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COST BENEFIT ANALYSIS AND MARINE PARK PLANNING IN THE SOUTH COAST MARINE CONSERVATION AREA, ST. VINCENT AND THE GRENADINES

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ABSTRACT

Marine and coastal ecosystems provide a range of goods and services that support human health and wellbeing. These highly sensitive resources however, face multiple threats from both anthropogenic and natural sources. Left unabated these pressures can severely compromise the ocean's ability to continually provide critically needed services. Establishing marine protected areas (MPAs) has increasingly been embraced as a key strategy to address many of the threats facing marine and coastal resources. Due to lack of sustainable funding however, many MPAs around the world fail to meet their management objectives. This study examined the costs and potential benefits of upgrading the South Coast Marine Conservation Area (SCMCA), St. Vincent and the Grenadines into a functional marine park. Start up and operating costs for the proposed park were determined, and weighed against the value of the indirect benefits provided by ecosystem services in the SCMCA, and projected user fee income in a cost benefit analysis. Analysis revealed that the net present value of combined indirect and direct benefits supported the development of the proposed park. The net present value of direct benefits only however, indicated that projected income from user fees will not be sufficient to allow the proposed park to sustainably fund estimated annual operating costs. Alternative means through which funding gaps can be met would thus need to be identified.

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ABBREVIATIONS

BMZ	The German Federal Ministry of Economic Cooperation and Development
CaMPAM	Caribbean Marine Protected Areas Managers Network and Forum
CATS	Caribbean Aqua Terrestrial Solutions
CBD	Convention on Biological Diversity
CERMES	Centre for Resources Management and Environmental Studies
CRMCMB	Coastal Resources Management and Conservation of Marine Biodiversity in the Caribbean
GEF	Global Environmental Facility
IUCN	International Union for Conservation of Nature
NGO	Non-Government Organization
MCA	Marine Conservation Area
MPA	Marine Protected Area
NPRBA	National Parks, Rivers and Beaches Authority
OPAAL	Organization of Eastern Caribbean States Protected Areas and Associated Livelihood
NPV	Net Present Value
PoWPA	Programme of Work on Protected Areas
SCMCA	South Coast Marine Conservation Area
SVG	St. Vincent and the Grenadines
TCMP	Tobago Cays Marine Park
TNC	The Nature Conservancy
UNEP	United Nations Environment Programme
WTP	Willingness to Pay

Unless otherwise stated, all prices are in Eastern Caribbean Dollar (ECD).
Exchange rate: 2.7 ECD = 1 United States Dollar

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1 INTRODUCTION

Marine ecosystems provide a wide range of goods and services that support human health and wellbeing. Across the Caribbean, coastal ecosystems attract tourists, protect shorelines from storm damage and contribute to fisheries. Coastal resources however, are under constant threat from numerous anthropogenic and natural stresses. Unimpeded, these threats can compromise the ecosystem's ability to continually provide benefits to society.

Marine protected areas (MPA) have been recognized as valuable conservation tools in global efforts to promote the sustainable use of resources. Within recent years, the Fisheries Division, St. Vincent and the Grenadines (SVG), in collaboration with the National Parks, Rivers and Beaches Authority, has spearheaded efforts to designate the South Coast Marine Conservation Area (SCMCA) as the country's second marine park. Comprising a number of sandy beaches and coral reefs, the SCMCA is an area of high social and heritage value, and is a major hub of the hotel and tourism industry on mainland St. Vincent. However, coastal habitats within the SCMCA have experienced significant decline in recent times due to improper use and waste disposal. Additionally, a number of user conflicts have developed among stakeholder groups including the yachting, tourism, recreational sport and boat servicing industries. Urgent intervention is thus needed to prevent further escalation of these potentially detrimental threats. It is envisioned that under the managed framework of a marine park, these and other conflicts could be better addressed, in a manner beneficial to each interest group.

To this end, in 2013 a multi sectorial group, led by the Fisheries Division and National Parks, Rivers and Beaches Authority, developed an initiative aimed at establishing and operationalizing the proposed South Coast Marine Park. This project is expected to proceed over two years and includes baseline biodiversity assessments, development of management and sustainable financing plans, zoning and demarcation of park boundaries and the implementation of revenue generating mechanisms (e.g. user fees, payment for ecosystem services, etc.) in the SCMCA.

A 2012 economic valuation study of ecosystem services in St. Vincent and the Grenadines has demonstrated the monetary benefits of expanding the MPA network in SVG. The study further recommended that planned expansion of the protected area system in SVG be better justified by comparing the costs and benefits of such. To date however, no economic analysis of the proposed park in the SCMCA has been carried out. This study examines the costs and benefits involved in upgrading the SCMCA into a marine park. Establishment and operating costs will be assessed and weighed against expected benefits, to provide an overview of the financial implications of establishing the proposed park. It is envisioned that this study will prove useful to policy makers in the ongoing process to develop the proposed park, and also serve as a template for future analysis of a similar nature in St. Vincent and the Grenadines.

2 GLOBAL OVERVIEW OF MARINE PROTECTED AREAS

Marine and coastal ecosystems are amongst the most productive ecosystems on earth and provide a wide range of goods and services that support human health and wellbeing (IUCN 2008). They are important sources of food and income for millions around the world and supply critical regulatory services that enables human existence (Table 1). However, coastal ecosystems face multiple threats from both anthropogenic and natural sources. An estimated 75 percent of the world's coral reefs are threatened by rising sea temperatures and manmade threats including overfishing and destructive fishing practices (Burke *et al.* 2011). Left unabated, these and other threats severely compromise the health and productivity of coastal ecosystems (IUCN 2008).

Table 1: Services provided by coastal and marine ecosystems (Waite *et al.* 2014).

Ecosystem services	Coral Reefs	Mangroves	Beaches	Seagrassses
Provisioning services				
Food	+	+	+	+
Raw materials	+	+	+	+
Medical resources	+	+		+
Genetic resources	+	+		+
Regulating services				
Flood/storm/erosion regulation	+	+	+	+
Climate regulation	+	+	+	+
Cultural services				
Tourism and recreation	+	+	+	+
History, culture, traditions	+	+	+	+
Science, knowledge, education	+	+	+	+
Supporting services				
Primary production	+	+	+	+
Nutrient cycling	+	+	+	+
Species protection	+	+	+	+

Worldwide, the implementation of Marine protected areas (MPAs) has been adopted as a key strategy to address many of the issues facing marine resources. Much research has focused on their utility as fisheries management tools (Mateos-Molina *et al.* 2014, Roberts *et al.* 2005) Further work has also substantiated their worth in maintaining biodiversity and ecological systems (Lester *et al.* 2009, Halpern 2003). MPAs also provide opportunities for education, recreation and increased standard of living for surrounding communities (Mascia *et al.* 2010). Effectively managed MPAs thus help to maintain resilience of coastal and marine ecosystems, while facilitating increased human and economic development.

Globally, protected area type and objectives vary significantly. The International Union for the Conservation of Nature (IUCN) broadly classifies protected areas into six categories. These range from strictly protected reserves that prohibit all forms of extraction, to multi use areas that allow

various types and degrees of usages (Table 2). However, terminology used to designate protected areas are not necessarily comparable across countries as in local, regional and international context, definition varies (Chape *et al.* 2005). A "reserve" for instance, in one country, may allow fishing while in another, exploitive use is strictly prohibited in reserves.

Table 2: IUCN protected area categories (IUCN 1994).

