than double protection of its terrestrial environment.

Grenada now joins the Bahamas, which in 2005, during the 10 Year Review of the Barbados Program of Action meeting, committed to set aside at least 20% of its productive marine bank areas as marine protected areas. Source: The Nature Conservancy.

**Ecosystem services** are the benefits people obtain either directly or indirectly from ecological systems (Millennium Ecosystem Assessment, 2003, page v.) Quantifying ecosystem services is a valuable tool for countering private attempts to convert an ecosystem such as a mangrove swamp to a marina, golf, and hotel development. By estimating and accounting for the economic value of ecosystem services, social costs or benefits that otherwise would remain hidden can potentially be revealed and vital information that might otherwise remain outside of the economic decision making calculus at local, national, and international scales can be internalized (Millennium Ecosystem Assessment, 2005).

## The Value of Coral Reefs



### Ecosystem Services:

- **Tourism**
- **Fishing**
- **Shoreline protection**
- **Natural products**

### Ecosystem Functions:

- **Biodiversity**
- **Trophic complexity**
- **Primary productivity**



The ReefFix project offers new insight into ecosystem services and markets exploring new technical guidelines and science-based methods to assess environmental service benefits which can promote markets for ecosystem services, including carbon trading to mitigate climate change.

Marine ecosystems provide many ecosystem services which have historically been viewed as free benefits to society – recreation, clean water and air, fisheries habitat, carbon storage, and scenic landscapes. Lacking a formal structure to market these services, marine ecosystems are overexploited suffering from the “tragedy of the commons”. Market-based approaches to conservation are proven to be a cost-effective method to achieve environmental goals and sustain working and natural landscapes. Without a greater understanding of these ecosystem services, they are lost as public goods or, in the case of privately-owned lands, converted to development.

ReefFix is a building block towards providing technical assistance to OAS Member States in developing the uniform guidelines and tools needed to create and expand markets for these vital ecosystem services. However, achieving such an objective requires considerably better understanding of ecosystem services and the landscapes that provide them. Through nine case studies, a framework for the spatial analysis of ecosystem service values (ESVs) is illustrated. Thanks to the increased ease of using Geographic Information Systems (GIS) and the public availability of high quality land cover data sets (in this case through Google Earth), bio-geographic entities such as forests, wetlands and beaches can be attributed with the ecosystem services they deliver on the ground.

Compared to just a few decades ago, the ever-increasing number and strength of forces affecting coastal ecosystems, including mangroves, require coastal managers to respond and adapt to ensure the sustainability of valued ecosystem services and products. One of the major challenges in the Caribbean region is strengthening the resilience of coastal ecosystems to the climate change-induced sea level rise and temperature increases.

**Background and results:** The first phase of ReefFix is a valuation of ecosystem services program to assess tourism, fisheries, and spatial analysis of ecosystem service values. Using economic ecosystem valuation, the ReefFix methodology was applied to 9 case study sites in the Caribbean and followed up by a participatory workshop.

<http://www.oas.org/dsd/IABIN/Component1/ReefFix/ReefFix.htm>

The REEFfix study conducted 3 valuation methodologies applied to 9 case study sites:

<b>IABIN ReefFix: A Coastal Zone Management Valuation and Capacity Building Project for the Caribbean</b>	
<b>Country</b>	<b>Marine Park</b>
Jamaica	Montego Bay Marine Park Trust
Bahamas	Moriah Harbour Cay National Park in Exuma
DR	National Park of the East.
Haiti	Carocol Mangrove and Coral Reef Ecosystem
St Vincent and the Grenadines	Tobago Cays Marine Park
Grenada	Southern Grenada

Dominica	Soufriere Scotts Head Marine Reserve (SSMR)
St Lucia	Soufriere Marine Management Area (SMMA)
Barbados	Folkestone Marine Reserve

