Capturing ecotourism benefit values in Riverine and Marine Parks: Socio-economic and institutional context of two sites, Montego Bay Marine Park, Jamaica, and the Canaima National Park in Venezuela.

Paper presented to the Symposium and Workshop
of the North American Marine Protected Areas Network:
Benefits and Financing of MPAs
Measuring the Effectiveness of MPAs
Loreto, Mexico, February 28-March 4, 2005

Richard M. Huber
Principal Environmental Specialist
Sustainable Development and Environment
Organization of American States
1889 F. St., N.W., Suite 695
Washington, D.C. 20006

T: +202-458-3227
F: +202-458-3560
<RHuber@oas.org>

Executive Summary

By capturing a portion of the economic value of the benefits derived from the local marine environment, ecotourism will be better able to finance management activities to protect natural and cultural resources and fulfil broader social objectives of providing for scientific research and education. Given the current inadequate investment in sustainable ecotourism, reflected by overcrowding, poor infrastructure, and resource deterioration, benefit capture can be effective in aligning social costs with private costs to improve economic decision-making and provide sustained revenues for management authorities. Benefit capture and market based instruments (MBIs) are reviewed as they apply to the socio-economic and institutional context of two sites, Montego Bay Marine Park, Jamaica, and the Canaima National Park in Venezuela. Specific attention is paid to the distribution of the costs among users and non-users, the change in incentives that may result, and the anticipated size of the revenues. The results of separate local use and contingent valuation studies provide guidance regarding the extent of producer and consumer surplus. The recommended instrument for the Montego Bay Marine Park is an earmarked hotel room fee of US$1 per bed-night, to lead to an annual revenue of approximately US$1.5 million. The recommended instrument for the Canaima National Park is a two- tiered park entrance fee that is already in place (US$10 for international visitors and US$4 for Venezuelan residents) and an ecotourism tax collected by the park service of US$1 per overnight stay in the park, to lead to an annual revenue of approximately US$5.0 million. Key in the recommendations is the provision of information to hotel guests regarding management activities and the benefits of forests, rivers, and coral reefs. An independent administration of the program by both Montego Bay Marine Park Trust and the Canaima National Park, in cooperation with the ecolodges, is necessary to ensure accessible and sustained funding.

Economic Rent and Environmental Resource Use

Rent is viewed by the classical economists who considered nature as the source of wealth and rent as "unrecompensed" work done by nature (Beer 1939; Cleveland 1987). Succinctly, rent as defined by Ricardo (1821/1960, p.33), a classical economist, is "…that portion of the produce of the earth that is paid to the landlord for the use of the original and indestructible powers of the soil." In general terms, land rent is conceived as a payment for the contribution of nature to productive value. Ricardian rent (in the extensive case) is earned for goods and services provided by nature due to the scarcity of the "land" or natural resource of a particular quality, the exclusion of use through ownership, and variations in natural productivities between lands. Granted, ecological resources such as fisheries are more accurately described as potentially renewable as opposed to "indestructible" resources, yet classical economists, including Ricardo, often considered fisheries and agriculture as analogues in the exposition of natural resource economic principles applied to land envisioned to have a characteristic set of natural properties. It is important to note that Ricardo considered rent as separate from returns to capital and labor employed in the production process; specifically, profits and wages are determined differently from rent, which itself can only be attributed to the natural attributes of the land.

The production of goods and services often relies on the drawing of services provided by natural capital or on the drawing down of the stock of natural capital, and thus on the productivity of natural biotic systems. It is through the involvement of the environment in production processes that contributions by ecosystems are made to the value of final economic goods and services (i.e., through a value-added process of which the natural biota is one factor of production) and, more generally, to human utility. Indeed, economic valuation of the environment is ultimately concerned with estimating the value of the flow of ecosystem goods and services.

The value of the contribution by the environment to the final value of goods and services whose production utilizes those resources is ultimately represented economically by the resource rent earned. Such rent is paid to the owners or users of the resource, be they government, private sector or non-government organizations (NGOs). A simple example of rent is the difference in room charges for a view that faces the ocean vs. a view in the same building that faces the parking lot. But the question remains: Who should rightfully retain rents or net benefit values earned through the use of the environment?