IUCN CATEGORY		MAIN OBJECTIVE OR PURPOSE
IA	Strict Nature Reserve	Strictly protected areas to protect biodiversity and possibly geological/geomorphological features. Human visitation, use and impacts are strictly controlled and limited to ensure preservation of the conservation values. These areas can serve as indispensable reference areas for scientific research and monitoring.
IB	Wilderness Area	Large or slightly modified areas, retaining their natural character and influence without permanent or significant human habitation, which are protected and managed so as to preserve their natural condition.
II	National Park	Large natural or near natural areas set aside to protect large-scale ecological processes, along with the compliment of species and ecosystems characteristic of the area, to provide a foundation for environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities.
III	Natural Monument	Set aside to protect a specific natural monument, which can be a landform, sea mount, submarine caverns, geological feature such as caves or even a living feature such as an ancient grove. They are generally quite small protected areas and often have high visitor value.
IV	Habitat/Species Management Area	Protect particular species or habitats and management reflects this priority. Regular, active interventions often needed to address the requirements of particular species or to maintain habitats.
V	Protected Landscape/Seascape	Where the interaction of people and nature over time has produced an area of distinct character with significant ecological, biological, cultural and scenic value; and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.
VI	Managed Resource Protected Area	Large, with much of the area in a natural condition and where a proportion is under sustainable natural resource management. Exploitation is a main aim of the area.

Planning and designing protected areas is often driven by physical factors and various schemes have been developed to objectively assess whether candidate sites possess the ecological attributes, needed to achieve their objectives. Commonly assessed criteria include habitat representation, area size, linkages between habitats and species diversity (Roberts *et al.* 2003). While research has shown that small MPAs may be effective in achieving their conservation objectives (Halpern 2003), over the last decade or so, much attention has focused on creating large scale MPAs or networks of MPAs. The argument is that in isolation, small MPAs may not be sufficient to support sustainable pollutions of marine life, thus casting doubt on their ability to help achieve conservation and other objectives. (Roberts *et al.* 2003, IUCN 2008). Conversely, bigger reserves provide greater connectivity between habitats, and better maintain large-scale ecological processes necessary to support viable pollutions of marine life (IUCN 2008). However, while large MPAs may be more advantageous from an ecological standpoint, they may prove to be economically and institutionally impractical (IUCN 2008). Additionally, in highly used areas, large reserves may not be well

accepted by the wider public. This is of particularly note since a reserve's ability to achieve its objectives is directly related to the rate of compliance (Roberts *et al.* 2003)

Effective design is also strongly linked to MPA goals and objectives. Fishery reserves for example may be concerned with sustaining reserve populations and supplying harvested areas, thus their design should have sound biological basis (Roberts *et al.* 2003). Tourism based protected areas on the other hand, may be more focused on income generation, necessitating consideration of additional or different design factors (Halpern 2003). As goals and objectives influence key decisions such as boundaries, size and management framework, it is essential that they be clearly defined at the beginning of the MPA planning process. Identification of well defined, measurable goals also helps to determine the focus of monitoring and evaluation programmes, that will enable tracking of progress and performance over time (IUCN 2008, Roberts *et al.* 2003).

Development of marine protected areas also encompasses socioeconomic considerations. Research has shown that MPAs are more likely to be successful when stakeholders are engaged in conceptualization, planning and management (Jentoft *et al.* 2012, Bavinck and Vivekanandan 2011, Klein 2008). Stakeholders however are often only engaged during the implementation process and not design phase of MPA development (Christie 2004). Even when consulted, stakeholders can be very doubtful or even opposed to proposed protected areas. This may be as a result of government planner's failure to properly communicate to public stakeholders what the proposed MPA is meant to achieve. It is also likely that stakeholders remain unconvinced that an MPA will improve their individual social welfare and leave them little opportunity to effectively participate in its governance (Jentoft *et al.* 2012). Power dynamics and division between and within stakeholder groups can also create conflict that impede successful MPA implementation (Bavinck and Vivekanandan 2012). Nonetheless, MPAs designed specifically around socioeconomic considerations can be more successful at minimizing impacts on fisheries resources, than those produced without socioeconomic considerations (Klein *et al.* 2008). Creating mechanisms that include people in decision making and being able to adequately manage their expectations should thus be emphasized to increase the likelihood of MPA success (Klein *et al.* 2008).

2.1 MPA management effectiveness

Around the world, MPA management effectiveness remains largely inadequate with many MPAs protected in name only, and others failing to meet stated objectives (Burke *et al.* 2011). In fact, in a global review of over 1147 coral reef related MPAs, only an estimated 15 percent of those surveyed were found to be effective in achieving their management objectives (Burke *et al.* 2011) (Table 3). In areas of the world such as the Caribbean where many livelihoods are dependent on coastal resources, ineffective management of coastal resources can have far reaching consequences that threaten the long term viability of development goals (TNC 2014, Depondt and Green 2006).

Many factors influence management effectiveness including regulatory mechanisms and available human and technical resources. However, inadequate financing is often identified as a major barrier to successful implementation, and the cause of functional failure of many MPAs (Emerton *et al.* 2006).

Table 3: Effectiveness of coral reef-related MPAs by region (Burke *et al.* 2011).

Region	No. of sites	Sites rated	Proportion of rated sites (%)		
			Effective	Partial	Not effective
Atlantic	617	310	12	26	61
Australia	171	27	44	52	4
Indian Ocean	330	192	29	46	25
Middle East	41	27	33	37	30
Pacific	921	252	18	57	25
Southeast Asia	599	339	2	29	69
Global Total	**2679**	**1147**	**15**	**38**	**47**

While being able to forecast income allows for better planning, many MPAs lack the ability to sustainably fund operating costs, in fact, many were established without proper consideration of how recurrent costs were to be met (Emerton *et al.* 2006). Lacking the requisite financing, these MPAs therefore struggle to achieve their management objectives.

Globally, domestic government budgets are the single largest source of protected area financing. However, in many instances, protected areas remain inadequately funded as development needs, often overshadow low priority conservation goals (Emerton *et al.* 2006). International donor grants are another important source of funding for MPAs, particularly in developing countries. Grants such as those provided under the World Bank's Global Environmental Facility (GEF), are commonly used to fund protected area start-up costs and capital projects, but are often unpredictable and therefore unsustainable. For these reasons, multiple income streams should be pursued and developed as part of a long term, sustainable plan for MPA success (Emerton *et al.* 2006).

Nonetheless, being able to secure adequate levels of funding does not necessarily lead to increased MPA effectiveness. Institutional weaknesses within management entities can lead to inefficient use of resources and mismanagement (Emerton *et al.* 2006). For example, funding sourced from government is often heavily skewed towards recurrent costs, particularly salaries, leaving less funds available for critical infrastructure development. Disbursement of funds from centrally allocated budgets can also prove problematic. In protected areas where generated or donor based income is not retained, and budgets are not linked to earnings, there is very little incentive to generate additional income or improve efficiencies (Emerton *et al.* 2006). These all underscore the need for MPAs to be supported by financial frameworks and mechanisms, which best ensure funding is allocated and spent efficiently.

Despite these and other management challenges, the number of MPAs worldwide continues to grow annually. Wood *et al.* (2008) reported that the spatial extent of global MPAs grew at an annual rate of 4.6 percent since 1984. This push no doubt has been propelled by international policies that support biodiversity conservation and the development of protected areas worldwide. The United Nations Convention on Biological Diversity (CBD) for instance, aims to build a global network of effectively managed protected areas, covering at least 10 percent of global marine habitats by 2020

(CBD 2010). Many countries have since ratified and acted on the obligations under agreements such as this, leading to the observed increase in the number of protected areas declared worldwide. However, while the CBD and other agreements have been influential in shaping the priorities of donor agencies, research has shown that these commitments have often been adopted without prior assessments of feasibility and remain inadequately funded (Wood *et al.* 2008). Further, with an annual rate of increase in new MPAs of 4.6 percent, spatially based targets were unlikely to be met which questions the relevance and utility of broad conservation targets. In any event, broad scale conservation targets have served to increase global awareness of the need to conserve biodiversity, and have also mobilized support that has led to tangible actions that directly support sustainable resource use (Wood *et al.* 2008).