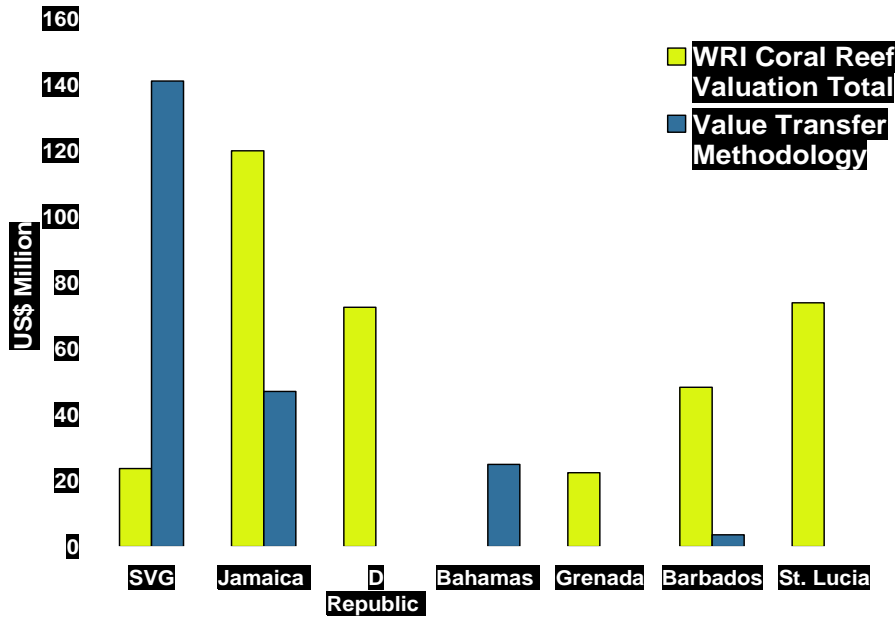
Two methodologies developed by the World Resources Institute for tourism and fisheries data (Economic Valuation of Coral Reefs in the Caribbean -- <http://www.wri.org/project/valuation-caribbean-reefs>) and a third methodology using site-specific land cover data (using benefits transfer economic valuation studies<sup>1</sup>) to assign estimates of ecosystem service values to each ecosystem type, e.g. coral reef, mangrove, or freshwater swamp were compiled for each of the 9 case study sites.

Caption: In the case study of Haiti, where no marine parks have been established, the Caracol Bay was analyzed in Northern Haiti on the border with the DR. An action plan was written to assist the Government of Haiti to establish Haiti's first Marine Protected Area (Proposed).



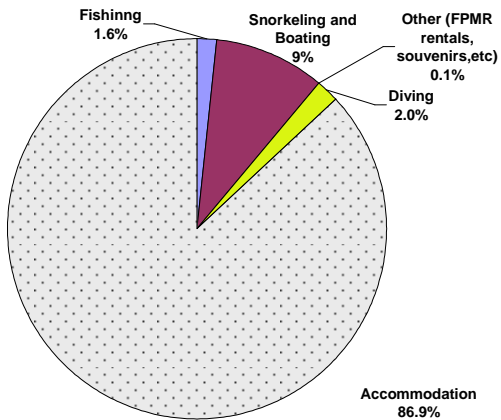
<sup>1</sup> The benefit transfer method is used to estimate economic values for ecosystem services by transferring available information from studies already completed in another location and/or context. Benefit transfer is often used when it is too expensive and/or there is too little time available to conduct an original valuation study, yet some measure of benefits is needed. It is important to note that benefit transfers can only be as accurate as the initial study.

### Case Study Sites\* (excluding Grenada Value Transfer)



\* Data based on unpublished OAS consultant reports by David Gill for Barbados and St. Vincent, Arun Mandesetti for Dominica, Jerry Mitchell for Grenada, Sylvester Clauzel for St. Lucia, Olethea Gardiner for the Bahamas, Enrique Pugibet for the Dominican Republic, Jean W. Wiener for Haiti (in Haiti an action plan was completed to establish the Caracol marine area as a marine park), and Brian L. Zane for Jamaica. All case study sites analyzed economic value from ecosystem goods and services in and around existing marine parks, except Grenada were all of Southern Grenada was analyzed. As a result Grenada Value Transfer method received values of estimated US\$900 million. Original consultant reports may be found at: <http://www.oas.org/dsd/IABIN/Component1/ReefFix/ReefFix.htm>

**Estimated sectoral contributions (to the local economy) from the direct use of coral reefs based on calculations from the WRI Fisheries, Tourism and Recreation Tools (left) and Ecosystem Service Values by cover type for the Folkestone Park and Marine Reserve, Barbados (US Dollars). From report by D. Gill <http://www.oas.org/dsd/IABIN/Component1/ReefFix/Barbados2010/Barbados.htm>**