Of great interest to natural resource management authorities is to capture at least a portion of economic rent to pay for the necessary management, and potential enhancement, of the resource. In other words, there are social costs associated with the conservation of the resource that should be paid by those benefiting from the resource. This is in keeping with the "user pay principle". Benefit capture instruments can be an effective means of aligning private costs with social costs, such that the operators "feel" the true costs associated with using the reefs.

Benefit Capture Options

Instruments for Benefit Capture

- Market-based instruments (MBIs), similarly referred to as economic instruments (EIs), are policy tools applied to address environmental problems by creating economic incentives to modify market behavior with the goal that better environmental conditions will result. Specific definitions vary. However, fundamentally, the goal of any MBI is to internalize environmental costs (aligning private and social costs to reduce externalities) (OECD 1997; Huber et al. 1998; Serôa da Motta et al. 1999. Figure 1 shows a continuum of environmental policy instruments from regulations

Figure 1 - Continuum [1]
Classification of Policy Instruments Based on Decentralization and Flexibility in Individual Decision-making

←---------MINIMUM FLEXIBILITY---------→ ←-----------MODERATE FLEXIBILITY-----------→ ←-----------MAXIMUM FLEXIBILITY-----------→

←--------MAXIMUM GOVERNMENT INVOLVEMENT--------→ ←----------INCREASED PRIVATE INITIATIVE---------→

←---------CONTROL-ORIENTED--------→ ←----------MARKET-ORIENTED----------→ ←-----------LITIGATION-ORIENTED-----------→

Regulations & Sanctions	Charges, Taxes, & Fees	Market Creation	Final Demand Intervention	Liability Legislation
eneral Examples				
andards: overnment restricts nature and ount of pollution or resource use for lividual polluters or resource users. ompliance is monitored and sanctions ade (fines, closure, jail terms) for n-compliance.	Effluent or User Charges: Government charges fee to individual polluters or resource users based on amount of pollution or resource use and nature of receiving medium. Fee is high enough to create incentive to reduce impacts.	Tradable Permits: Government establishes a system of tradable pollution or resource use permits, auctions or distributes permits, and monitors compliance. Polluters or resource users such as salmon fishers trade permits at unregulated market prices.	Performance Rating: Government supports a labeling or performance rating program that requires disclosure of environmental information on the final end-use product. Performance based on adoption of ISO 14000 voluntary guidelines (e.g., zero discharge of pollutants, mitigation plans submitted, reuse policies and recycling of wastes). Eco-labels are attached to 'environmentally friendly' products.	Strict Liability Legislation: The polluter or resource user by law is required to pay any damages to those affected. Damaged parties collect settlements through litigation and court system.
ecific Examples of Urban Applications				
Pollution standards Licensing of economic activities Land-use restrictions Construction impact regulations roads, pipelines, ports, or mmunications grids Environmental guidelines for an road alignments Fines for spills from port or land- sed storage facilities Bans applied to materials deemed acceptable for solid waste collection vices ater use quotas	▪ Non-compliance pollution charges ▪ Greening of conventional taxes ▪ Royalties and financial compensation for natural resources exploitation ▪ Taxes affecting inter-modal transport choices ▪ Taxes to encourage reuse or recycling of problem materials (e.g., tire taxes, battery taxes) ▪ Source-based effluent charges to reduce downstream water treating requirements ▪ Tipping fees on solid wastes ▪ User charges for water	▪ Market-based expropriation for construction, including 'environmental values' ▪ Property rights attached to resources potentially impacted by urban development (forests, lands, artisan fish) ▪ Deposit-refund systems for solid and hazardous wastes ▪ Tradable permits for water abstraction rights, and water and air pollution emissions	▪ Consumer product labeling (Eco-labels) relating to problem materials (e.g., phosphates in detergents) ▪ Education regarding recycling and re-use ▪ Disclosure legislation requiring manufacturers to publish solid, liquid and toxic waste generation ▪ Black-list of polluters	▪ Damages compensation ▪ Liability on neglecting firm's managers and environmental authorities ▪ Long-term performance bonds posted for potential or uncertain hazards from infrastructure construction ▪ "Zero Net Impact" requirements for road alignments, pipelines or utili rights of way, and water crossings