2.2 Economic Analyses of MPAs

Though coastal ecosystems provide varied benefits to people around the world, competing societal demands and pressures can result in compromises on environmental conservation and protection (Glenn *et al.* 2010). In fact, the flow of goods and services from nature is often overlooked in decision making and is often only considered after they have been lost (van Beukering 2007). However, changes in the ecosystem directly affect the level and quality of services provided to human. Being able to assess the economic impacts of changes that affect ecosystem functioning can provide information on how to sustainably manage resources. Similarly, it helps to engage stakeholders, build political support and provide justification for soliciting resources (IUCN WCPA 2008, Murdoch *et al.* 2007, Glenn *et al.* 2010).

As many environmental goods and services are not formally traded on markets, they lack readily observable prices (van Beukering *et al.* 2007). Being able to monetize the impacts of ecosystem goods and services helps to translate their values to stakeholders, in a manner that is familiar and easy to understand. Valuation also facilitates comparative analysis of proposed interventions thus helping to make the trade-offs of decision making more explicit (Waite *et al.* 2014).

Economic valuations have been used globally to address a wide range of policy priorities. These include determining appropriate levels of damage compensation, comparing costs and benefits of different coastal resource uses, developing climate change adaption strategies and raising awareness of the economic benefits of conservation (van Beukering *et al.* 2007). Valuation methodology varies according to what exactly is being measured and how the information is to be used (Appendix 1) however, chosen methodology should produce accurate enough results, in a cost effective and timely manner (Waite *et al.* 2014).

To determine the value of proposed interventions, alternative scenarios are usually developed and compared. The number of scenarios developed is limited by available resources however, a baseline scenario where the status quo is maintained, is often compared to at least two other alternatives, for example best and worst case scenarios (Waite *et al.* 2014). In this way, key assumptions about the future and uncertainties are accounted for.

The impacts of each scenario is then assessed and compared. This requires identifying the causal links between developed scenarios, ecosystem services and resource users which helps to highlight the winners and losers or unavoidable trade-offs (Waite *et al.* 2014). Once identified, impacts are then monetized and can be used for further analysis.

In economic valuation studies, impacts are assessed in terms of the benefits they provide to humans (van Beukering *et al.* 2007). This is reflected in the Total Economic Value concept that divides the value of a resource into use and non-use values (Figure 1). Non-use values refer to benefits derived from goods and service independent of present or future use. This can be further broken down into bequest values (benefits from ensuring that goods and services will be available for future use) and existence values (value placed on just knowing something exists).

Use values are divided into direct and indirect use values. Direct use values pertain to goods and services directly used by humans. These are either consumptive e.g. timber production, or non-consumptive e.g. beach recreation. Indirect use values refer to ecosystem services which can be essential to human existence e.g. oxygen production. Lastly, option values combine both use and non-use ideals and represents the significance of a good or service in the present for a potential future use (van Beukering *et al.* 2007). One example includes medicine potentially found in coral reefs or forests. Direct and indirect use values are often easier to quantify and are also more likely to influence policy makers (Waite *et al.* 2014). Non-use and option values on the other hand, are more difficult to estimate and possess a high degree of uncertainty.

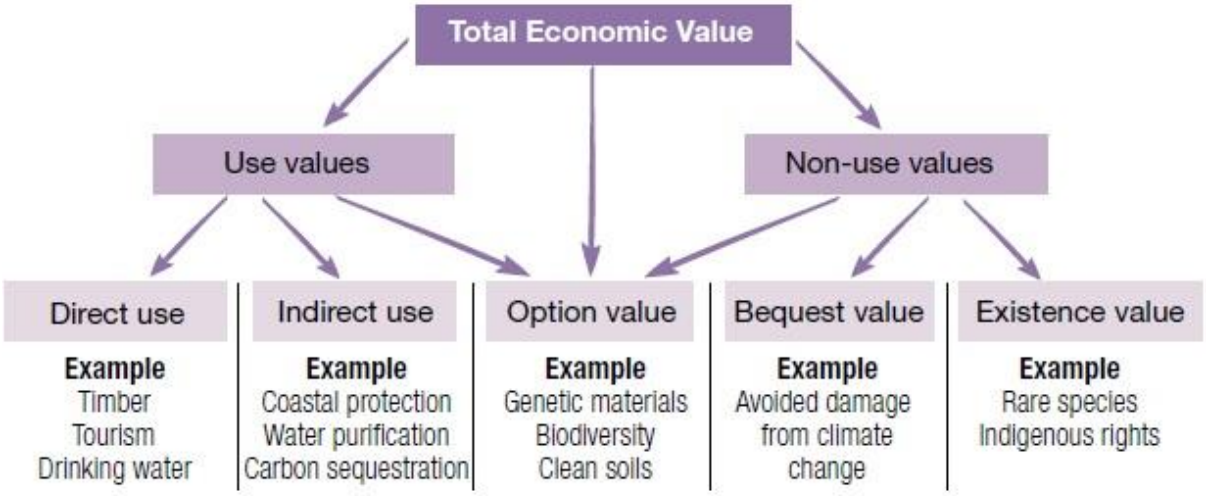

Figure 1: Total Economic Value framework of an ecosystem (van Beukering *et al.* 2007).

The outputs of valuation studies can be expressed in a number of ways including willingness to pay and producer and consumer surplus values. However, when a valuation is intended to target a specific decision, decision support tools can be used to produce outputs more familiar to policy makers.

Cost benefit analysis is the most commonly used decision support tool used to appraise and evaluate investment trade-offs (van Beukering *et al.* 2007). As defined by Hanley and Barbier (2009), Cost benefit analysis is *"the technique for measuring whether the benefits of a particular action are bigger than the costs."* The action in question may be a particular investment project or policy. This analysis is carried out by summing the costs and benefits of alternative options, and comparing options in terms of their net benefits i.e. the extent to which benefits exceed costs. Simply put, cost benefit analysis provides insight on how much society is likely to profit from

proposed investments. It is a standard tool used by many governments and organizations and provides a framework that monetized environmental values can be easily integrated into (van Beukering *et al.* 2007).

A key strength of cost benefit analysis is that alternative options can be quickly computed and compared (van Beukering *et al.* 2007). On the other hand, cost benefit analysis can fail to assess the full value of coastal ecosystem services, particularly the value of difficult to measure and nonmarket benefits (Schuhmann 2012). While methodologies exist for estimating the value of nonmarket goods and services, significant limitations in accuracy and reliability persist in some cases (van Beukering *et al.* 2007). Ineffective monitoring and lack of reliable data can also make quantitative assessment of other values difficult (Murdoch *et al.* 2007). As a result, estimating a monetary value for some costs and benefits may not be possible, thus precluding their use in a cost benefit analysis. Undervaluing benefits however, can lead to underinvestment and mismanagement of resources. This in the long term, can negatively affect the provisioning of services that impact human welfare (van Beukering *et al.* 2007, van der Lely *et al.* 2013).