Ecosystem Type	\$/ha/yr	Total Hectares	Total Contribution (US Dollars)
Beach Near Dwelling	\$117,000	2.5	\$295,980
Freshwater Herbaceous Swamp	\$72,787	0.2	\$17,115
Coral Reef Environ	\$100,000	32.3	\$3,226,522
Mangrove	\$37,500	0.3	\$11,396
<b>TOTAL FPMR ECOSYSTEM SERVICE VALUE</b>			<b>\$3,551,014</b>

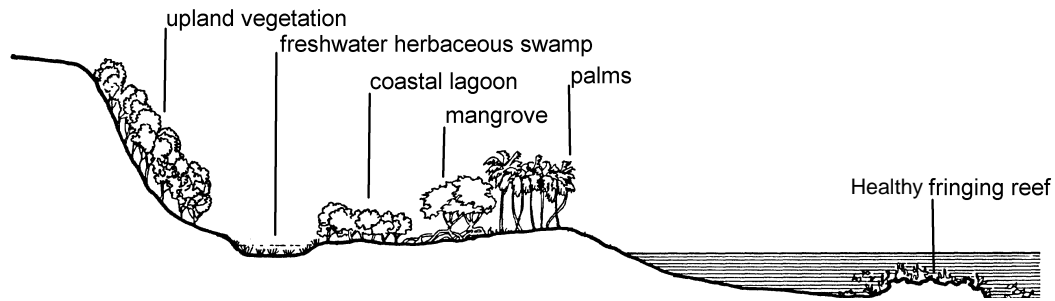
**Caption:** Picture depicts sedimentation from the Montego Bay River headed into the bay. Coral reefs are sensitive to sediment and nutrient loads, so the Montego bay marine Park Trust has developed a Community-Based Restoration Program to restore important habitat and foster long-term environmental stewardship among citizens. The objective is to restore Mobay's most productive ecosystems mangroves, estuaries, coral reefs for on-the-ground habitat restoration projects through establishment of a dive and yacht mooring fee. On-the-ground restoration projects include fish/lobster trap education and redesign; estuary and coral reef restoration, cleaning of storm water channels, a pilot volunteer stewardship and monitoring program, native plant propagation and planting, exotic plant removal, bulkhead removal, marsh creation, re-vegetation and reconstruction of barrier islands, streamside forest buffers, shoreline restoration, creek and storm water clean-ups, informational signage, and water quality monitoring.



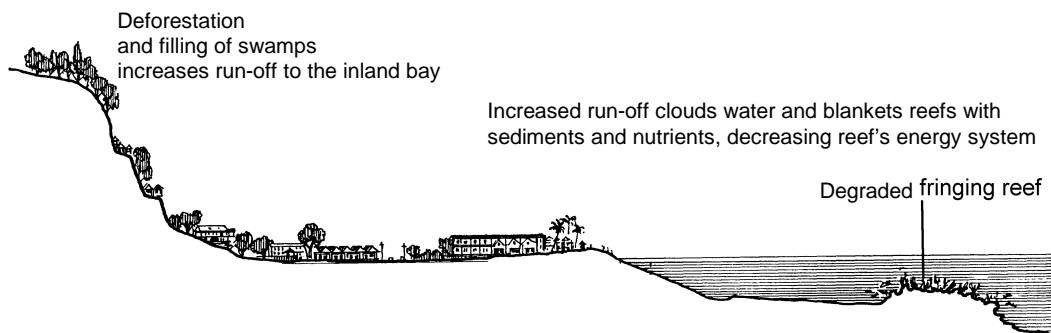
**Governance of marine parks.** The Caribbean offers diverse management structures from Government managed, to co-management regimes where Government shares responsibility with an NGO, to decentralized local management. In all cases, the people surrounding the marine parks have endured some level of environmental deterioration from ecosystem conversion (see **Figure 1**) that includes:

- Increasing pollution of the inshore, coastal and ocean environment;
- Damage to productive coastal ecosystems, which increases losses of life and property from coastal hazards and disasters; and,
- Conflicts of interest among user groups.

### Natural Environment before Development



### Impact on Ecosystem after Development



**Fig. 1** Diagrammatic cross section of the physical effect of coastal development resulting in loss of the ecological functions provided by coastal and upland habitat, leading to an increase in the effects of run-off, sewage and sedimentation on the marine environment and, in particular, the coral reefs.