1 Huber, Richard M., Jack Ruitenbeek and Ronaldo Serôa da Motta. 1998. Market Based Instruments for Environmental Policymaking in Latin America and the Caribbean: Lessons from Eleven Countries. p. 79

Benefit Capture Recommendations for Protected Areas

Notable features of the recommended instrument for benefit capture include:

- Earmarking. The collected funds must be made available to the local authority responsible for environmental management. Earmarking is often not a recommended approach for the disbursement of taxes or charges due to the possibility of inefficient use of the funds through over investment in a particular project. Specifically, it may be that higher social returns are obtained by spending the money on other projects. Earmarking effectively serves as compensation for the explicit provision of a management service (i.e., the conservation of the public resource). It also increases political pressures for accountability and can be expected to facilitate the collection of the fee (Huber et al. 1998; O'Connor 1999; Serôa da Motta et al. 1999). Individuals asked to pay the fee will be more willing to do so if they see it going directly towards a cause they see as worthy. If charges are directed to the general government collectorate, this can be viewed as an additional "tax grab" and, particularly in the context of a developing country, with little hope of actually being applied to environmental management. Despite general discouragement by economists regarding the earmarking of environmental funds, earmarking is gaining favor and does have a legitimate place in the use of economic instruments. Emerging evidence indicates that earmarking has success where: (i) taxes are linked to existing collection mechanisms; and, (ii) the collected revenues are made available to local authorities.

- Cost recovery. Earmarking of the fee supports cost recovery. The Montego Bay Marine Park and Canaima National Park lack adequate and secured funding. An independent administration of the program by the Park Services, in cooperation with hoteliers, is necessary to ensure accessible and sustained funding. Funds should not be directed through government agencies. This self-financing will help ensure that the Park management institution itself is sustainable in the long-term.

- Consumer advocacy. Public pressure as expressed by the consumers serves as an effective substitute for weak government institutional capacity. Although consumer advocacy through Market Based Instruments is more fully realized with final demand interventions (e.g., eco-labeling) greater consciousness increases the pressures on all producers and consumers to behave in a more environmentally responsible manner. It will also increase the public accountability of the Park to deliver effective management programs.

Options: Which Economic Instrument is most Appropriate

What economic instrument would be most appropriate in each case study given the specific socio-economic context and the revenue-generating objective? Instrument selection, design and implementation should speak to the criteria discussed previously in this report. Overall, one needs to consider the type and structure of the selected instrument; the target group; policy procedures and process for implementation, including information sharing and consultation; the administrative organization for implementation and enforcement; and implementation procedures. Here we examine the benefit capture options that will focus on the first of these – the identification of the most appropriate instrument and the selection of the target group.

Within the general category of charges, taxes or fees there are two general options – directly target the producers or directly target the consumers. If the tourists as consumers are to be

charged, it would be difficult to apply an instrument to the activities that directly use the environment, such as water sports, hiking, or nature appreciation. The most obvious complimentary service utilized by all tourists in both cases is the accommodations sector. A charge administered through the use of accommodations would effectively target this consumer group and ease administration of the charge.

Another option is an annual user fee or resource use charge that would focus on producers, namely fishers and tour operators. There are notable problems with setting the fee at the appropriate amount and enforcement of the resource use (e.g., ensuring that only those licensed are the exclusive users and monitoring to ensure that use by those licensed does not rise above specified or reported levels) (Huber et al. 1998). Ultimately, one should be concerned with setting a maximum level of use permittable (i.e., this could include the level of fishing effort, the number dive days, the amount of aircraft allowed to visit the site, etc.). Upper bounds on the level of resource use will ultimately be self-limiting, with the dissipation of economic rents or the destruction of the resource, yet it is desirable to limit use before these factors "kick in".

The ability to collect fees attached to the licensed use of the sites requires that the exclusion of non-licensed users is enforceable. Without an effective ability to control access to the resource, licensed users will be reluctant to pay associated fees because their exclusive rights to the resource are not enforced. User fees also increase the accountability of the management authorities in the delivery of effective management. Although arguably a benefit of the mechanism, it can also be expected to put pressure on management to implement a limited set of short-term services for the users to appease. These may be at the expense of longer-term management goals.