2.3 Impact of Economic Valuation studies in the Caribbean

Across the Wider Caribbean, interest in economic valuation of environmental services has increased significantly over the last thirty years (Waite *et al.* 2014). Kushner *et al.* (2012) reported that over 200 coastal and marine valuation studies of varying quality have been completed in the region. These studies have largely focused on a limited number of relatively easy to measure benefits, such as those derived from recreational opportunities, and have employed the use of a variety of valuation methods. However, variation in research methodology and quality has resulted in data that is often not comparable across studies. This then leads to an incomplete understanding of ecosystem services values across the region (Schuhmann 2012).

Despite increased interest in valuations, few studies seemed to have had meaningful impact on environmental policy or decision making. Of the more than 200 coastal economic valuation studies conducted in the Caribbean, only 16 valuation studies appeared to have had a positive influence on policy (Kushner *et al.* 2012, Waite *et al.* 2014). Clear policy questions, local demand for valuations, strong local partnerships, good governance, effective communication and clear presentation of methods, appear to be the key factors that led to the successful influence of these studies. The presence of "in country champions", low organizational turnover and the ability to identify clear links between ecosystem services and resource users, were also recognized as key conditions that governed the likelihood of valuation studies influencing policy (Table 4).

These results reiterate the fact that there is no one "best" valuation method, but that instead, methodology should be assessed as part of a wider contextual and procedural framework. Furthermore, aiming for absolute accuracy is not always necessary but clear presentation of methods, assumptions and limitations is needed in order to address critiques and legitimize valuation results (Kushner *et al.* 2014).

Table 4: Key conditions enabling the effective use of economic valuation studies in policy making (Kushner *et al.* 2012).

Contextual	Procedural	Methodological
Dependence on coastal resources	Set realistic expectations	A clear policy question
Good governance including high transparency and public participation, and ability to enforce laws	Identify causal links between ecosystems, ecosystem services and resource users	The type of methodology has less significance than the quality of its application and other enabling conditions
In-country champions - people with good access to decision makers	Develop a strategy for widespread and targeted dissemination of valuation results	Methodology that produces relatively accurate numbers
Low organizational turnover	Results packaged according to stakeholder interest	The type of ecosystem service being valued may matter
Visible threats to resource encourage demand for valuation	Target windows of opportunity to influence strategy	
Country size-might be easier to communicate valuation results in smaller country	Stakeholders engaged in all phases of valuation	

One example where economic valuation enabled effective policy change in the Caribbean is the introduction of user fees in the Bonaire National Marine Park. Part of the Netherlands Antilles, Bonaire has been the subject of many coastal valuation studies (Waite *et al.* 2014). With limited terrestrial resources, Bonaire is heavily dependent on coastal tourism (particularly diving and snorkelling), and an estimated total economic value of US$105 million is derived from its marine and terrestrial ecosystems annually (van der Lely *et al.* 2013).

Given this high reliance on coastal tourism, Bonaire has taken significant steps to conserve and protect its coastal ecosystems including the establishment of the Bonaire National Marine Park. Initially funded with support from government and NGOs in 1979, the Bonaire National Marine Park found itself unable to finance its operations in later years (Thur 2010). A 1991 study however revealed that dive visitors were willing to pay an annual fee of over US$30 for improved park management that would help to maintain coral reef quality. This resulted in the implementation of a US$10 yearly diver fee which by 1992, generated enough income for the Bonaire National Marine Park to self-fund its operating budget, becoming the first MPA in the Caribbean to do so (Thur 2010).

Efficiency and transparency in the management of fee revenue helped the fee system sustain broad support from both tourists and dive operators. Revenue earned supported regular park patrols, development and dissemination of educational materials and proper maintenance of more than 100 moorings (Thur 2010, Waite *et al.* 2014). Additionally, the integration of fee collection directly into existing operations, (dive operators and hotels collected fees and remitted them to the park on a weekly basis), reduced administrative costs and increased accountability (Waite *et al.* 2014). In 2005, a subsequent willingness to pay study led to an increase in the yearly diver fee to US$25 and the implementation of a US$10 charge on other water users (snorkelers, swimmers, fishermen, etc.). Today, Bonaire's National Marine Park remains one of the few self-financed marine parks in the Caribbean and one of the healthiest marine ecosystems in the world (Waite *et al.* 2014).

3 MARINE PROTECTED AREAS IN ST. VINCENT AND THE GRENADINES

St. Vincent and the Grenadines is an archipelagic state in the Eastern Caribbean with an exclusive economic zone of 27,500 km^2. The main island St. Vincent is composed of steep volcanic slopes while the Grenadines are comprised of a series of smaller islands and cays. The islands possess a range of ecosystems and habitats, and a variety of plant and animal species. Coastal and marine ecosystems are also a major source of revenue for many, particularly in the Grenadines where tourism and fishing are especially important (GOSVG 2010).

Under the Fisheries Act of 1986 and Regulations of 1987, The Government of St. Vincent and the Grenadines (GOSVG) designated ten marine conservation areas (MCAs) (Figure 2) to help conserve marine ecosystems. These MCAs, were initially recognized as important fisheries habitats and overlie nearshore coral reefs, seagrass beds and sensitive wetlands (Kirby-Straker 2003). Though designated by law, little was initially done to develop effective onsite management mechanisms for MCAs in SVG. Limited infrastructure was developed and monitoring and surveillance within these areas remained insufficient (Jackson 2004). Boundary markers have not been established and a majority of locals are likely not aware of their existence or locations (Simmons and McConney 2006). Additionally, the conservation status of MCAs remains relatively ambiguous as it is unclear what activity is and is not allowed within their boundaries. Spear fishing remains the only explicitly restricted activity as per the Fisheries Regulations of 1987.

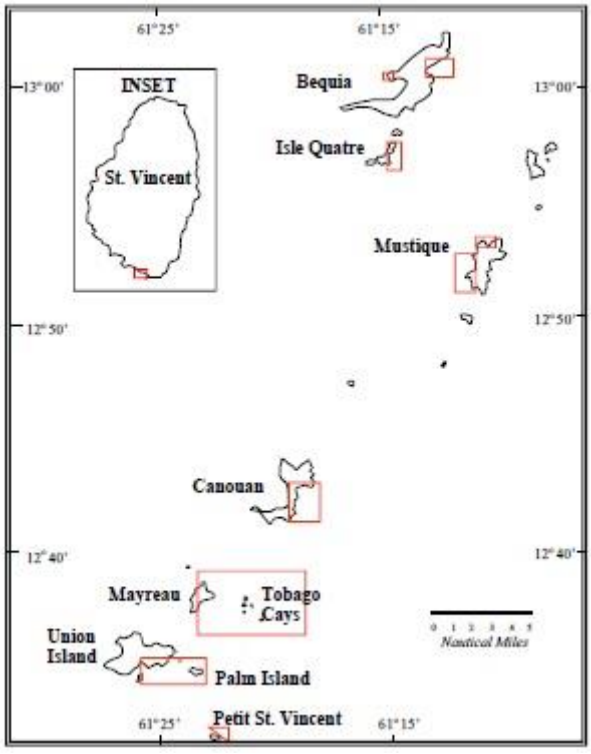

Figure 2: Location of Marine Conservation Areas in St. Vincent and the Grenadines (Kirby-Straker 2003).

As per their respective legal mandates, a number of different government agencies share jurisdiction over protected areas in SVG (Jackson 2004). Functionally however, the Fisheries Division is the lead organization on the management and planning of activities relating to

existing MCAs in SVG. Frequent collaboration on planning and management activities occurs however with the National Parks, Rivers and Beaches Authority (NPRBA). Established in 2002 with the passage of the National Parks Act (2002), the NPRBA has been tasked with implementing the SVG National Parks and Protected Area System Plan, which outlines a number of proposed protected areas throughout SVG (see section 3.2). In light of the resource limitations of other protected area management agencies, the establishment of the NPRBA is seen as a key part of the GOSVG's response, to increasing institutional capacity for tourism development and protected area management in SVG (Constantine and Samuel 2010).