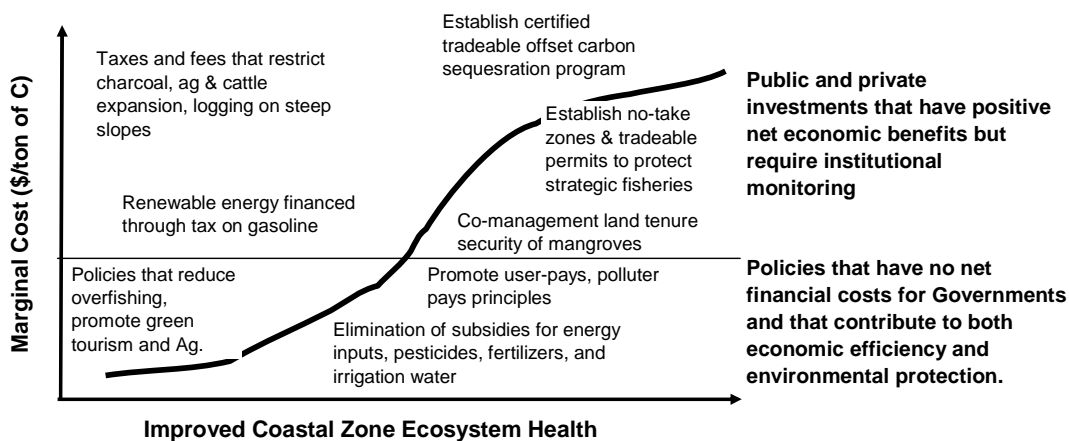
The stakeholders living around marine parks share a common vision:

- A desire to increase the economic benefits flowing from the use of coastal resources; and,
- An eagerness to explore economic opportunities associated with new forms of development in the coastal zone.

Potential solutions include:

- Participatory approaches to planning, involving NGOs and community based groups;
- Strong institutions with accepted mechanisms for cross-sectoral co-operation;
- Enforcement of and compliance with cost effective policies (see marginal cost curve below) through the use of positive reinforcement, encouragement, and incentives;
- Establishment of recognized boundaries with the rights and rules accepted by the user groups with provisions for sanctions; and,
- A seamless flow of information through different mediums.

## Marginal Cost Policies for Improved Coastal Zone Management



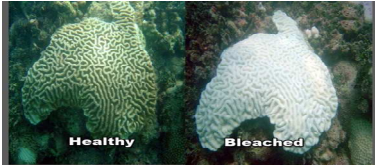
### Recommendations made by the marine park experts included:

- Encourage a unified collaborative on-line Caribbean-wide database of ecosystem goods and services values and economic benefits derived from ecosystem services like the IABIN management effectiveness database that will help in reporting to CBD, the Millennium Development Goals, the World Parks Congress, and the Grenada Declaration.
- Explore partnerships to help finance the policy reform, institutional arrangements, and sustainable financing agenda required to implement ICZM and create governance through co-management.
- Invest in creating sustainable alternative livelihoods and social protection for those affected by reallocation of use rights.
- Expand biological corridors and biodiversity conservation-oriented MPAs to meet “representative system” targets.
- Scale up community-based resource reserves to mainstream biodiversity protection in the production landscape.

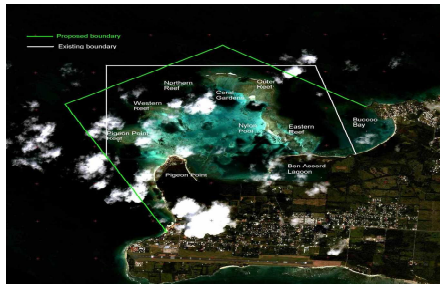
# Cost effective Interventions include cost recovery from Marine Parks, Certified Forestry, PES, and ICZM

Coral Reef bleaching/ Marine Parks with no take zones such as Tobago Cays Marine Park that charges an entrée fee for yachts and diving.

Deforestation/  
Smartwood



Integrated coastal zone  
management/ Ecotourism



Forest/wetlands  
Payments ecosystem services



Monoculture/Shade coffee  
alternative



**Areas of work:** policy strengthening – technology transfer/data – capacity building - strategic alliances – adaptation measures –