A user fee or a user permit would target fishers and/or water sport operators, as these are the producers directly using the waterways on a daily basis. Many of the fishers, however, would be unable to pay an attached fee as the resource rents earned by this group are marginal and may even be negative (Gustavson 1998). There are other significant drawbacks. Notable is the difficulty of achieving a politically and socio-economically acceptable limit on the level of use. It is extremely difficult to currently control use by fishers, and limitations on the level of use by water sports operators have never been seriously considered (Bunce and Gustavson 1998). In addition, it is difficult to conceive of a scientifically defendable position regarding the development of specific user limits (e.g., 10 lbs or 20 lbs of fish per fisher per week, 500 or 1000 hiker days per year for visiting of the Angel Falls). As previously mentioned, however, perhaps the greatest challenge is that the successful implementation of a user fee or user permit system requires that allocated property rights are secured and that the management authorities are able to enforce those rights. Without exclusion of those not permitted, the instrument will be ineffective.

Final demand interventions (consumer preference) also have the potential to raise revenues or other resources. "Green certification" linked to the Park may provide incentives for the local tourism businesses to support the Park and its programs either with support in kind, specific project sponsorship or monetary donations. Effective final demand interventions require that consumers be provided with adequate information regarding the nature of the environmental problems and the consequences of their consumption choices. This is particularly challenging since many of the consumption choices of the tourists (e.g., where to stay) are made well in advance of their visit (but increasingly they may find their destination on the web under a green eco tourism website).

Marine System Valuation Studies

The results of previous local use and contingent valuation studies (Gustavson 2000; Spash et al. 2000) provide information regarding the extent of the local producer and consumer surplus. The most prominent local uses of the Montego Bay Marine Park are activities associated with the near-shore artisanal fisheries and the tourism sector (including water sports, swimming and beach activities, as well as the broader spectrum of tourism services indirectly dependent on the marine environment). These values represent the extent of the reef-derived production contributions at risk of being lost if conservation efforts prove inadequate.

Net present value (NPV) estimates associated with tourism in Montego Bay range from US$210 million (using a 15% discount rate) to US$630 million (using a 5% discount rate) in 1996 (Gustavson 2000). The NPV estimates in 1998 associated with fishing are from –US$1.66 million to US$7.49 million (1996 dollars, using lower and upper estimate, respectively, of annual net values and a 5% discount rate; 10% and 15% discount rate estimates fall within this range).

Spash et al. (2000) utilized contingent valuation method (CMV) to estimate utility values associated with coral reef biodiversity within the Montego Bay Marine Park. Survey respondents were asked to contribute towards a trust fund that would be managed by the Park to increase biodiversity. The payment was to be made on a per annum basis for five years and lead to a 25% increase in coral reef cover. At the sample means, willingness to pay (WTP) was estimated as US$3.24 per person in Jamaica. Using typical visitor and local population profiles and a 10% discount rate, this leads to a total estimated WTP of approximately US$20 million in Montego Bay (Spash et al. 2000).

Expected WTP was found to depend on: (i) whether the individual was a local or tourist; (ii) the socio-economic characteristics (specifically gender and income) and knowledge of the individual; and, (iii) the attitudes of the individual towards moral duties and rights to protect biodiversity (Spash et al. 2000). Typical local Jamaicans had a mean expected WTP of US$3.75, while typical tourists had a mean expected WTP of US$2.73.

These studies indicate that there are substantial benefit values. With approximately 150,000 stopover tourists a year visiting Montego Bay, consumer surplus (WTP) total approximately US$410,000 each year from this group or, more accurately within the context of the CV survey design, a NPV of US$1,708,000 (10% discount rate) over the five year stream of the payment scenario. With producer surplus from the tourism sector of approximately US$430 million NPV, or US$43 million on an annualized basis (10% discount rate), the capture of only 1% of this would yield annual revenue of US$430,000. However, the NPV estimate for the tourism industry is dispersed among many different types of services, including most notably accommodations, entertainment (water sports and attractions), food and beverage services, and transportation. Approximately two thirds of the producer surplus is estimated to fall on the accommodations sector alone. It is evident from the valuation studies that little can be gained from attempting to extract benefit values from the local fishers. Rent is effectively zero, and may even be negative (Gustavson 2000).