3.1 Tobago Cays Marine Park

The passage of the Marine Parks Act, 1997 and the Marine Parks (Tobago Cays) Regulations, 1998 saw one MCA, the Tobago Cays, being legislated as the country's first marine park. This designation marked a move towards the implementation of more tourism based development in the Tobago Cays (Gill 2010).

Located in the Southern Grenadines, The Tobago Cays Marine Park (TCMP) comprises a central lagoon surrounded by the five islands of the Tobago Cays and the island of Mayreau. Encompassing a wide variety of marine habitats, the TCMP provides nursery and foraging habitats for commercially important marine species and other wildlife, including migratory birds (Hoggarth 2007).

The TCMP is the focal point of tourism in the southern grenadines and is the main source of direct and indirect income for surrounding communities (Simmons and McConney 2006). Scenic surroundings, favourable mooring conditions and its location below the major hurricane belt make the TCMP a particularly popular destination among yachtsmen, with an estimated 84 percent of yachts entering SVG, stopping over in the TCMP (ECLAC 2004, Gill 2010). Day charters, snorkelling and diving are popular activities occurring within the park, while food, craft and clothing sales, water taxiing and equipment rentals are some of the key services provided (Hoggarth 2007, Gill 2010).

Traditionally, the Tobago Cays acted as a fishing village for fishers from across the Grenadines (Gill 2010). In keeping with the conservation objectives of the park however, fishing is now restricted in the greater part of the TCMP. Nevertheless, as part of an effort to allow fishermen to be able to benefit from the "spillover" of fish produced by the park, west of the island of Mayreau has been designated a management zone which among other things, allows for fishing activities to take place (Hoggarth 2007). Reefs surrounding the parks boundaries however, are frequented by fishers from the neighbouring islands of Mayreau, Canouan and Union Island and less frequently, by fishers from as far north and south as Bequia and Petit Martinique respectively (Gill 2010).

Management of the TCMP is overseen by the marine parks board which comprises representatives from both civil and civic society. Established by the Marine Parks Act 1997, the marine parks board was initially intended to oversee the management of all marine parks in the SVG. But with TCMP being the only existing marine park in SVG, the marine parks board essentially functions as the board of management for the TCMP. The board, which is responsible for staff recruitment, enforcement and the development of workplans and budgets, reports its activities directly to the Prime Minister's Office (Hoggarth 2007). However, day to day operations in the park is overseen by a manager, who leads a 14-member team of staff including park wardens and administrative personnel.

Initially privately owned, the islands of the Tobago Cays were purchased by the government of SVG in 1999 under the condition that the Cays be used in perpetuity as a National Park (Simmons and McConney 2006). Subsequent to be being declared a marine park, the park was initially manned by a manager and a small compliment of staff. However ill equipped, understaffed and lacking the requisite training, operational activities within the park were severely limited (Simmons and McConney 2006). Additionally, lacking income generating mechanisms and reliant on an annual subvention from government, the park remained severely underfunded. Added to this, although a number of management plans were drafted by different parties, no management plan was ever formally adopted, thus management lacked the institutional framework to execute operational functions successfully (Pena and McConney 2007). Simmons and McConney (2006) reports that some residents of surrounding communities viewed the marine parks board and by extension, the government's inability to develop effective management within the TCMP, as a purposeful strategy to justify its' future divestment to private investors. This view was seemingly brought to bear when in 2004, the Palm Island Resort Limited, a private all-inclusive resort located close to the TCMP, presented a proposal to manage the Cays. Due to strong local opposition however, this proposal was subsequently withdrawn by the developers (Simmons and McConney 2006).

Management of the park remained in limbo until the start of the Organization of Eastern Caribbean States Protected Area and Associated Livelihood (OPAAL) project in 2004. This project aimed to develop sustainable financing mechanisms in protected areas and improve livelihoods opportunities for local communities among other things, in six different demonstration sites in the Eastern Caribbean including the TCMP (OECS-ESDU 2008). In the TCMP, the OPAAL project resulted in the establishment of an interpretation center, refurbishment of park offices, procurement of patrols boats and other equipment and the delivery of livelihood training for residents of surrounding communities. Under the auspices of the OPAAL project, the TCMP was also symbolically relaunched in 2008 with a new management structure, an approved management plan and a fee system in place. Since then, operations at the park have vastly improved. In 2012 and for the first time since initially opening, the park was able to self-fund its operations (K. Williams pers comm., 2014). There are now consistent surveillance patrols within the park, visitor awareness has improved and illegal, unreported and unregulated (IUU) infractions have also significantly reduced.

3.2 Recent advancements in protected area management in St. Vincent and the Grenadines

Traditionally, the agricultural sector has been the mainstay of the Vincentian economy however with continued decline of the banana industry, the GOSVG has increasingly looked to the tourism sector to fill the gap created by a weakened agricultural sector (Jackson 2004). Increased investments in tourism include private development projects such as the Buccament Bay Resort, the largest hotel development on mainland St. Vincent, as well as capital projects such as the European Union funded Tourism Development Project. This project aimed to develop community based tourism at a number of cultural and recreational sites across SVG (NPRBA 2009). Also of note, is the ongoing construction of an international airport at Argyle, St. Vincent a highly anticipated project, envisioned to bring tremendous benefits to various sectors of the Vincentian economy.

Recognizing that good management of forest and marine resources is critical to maintaining economic and social benefits, the GOSVG in 2004 commissioned the development of a master

plan for a system of protected areas and heritage sites across SVG. This plan was the first to provide a logical framework for the identification, listing and management of sites of great environmental, socio-economic and heritage value. It was envisaged that this plan would provide guidance on how ecological and heritage resources were to be sustainably managed (Jackson 2004). This was further followed in 2010 by the development of a four year national parks and protected area system plan (NPRBA 2009). Guided by international conventions and agreements, this system plan defined a national parks and protected area policy for St. Vincent and the Grenadines. It also reviewed existing and proposed recreational sites and protected areas, and outlined possible roles and responsibilities for agencies involved in management at both the site and system level.

St. Vincent and the Grenadines has also committed to implementing the United Nations Convention on Biological Diversity Program of Work on Protected Areas (CBD PoWPA), the globally-accepted framework for creating effectively managed and sustainably funded systems of protected areas (CBD 2010). In attempts to meet its obligations under the CBD, SVG has conducted an ecological gap analysis of its protected areas system (Byrne 2007), and developed sustainable financing and management capacity development plans (MacLeod 2007, Sector 2007). A national level economic valuation of environmental services provided by marine habitats in SVG, and a willingness to pay (WTP) study, which investigated the willingness of residents and tourists to pay to support effective management of protected areas, have also been completed in support of the CBD PoWPA (Christie and Teelucksingh 2012, Constantine and Samuel 2010). Further to its obligation under the CBD to effectively manage at least 10 percent of marine habitats by 2020, SVG has more recently committed to implementing the Caribbean Challenge, an initiative of ten Caribbean countries to 1) conserve 20 percent of near shore marine and coastal habitats by 2020 and 2) create national conservation trust funds, solely dedicated to funding protected areas management (TNC 2014).

While these actions no doubt display the progress that has been made towards advancing protected areas management in St. Vincent, numerous barriers to achieving national targets remain. These include inadequate baseline environmental and socio economic data, low levels of public involvement and awareness, low law enforcement and inadequate funding and staffing (MacLeod 2007). Inefficient coordination between government agencies with responsibility for protected areas management is also a significant challenge (NPRBA 2009). As mandated in their various acts, multiple agencies such as the Fisheries Division and Forestry Department have over lapping jurisdiction over multiple protected areas. Despite this, the functional roles and responsibilities of each entity at such sites have not been formally defined. This then leads to miscommunication and inefficient coordination (MacLeod 2007, NPRBA 2009). Despite these challenges, work is advancing to implement the national system plan of protected areas, including the proposed development of a new marine park in the South Coast Marine Conservation Area on mainland St. Vincent.

3.3 South Coast Marine Conservation Area

The South Coast Marine Conservation Area (SCMCA) located south of the capital Kingstown, encompasses an area of 326.98 hectares and includes both land and sea expanses (Figure 3). Total sea space measures 260.49 hectares and is comprised mainly of coral reefs with sand and seagrass habitats (Baldwin 2014).

The SCMCA is a highly used area with a wide range of stakeholders at the individual, community and government level (Appendix 2). It is the hub of the hotel and tourism industry

on mainland St. Vincent surrounding many hotels, restaurants and entertainment establishments (NPRBA 2009). Similarly, the SCMCA is a popular yacht anchorage and includes a range of commercial businesses offering general and specific services to marine vessels (ECLAC 2002). It is also an important recreational area frequented by locals and tourists for swimming, snorkelling and other water sport activities (Lockhart *et al.* 2013). Additionally, a number of historical, cultural and fisheries landing sites are located throughout the SCMCA.

Figure 3: Map of the South Coast Marine Conservation Area (SCMCA), St. Vincent (Baldwin 2014).

3.3.1 Threats and impacts

Increasing commercial and recreational exploitation has placed significant stress on the health of nearshore habitats within the SCMCA (Kilgo and Edwards 2010). In a recent socioeconomic survey of households and key informants in the SCMCA the main user groups within the area were perceived to have largely negative impacts on coastal and marine resources (Lockhart *et al.* 2013). These impacts included anchor damage, stock depletion and pollution from land based sources of pollution (Figure 4).

Inadequate solid and sewage waste disposal were of particular concern to individuals throughout the area (Lockhart *et al.* 2013). No facilities exist for the reception and treatment of sewage from yachts, households or businesses in the area which represents a serious threat to water quality and human health (ECLAC 2002). Research carried out by White (2013) seemingly validate these concerns as high levels of faecal coliform and various chemical pollutants, where identified at various points within the SCMCA.

Coastal inundation is also a significant hazard throughout the area, with both beaches and coastal infrastructure at high risk during storm surges (White 2013). Additionally, the presence

of numerous derelict boats poses significant navigational and environmental threats, and detracts from the aesthetic value of the area (White 2013).

While some beach seining and recreational fishing is known to occur, no significant commercial fishing activity is believed to occur within the SCMCA (K. Isaacs pers comm., 2014). Even though, divers report sightings of fish pots and nets within the area (K. Wilson pers comm., 2014), which is a diver safety hazard. Conflicts over noise levels have also arisen between nightclubs/bars and hoteliers. Known as voracious predators of juvenile fish, lionfish *(Pterois volitans)* have also increased significantly in the SCMCA since first appearing in 2009, and are now a common sight throughout the area (K Isaacs pers comm. 2014).

Of note as well is the fact that the SCMCA is not on official port of entry and that a number of yachts entering the area fail to clear customs and immigration at the nearest seaport, Kingstown. This results in a loss of revenue for the GOSVG and reduced control of authorities. Furthermore, drug trafficking and yacht crime in the SCMCA is also cause for concern (ECLAC 2002).

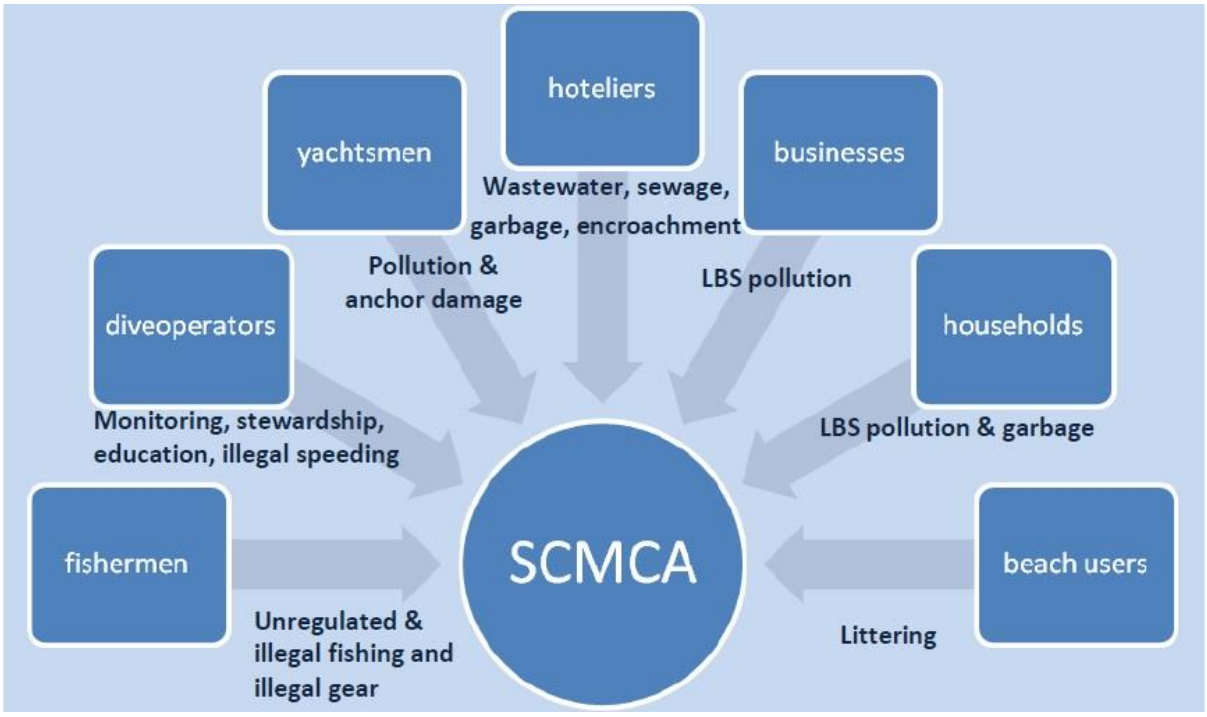

Figure 4: Main impacts of key stakeholders on costal and marine resources in the SCMCA (Lockhart *et al.* 2013).

3.3.2 Valuation of ecosystem services in the SCMCA

As part of a national level study, the impacts of five different policy interventions (stopping sewage, overfishing, land based sources of pollution, sand mining and introducing no take zones) on the provision of the six ecosystem services (fishing, coastal protection, human health, species diversity, beach creation and diving/snorkelling) in the SCMCA were valued based on survey of local residents (Christie and Teelucksingh 2012). Valuations were determined under two different scenarios; improved management of the SCMCA and a decline scenario where protected area status was removed. Lower bound estimates of ecosystem valuations were determined based on the number of households in Calliaqua (located in the SCMCA) and capital Kingstown only (10,532 households in total), while upper bound estimates were based

on the total number of households in SVG (32,262). This work was further expanded upon in a separate study that conducted similar analysis among tourists (Wainwright 2013). For the tourists based study, lower bound valuation estimates were based on total tourist bed capacity on mainland St. Vincent (1,578 beds) while upper estimates were based on the number of visitors to SVG who enter via St. Vincent (126,525 estimate).