Marine Environmental Management in Montego Bay, Jamaica

The Montego Bay Marine Park (the Park) is a 15.3 km^2 coastal marine area adjacent to the city of Montego Bay, Jamaica. The Park was formally proclaimed in law in 1992 and management responsibilities subsequently transferred in 1996 from the Government of Jamaica to a non-government organization (NGO), the Montego Bay Marine Park Trust (Bunce et al. 1999; Jameson and Williams 2000). Park management authorities are challenged with having to develop and implement effective programs in light of the complex mix of local uses of the marine environment, the multifaceted and mulitsectoral nature of impacts on the marine ecosystems, and the complex and often adversarial socio-economic climate (Bunce et al. 1999; Bunce and Gustavson 2000; Huber and Jameson 2000). The marine environment of Montego Bay is notably affected by local human activities, resulting in (Bunce et al. 1999; Jameson and Williams 2000):

- High nutrient (and likely pollutant) loading from rivers and storm-water runoff;
- Sedimentation from coastal construction and loss of upland and coastal vegetation;
- Loss of habitat through the infilling of mangroves and reclamation of large sections of the waterfront area for commercial development;
- Intensive harvesting of fishes; and,
- Physical damage from marine recreational activities, such as diving, snorkeling and boating.

Further impacts, not localized to the Montego Bay area, have occurred by coral bleaching events (as experienced through much of the wider Caribbean), the massive die-off of the long spined black sea urchin (Diadema antillarum) in the early 1980s (a species key in affecting coral reef ecosystem structure), Hurricane Allen in 1980 and Hurricane Gilbert in 1988 (causing significant physical damage to coral reef structures) (Woodley et al. 1981; Kaufman 1983; Hughes et al. 1985; Liddell and Ohlhorst 1986; Lapointe 1989; Goreau 1992; Hughes 1994). Current ecological condition of the coral reefs of the Montego Bay Marine Park is notably deteriorated (Hughes 1994; Sullivan and Chiappone 1994; Ruitenbeek et al. 1999, 2000; Huber and Jameson 2000).

The General Case of a Hotel Room Tax

It is recommended that a benefit capture instrument be implemented that targets tourist consumer surplus. The recommended instrument is an earmarked voluntary hotel room fee of US$1 per bed-night, to lead to total revenue of approximately US$1.5 million per year. The use of a hotel room tax is justified from the perspective of the desire to capture the benefit values enjoyed through the use of the marine waters by, almost exclusively, the foreign tourists in Montego Bay. Given the open access management of the Montego Bay Marine Park, and the substantial transaction costs that would be associated with effectively instituting property rights and enforcing efficient pricing of the resource directly, attaching the charge to the complementary service (i.e., the hotel room) is justified (Clarke and Ng 1993).

- Regarding the implementation of a new hotel room tax the question arises whether or not levels of business will be significantly affected. Imposing a new hotel room tax that all guests are required to pay may result in a drop in local demand, at least to some extent. An additional question is how the burden of the tax will be shared between the guests and the hotel owners?

Published studies that estimate the elasticity of demand for the accommodations sector are limited to the United States. Overall, estimates of demand elasticities are variable. Earlier predictions (e.g., Combs and Elledge 1979) indicated that demand is expected to be inelastic, meaning that a

small additional room tax would not substantially affect accommodation business levels. Hiemstra and Ismail (1992), in a survey of members of the American Hotel and Motel Association, found an elasticity of –0.44 (at weighted sample means) (e.g., a 10% increase in the room price with a new tax would lead to approximately a 4.4% drop in the demand). Broken into categories based on room rates, it was found that the demand for more expensive rooms was more elastic (–0.35 for the least expensive category of rooms versus –0.57 for the most expensive category of rooms) (Hiemstra and Ismail 1992). Thus, more expensive hotels might see a proportionately larger drop in business.

If the Montego Bay Marine Park, or more broadly the Government of Jamaica, wishes to "optimize" taxation to capture the maximum rent from the tourists visiting Montego Bay and additionally capture at least a portion of the producer surplus, a mandatory hotel room tax, rather than a voluntary room fee as recommended here, may be a more effective option. A mandatory tax would certainly remove the discretionary component and, thus, more rigidly institutionalize the payment mechanism. However, given the lack of existing evidence regarding the effect of a hotel room tax in Jamaica or even more broadly within the Caribbean, it is prudent to adopt a voluntary fee.