Combining both studies, the aggregate value of ecosystem services that would be delivered through improvements to the SCMCA was estimated to be between $24.42/million/yr and $38.96 million/yr (Table 5). Conversely, the aggregate value of ecosystem services that would be lost if MPA protection was removed was estimated to be between -$19.76 million/yr and -$32.96 million/yr. Of note is the fact that tourists were willing to pay more than residents, under both the decline and improved scenarios. This may be a reflection of both higher incomes and environmental concern among tourists (Wainwright 2013).

Table 5: Aggregate ecosystem benefits estimated based on Tourists and Residents surveys (Adapted from Wainwright 2013).

Scenario	Improve		Decline	
	Lower bound estimate (million/yr)	Upper bound estimate (million/yr)	Lower bound estimate (million/yr)	Upper bound estimate (million/yr)
Tourists	23.57	36.34	-18.14	-27.97
Residents	0.85	2.62	-1.62	-4.99
Total	**24.42**	**38.96**	**-19.76**	**-32.96**

Among residents, three ecosystem services (coastal protection, maintenance of species diversity and water quality/human health), were found to be statistically significant (Table 6) while among tourists, all five ecosystem services were found to be significant (Table 7). These results indicate that residents tend to value preventing a decline in ecosystem services provisioning over an improvement, while tourists tend to value an improvement in ecosystem services provision more than a decline (Wainwright 2013). This contrast slightly with results from the TCMP where both locals and tourists tended to value preventing a decline in ecosystem service provisioning. This may reflect the fact that the TCMP currently provides greater provisioning of ecosystem services compared to the SCMCA, thus maintaining its present state is inherently more valuable to both locals and tourists (Wainwright 2013).

In the SCMCA, policy interventions directly related to human health i.e. stopping sewage and land based source of pollution, yielded the most ecosystem service benefits among both residents and tourists. It stands to reason therefore that policy interventions within the SCMCA should primarily target mitigating risks to human health (Wainwright 2013). Likely interventions include improving sewage disposal and increasing buffer zones to limit agricultural runoff from land. In the SCMCA, coastal protection and species diversity were also prioritized by both residents and tourists. Thus, the introduction of no take zones, banning of unsustainable fishing practices and addressing uses that compromise the integrity of the surrounding barrier reefs, would further help to realize the full economic potential which can be obtained through ecosystem services in the SCMCA (Wainwright 2013).

Of note however is the fact that these valuation studies only considered indirect use benefits. To achieve a more robust assessment of total economic value provided by the SCMCA, direct

use and non-use benefits should also be accounted for. Nevertheless, both of these studies highlight the significant benefits that are derived from coastal ecosystems in SVG. They also provide strong economic evidence for retaining and expanding MPAs in SVG, including the SCMCA.

Table 6: Economic benefits of policy interventions in the SCMCA and TCMP based on survey of residents (Adapted from Christie and Teelucksingh 2012).

		Stop sewage (yachts, houses and hotels)	Stop overfishing/ bad fishing practices	Stop land based pollution (mainly agricultural such as pesticides, eutrophication and sedimentation)	Stop sand mining/ extraction of coral	Introduce 'No take zones' that would ban fishing and anchoring
SCMCA	Fishing	-	-	-	-	-
	Coastal protection	38	38	38	114	75
	Water quality/human health	221		221		
	Species diversity, ecosystem resilience and genetic pool	11	32	21	11	32
	Beach recreation	-	-	-	-	-
	Diving/snorkelling	-	-	-	-	-
	Total value (thousand/yr)	**269**	**70**	**279**	**125**	**107**
TCMP	Fishing	12	12	12	-	6
	Coastal protection	-	-	-	-	-
	Water quality/human health	-	-	-	-	-
	Species diversity, ecosystem resilience and genetic pool	3	8	6	3	8
	Beach recreation	-	-	-	-	-
	Diving/snorkelling	-	-	-	-	-
	Total value (thousand/yr)	**15**	**21**	**18**	**3**	**15**

Table 7: Upper and Lower bound estimates of economic benefits of policy interventions in the SCMCA under both improve and decline scenarios based on survey of tourists (Wainwright 2013).

		Stop sewage (yachts, houses and hotels)		Stop Overfishing/bad fishing practices		Stop Land Based Pollution (mainly agricultural, such as pesticides, eutrophication and sedimentation)		Stop sand mining/ extraction of coral		Introduce 'No take zones' that would ban fishing and anchoring	
	Estimate	Impr	Decl	Impr	Decl	Impr	Decl	Impr	Decl	Impr	Decl
Fishing	upper	703	-	703	-	703	-	-	-	352	-
	lower	456	-	456	-	456	-	-	-	228	-
Coastal protection	upper	94	-456	94	-456	94	-456	285	-1,383	188	-913
	lower	61	-296	61	-296	61	-296	185	-897	122	-592
Water quality/human health	upper	1571	-3,350	-	-	1,571	-3,350	-	-	-	-
	lower	1019	-2,173	-	-	1,019	-2,173	-	-	-	-
Species diversity, ecosystem resilience and genetic pool	upper	316	-	958	-	632	-	316	-	958	-
	lower	205	-	621	-	410	-	205	-	621	-
Beach recreation	upper	-	-	-	-	-	-	-	-	-	-
	lower	-	-	-	-	-	-	-	-	-	-
Diving/snorkelling	upper	870	-	1,318	-	870	-	-	-	870	-
	lower	564	-	855	-	564	-	-	-	564	-
Total value (USD thousands/yr)	upper	**3,554**	**-3,807**	**3,073**	**-456**	**3,807**	**-3,807**	**601**	**-1,383**	**2,367**	**-913**
	lower	**2,305**	**-2,469**	**1,993**	**-296**	**2,510**	**-2,469**	**389**	**-897**	**1,535**	**-592**

3.3.3 Marine Park planning for the SCMCA

The SCMCA was initially designated in 1987 to afford special protection to marine life (Kirby-Straker 2003) yet since then, no onsite management mechanisms have been developed in the SCMCA. A number of government agencies are legally mandated to regulate some form of activity within the SCMCA but due to limited human, financial and technical capacity (MacLeod 2007), activities within the SCMCA remain largely unregulated. Mainly through ad hoc training exercises and capital projects, the Fisheries Division has conducted limited resource monitoring within the SCMCA (Kilgo and Edwards 2010, Baldwin 2014) however, routine biological assessments are not known to occur. Weekly garbage collection and recently commenced water quality testing is also coordinated through the NPRBA (A. Wilson pers comm. 2014), and ad hoc surveillance patrols are carried are carried out by the SVG Coast Guard which happens to be based in the SCMCA (ECLAC 2002). However, there is no formal coordination among management agencies to holistically coordinate activity within the area hence monitoring, control and surveillance remain inadequate.

Due to unique natural, social and cultural attributes, the SCMCA is a major component of the tourism product on mainland St. Vincent thus there is great interest in improving management throughout the area (Jackson 2004). Within recent years, the St. Vincent and the Grenadines (SVG) Fisheries Division in collaboration with other stakeholders, has spearheaded efforts to designate the South Coast Marine Conservation Area (SCMCA) as the country's second marine park. This would be the first marine park to be developed based on recommendations outlined in the National Protected Areas System Plan which proposes the upgrade of the SCMCA to an IUCN category II protected area (Jackson 2004, NPRBA 2009).

It is envisioned that under the structured framework of a sustainably funded and managed marine park, environmental threats within the SCMCA could be effectively mitigated, and conflicts among stakeholders could be resolved in a manner beneficial to each interest group. A park would also provide opportunity for outreach and education, geared at increasing local appreciation for nature (Jackson 2004).