Financing Conservation and Cultural Heritage in Canaima National Park, Venezuela

Canaima National Park is located in the south-east of Venezuela in Bolívar State close to the borders with Brazil and Guyana. The park protects the north-western section of the Guayana Shield, an ancient geological formation shared with Brazil, the Guianas and Colombia. The park was established in 1962 with an area of 10,000km2, but its size was increased to 30,000km2 in 1975 in order to safeguard the watershed functions of its river basins. At that time it became the world's largest national park, its area being equivalent to that of Belgium in Europe, or larger than the State of Maryland. In recognition of its extraordinary scenery and geological and biological values, the park was conceded World Heritage Status in 1994, forming one of a select list of 126 natural and natural-cultural World Heritage Sites worldwide. Canaima actually fulfilled all four of UNESCO's criteria for qualification as a World Heritage property. Ironically, the name of the park, which derives from the novel "Canaima" by Venezuelan author Rómulo Gallegos, means "spirit of evil" in the language of the Pemón, local inhabitants of the park.

This remote land of table mountains, sheer cliffs, and savannah uplands is home to the tallest waterfall on Earth, the 1,002-metre Angel Falls. Encompassing more than 3 million hectares of south eastern Venezuela, along the border with Guyana and Brazil, Canaima National Park includes an extensive region of spectacular tepui summits, steep flat-topped table mountains that are the founts of hundreds of waterfalls. Vegetation includes rolling savannas, moriche groves, montane forests, and dense river woodlands. Wildlife includes giant anteater, giant armadillo, giant otter, three-toed sloth, ocelot, jaguar, capybara, crab-eating raccoon, tapir, peccary, several species of monkeys, and puma. More than 550 species of birds have been seen in the park, and Canaima is world-renowned for being home to over 500 species of orchids. Activities include viewing the amazing table-mountain tepui formations, visiting the tallest waterfalls on Earth, dayhiking, wildflower photography, and wildlife observation.

Ecotourism threats include accumulation of garbage, faecal pollution, extraction of flora, extraction of crystals, introduction of exotic plant species, deforestation for firewood, burning to clear trails, opening of new trails, erosion

Conservation Value

Of economic importance, water drains from the flat summits forming hundreds of waterfalls. The Río Caroní, with its many tributaries arising within the park, supplies the Guri dam that provides electricity to large areas of the country. There are many waterfalls in the park including Angel Falls, the world's tallest at 1002m (Government of Venezuela, 1993). The park currently receives 100,000 visitors per year, 90% of whom visit the Gran Sabana (Government of Venezuela, 1993).

Canaima National Park exhibits an exceptional geomorphology produced by weathering processes. The distinctive tepui formations give rise to numerous waterfalls, including Angel Falls, the world's highest. The high level of endemism found on the summits of the tepuis has led to the recognition of Pantepui as a unique bio geographical entity. Canaima is the homeland of one of the largest Amerindian populations in the country. The park protects the headwaters of the Río Caroní which supplies Guri, the country's largest hydroelectric power station and source of 77% of the nation's energy. Based in table below, conservation in Canaima National Park is saving Venezuela present value replacement costs of 90 million to 134 million dollars.[2] Power capacity was on the order of 10 millions kW by 1992, with construction of a second stage of 7.5 millions kW well advanced. A third stage of development, now only at project level would further push energy capacity to a grand total of 26.8 million kW.

From the very beginning of the hydroelectric works, EDELCA (Electrificación del Caroní), the utility company, was aware of the importance of conserving the vegetation cover of the river basin to protect the Guri reservoir from silting up. If this happens energy capacity would fall and the useful life of a multibillion dollar investment will be threatened. EDELCA lobbied successfully to extend the protected areas already existing in the Caroní basin and to impose a legal ban to keep commercial agriculture out of the basin. Currently EDELCA operates and pays for a sophisticated watershed surveillance program for the Caroní river basin. The program includes hydrological data gathering, aerial surveillance, fire control systems in critical areas (some 2.1 million hectares) and support for local Indian communities.

EDELCA's interest in conservation is well grounded. According to detailed studies conducted at IVIC, Venezuela's Science Institute (Rabinovich, 1976), if unchecked deforestation occurred in the fragile Caroní basin, the power capacity of the hydroelectric system would be reduced between 10% and 15% when the project useful life was half over. EDELCA's detailed information on past and future investment plans (Lezama, 1992) helps gauge the cost of replacing such energy losses. The hydroelectric system has an expected life of 60 years and, in the moderate deforestation scenario damages are expected to occur at mid life. Therefore replacement investment for the current installed capacity -17.7 million kW- would have to be in place in year 30, and according to engineering information would have to take place between year 25 and year 29. I have assumed that the investment is evenly distributed over that five year period, at the marginal investment cost of US$ 1,200 per kW (1992 prices). NPs make up one third of the basin, therefore only one third of the avoided replacement costs can be counted as benefits from conservation (see table).

[2] At an 8% discount rate, see annex table A.1. columns 1 and 2. Marginal investment costs are based in EDELCA's figures for the third stage expansion plans. If the third stage is undertaken, benefits of watershed protection would increase significantly, because the investment in place would be larger, and marginal investment costs would be higher.

Table Hydroelectric Production Benefits

1. 1992 capacity	17.7 Million kW (MkW)
2. Possible energy losses due to deforestation at dams' mid life (year 30)	Low 10% High 15% 1.77 MkW 2.655MkW
3. Marginal investment cost per kW (1992 US dollars)	$ 1,200
4. Total investment costs to replace energy losses (Row 2 times row 3) (Millions of 1992 US dollars)	L=$ 2,124M H=$ 3,186M
5. Investment costs per year throughout years 25-29 (row 4 divided by 5) (Millions of 1992 US dollars)	L=$ 424.8M H=$ 637.2M
6. Annual conservation benefits throughout years 25-29 (one third of row 5)	L=$ 141.6M H=$ 212.4M

Thirty-five years after the creation of Canaima National Park, the area continues to be managed on a shoestring budget. Although the conditions for staff have improved in the last five years, the budget does not cover even the most basic management necessities: for example, the Gran Sabana has one vehicle in poor condition and there is no radio system. The Western Sector of the park is still lacking a Zoning and Use Plan.

The General Case for an Entrance Fee and Ecotourism Tax

The recommended instrument for the site is a two-tiered park entrance fee that is already in place (US$10 for international visitors and US$4 for Venezuelan residents) and an ecotourism tax collected by the park service of US$1 per overnight stay in the park, to lead to an annual revenue of approximately US$5.0 million.

References

Beer, M, 1939. An Inquiry into Physiocracy. New York, New York: Russell and Russell.

Bunce, L and K Gustavson, 2000. The social context for local management in Jamaica. In: K Gustavson, RM Huber and J Ruitenbeek (eds.), Integrated Coastal Zone Management of Coral Reefs: Decision Support Modeling. Washington, DC: The World Bank. pp.159-173.

Bunce, L, K Gustavson, J Williams, and M Miller, 1999. The human side of reef management: a case study analysis of the socio-economic framework of Montego Bay Marine Park. Coral Reefs 18: 369-380.

Clarke, HR and Y-K Ng, 1993. Tourism, economic welfare and efficient pricing. Annals of Tourism Research 20: 613-632.

Cleveland, CJ, 1987. Biophysical economics: historical perspectives and current research trends. Ecological Modeling 38: 47-73.

Combs, JP and BW Elledge, 1979. Effects of a room tax on resort hotel/motels. National Tax Journal 32: 201-207.

Goreau, TJ, 1992. Bleaching and reef community change in Jamaica: 1951-1991. American Zoologist 32: 683-695.

Gustavson, K, RM Huber and J Ruitenbeek (eds.), 2000. Integrated Coastal Zone Management of Coral Reefs: Decision Support Modeling. Washington, DC: The World Bank

Hiemstra, SJ and JA Ismail, 1992. Analysis of room taxes levied on the lodging industry. Journal of Travel Research 31(1): 42-49.

Huber, RM and SC Jameson, 2000. Integrated coastal zone management in the tropical Americas and the role of decision support models. In: K Gustavson, RM Huber and J Ruitenbeek (eds.), Integrated Coastal Zone Management of Coral Reefs: Decision Support Modeling. Washington, DC: The World Bank. pp.3-21.

Huber, R, J Ruitenbeek and R Serôa da Motta, 1998. Market Based Instruments for Environmental Policymaking in Latin America and the Caribbean: Lessons from Eleven Countries. Washington, DC: The World Bank.

Hughes, TP, 1994. Catastrophies, phase shifts, and large-scale degredation of a Caribbean coral reef. Science 265: 1547-1551.

Hughes, TP, BD Keller, JBC Jackson, and MJ Boyle, 1985. Mass mortality of the echinoid Diadema antillarum Philippi in Jamaica. Bulletin of Marine Science 36: 377-384.

Jameson, SC and J Williams, 2000. Local needs and interventions for management of coral reefs in the developing tropical Americas – the Montego Bay Marine Park case study. In: K Gustavson, RM Huber and J Ruitenbeek (eds.), Integrated Coastal Zone Management of Coral Reefs: Decision Support Modeling. Washington, DC: The World Bank. pp.25-45.

Lezama, A. (1992) Hidroenergia y Areas Protegidas en la Cuenca del Rio Caroni. IV World Congress on National Parks and Protected Areas. Caracas, February 1992.

Lapointe, BE, 1989. Caribbean coral reefs: are they becoming algal reefs? Sea Frontiers 35: 81-91.

Liddell, WD, and SL Ohlhorst, 1986. Changes in benthic community composition following the mass mortality of Diadema at Jamaica. Journal of Experimental Marine Biology and Ecology 95: 271-278.

O'Connor, D, 1999. Applying economic instruments in developing countries: from theory to implementation. Environment and Development Economics 4: 91-110.

Organization for Economic Cooperation and Development (OECD), 1994. Managing the Environment: The Role of Economic Instruments. Paris: OECD.

Rabinovich J. (1976) EL modelo Guri: Analisis de un potencial conflicto en el uso de recursos naturales en una cuenca tropical. Instituto Venezolano de Investigaciones Científicas, IVIC, Caracas.

Ricardo, D, 1960. The Principles of Political Economy and Taxation. London, UK: JM Dent & Sons Ltd.

Ruitenbeek, HJ, M Ridgley, S Dollar and R Huber, 1999. Optimization of economic policies and investment projects using a fuzzy logic based cost-effectiveness model of coral reef quality: empirical results for Montego Bay, Jamaica. Coral Reefs 18: 381-392.

Ruitenbeek, J, M Ridgley, S Dollar and R Huber, 2000. Interventions for coral reef conservation – a least cost model. In: K Gustavson, RM Huber and J Ruitenbeek (eds.), Integrated Coastal Zone Management of Coral Reefs: Decision Support Modeling. Work in Progress for Public Discussion. Washington, DC: The World Bank. pp.129-148.

Serôa da Motta, R, RM Huber and HJ Ruitnebeek, 1999. Market based instruments for environmental policymaking in Latin America and the Caribbean: lessons from eleven countries. Environment and Development Economics 4: 177-201.

Sullivan, K, and M Chiappone, 1994. Montego Bay Marine Park, Jamaica: Rapid Ecological Assessment. Conservation Data Centre, The Nature Conservancy, and Natural Resources Conservation Authority, Arlington, Virginia, USA.

Spash, CL, JD van der Werff ten Bosch, S Westmacott and J Ruitenbeek, 2000. Lexicographic preferences and the contingent valuation of coral reef biodiversity in Curaçao and Jamaica. In: K Gustavson, RM Huber and J Ruitenbeek (eds.), Integrated Coastal Zone Management of Coral Reefs: Decision Support Modeling. Washington, DC: The World Bank. pp.97-117.

Woodley JD, EA Chornesky, PA Clifford, JBC Jackson, LS Kaufman, N Knowlton, JC Lang, MP Pearson, JW Porter, MC Rooney, KW Rylaarsdam,VJ Tunnicliffe, CM Wahle, JL Wulff, ASG Curtis, MD Dallmeyer, BP Jupp, MAR Koehl, J Neigel, and EM Sides, 1981. Hurricane Allen's impact on Jamaican coral reefs. Science 214: 749-755.