To this end, funded through a Caribbean Marine Protected Areas Managers Network and Forum United Nations Environment Programme (CaMPAM UNEP) mid-sized grant, the Fisheries Division in conjunction with the NPRBA and other stakeholders, in 2011 embarked on the drafting of a development plan to upgrade the SCMCA to a marine park. Hoping to avoid the management inefficiencies and social controversies that accompanied the early development of the TCMP (Simmons and McConney 2006), this project was viewed as an opportunity to holistically map out the socioeconomic, financial and administrative considerations necessary to ensure smooth transition to onsite management in the SCMCA (Fisheries Division 2011). However, after an initial start in late 2011, further work on this effort was delayed due to administrative reasons (Lockhart *et al.* 2013).

In 2013, work began under the Coastal Resources Management and Conservation of Marine Biodiversity in the Caribbean Caribbean Aqua Terrestrial Solutions (CRMCMB CATS) project, funded by The German Federal Ministry of Economic Cooperation and Development (BMZ), to develop a new strategy aimed at operationalizing the proposed South Coast Marine Park (Ministry

of Agriculture 2013). Under this project, baseline environmental assessment of the SCMCA was completed in early 2014 (Baldwin 2014), with further activities aimed at operationalizing a marine park at the SCMCA expected to follow over a twenty-nine months' project cycle.

Along with demonstrating the economic benefits associated with the expansion of the MPA network in SVG, Christie and Teelucksingh (2012) in their valuation of ecosystem services in SVG recommended that the costs and benefits of expanding SVGs MPA network, be compared to determine whether such expansion was justifiable. To date however, no economic analysis of the proposed park in the SCMCA has been carried out. This study examines the costs and benefits involved in upgrading the SCMCA into a marine park. Establishment and operating costs will be assessed and weighed against expected benefits, to provide a financial overview of the proposed development. It is envisioned that this study will prove useful to policy makers involved in the management of the SCMCA and also serve as a template for future analysis of a similar nature

4 COST BENEFIT ANALYSIS

Cost and benefit data were estimated for the proposed park using information obtained via key informant interviews and available literature. Semi structured informal interviews were conducted by telephone and email with key informants from a select group of stakeholders (Appendix 3). Interview questions varied according to target group but focused on gathering quantitative information relevant to the contained analysis e.g. what is the annual cost of management activities carried out by your organization in the SCMCA, annual number of dives conducted in the SCMCA, annual number of yachts that visit the SCMCA. Each informant was also asked to provide feedback on their role in the current and proposed management of the SCMCA. Where site specific data was unavailable, comparable data from other sources were used as proxy.

4.1 Cost estimates

Start-up and annual operating costs for the proposed new park in the SCMCA where the two costs estimates considered in this study. Based on estimates outlined in the CRMCMB CATS project developed by the Fisheries Division in conjunction with other stakeholders (Ministry of Agriculture 2013), it was assumed that a total of $2.16 million in start-up funds would be spent over the two-year period, 2014 to 2015 to establish the park. Costs estimates include expenditure on infrastructure development (moorings, administrative buildings, etc.), procurement of patrol vessels and other equipment, and the development and implementation of an appropriate regulatory framework.

Annual operating costs of $579,400 were estimated for the proposed park based on estimates outlined in the management plan of SVGs only existing marine park, the TCMP (Hoggarth 2007). These include consideration of salary, gear maintenance, fuel, utilities and training costs (Table 8).

4.2 Benefit estimates

Information on non-use values were not available and thus could not be factored into benefit analysis. Indirect use values were ascertained from two economic valuation studies of the environmental services provided by marine habitats in St. Vincent and the Grenadines based on surveys of resident and tourists (see Table 5). An aggregate lower bound benefit estimate of $24.42 million and an upper bound benefit estimate of $38.96 million were used throughout analysis as the indirect value of enhanced ecosystem services that could be delivered under improved management of the SCMCA (see section 3.3.2).

With the exception of dive visitors, information on the annual number of visitors and number of vessels to the SCMCA was not available at the time of this study. Based on information received from diver operators contacted, annual income of $1500 was estimated for dive fees based on an estimated 100 annual dives in the SCMCA and a willingness to pay $15/dive day (Constantine and Samuel 2010). Estimates of projected income from other user fees were based on information provided in the management plan of the TCMP. These include a daily entrance fee of $10 per passenger on yachts and other vessels (Table 9).

Table 8: Estimated annual operating costs for the SCMCA (Adapted from Hoggarth 2007).

Staff	**ECD**
Park Manager	48000
Park warden	24000
Park rangers (6)	74826
Natural resources officer / Marine biologist	32412
Management assistant	21816
Accounting assistant	18216
Education coordinator	32412
Office attendant	9516
Benefits (3.5% park contribution to National Insurance)	9142
Total staff	270340
Operating Expenses	
Fuel	51744
Boat operation & maintenance	24000
Office equipment & stationeries	3600
Field safety equipment	5000
Uniforms	4680
Publications and promotions	6000
Supplies and material	6000
Utilities (electric)	5000
Communications (phone + website)	12000
Travelling & subsistence	30000
Staff training	18000
Monitoring	4800
Board expenses	9600
Buoy maintenance	5000
Facility maintenance etc.	10000
Insurance (patrol boats, staff disability / compensation etc.)	10000
Depreciation	75000
Miscellaneous / sundry expenses	4800
Total (operating expenses)	285224
Total	**555,564**

Table 9: Estimated annual user fee income in the SCMCA (Adapted from Hoggarth 2007).

Fee category	Duration/units	Rates/ECD	Estimated no./year	Projected Income
Moorings				
Yachts, 40ft	Per yacht per day (24 hrs)	40	100	4000
Yachts, 41 ft-70 ft	Per yacht per day (24 hrs)	50	100	5000
Total mooring fees			200	9000
Entrance Fees				
Yacht passengers	Per yacht per day (24 hrs)	10	20880	208800
Cruise ship passengers	Per yacht per day (24 hrs)	10	21290	212900
Scuba Divers	Per yacht per day (24 hrs)	15	100	1500
Day tours	Per yacht per day (24 hrs)	10	12400	124000
Local excursions	Per yacht per day (24 hrs)	2	1000	2000
Total entrance fees			55670	549200
Commercial operators' licenses				
Vendor licence	Per year	200	20	4000
Water taxi licence	Per year	300	40	12000
Charter boat licence	Per year	400	4	1600
Scuba licence	Per year	800	3	2400
Total comm. operators' fees			67	20000
Other income				
Filming permits	Per permit	300	2	600
Wedding permits	Per permit	300	2	600
Total income (from fees)				**579,400**

Start-up costs of $2.16 million were split evenly over the first two years of the project. It was assumed that the park will become operationalized half way through the second year thus half of annual operating cost estimates was included in year two. Annual operating costs of $579,400 was simulated from year three onwards. During year one it was assumed that no income from fees will be earned while in year two, fees are charged over a half year period. From year three onwards, fee income is generated all year round. Indirect benefits were simulated from year 4 onwards as it was assumed that it would take a few years for proposed policy intervention to generate an effect on ecosystem services (appendix 4). Analysis was simulated over a one-hundred-year period.

Net Present Value (NPV) was calculated at a discount rate of 7 percent as follows:

$$NPV = \sum_{t=0}^{n} \frac{B(t) - C(t)}{(1+r)^t}$$

where B = benefits, C = costs, t = time and r = discount rate. Sensitivity analysis was also conducted with discount rates ranging from 1-12 percent and total costs and benefits estimates varying +/- 30 percent.

4.3 Results of analysis

Figure 5 shows the decline in the NPV of benefits derived from combined direct benefits (income from user fees) and indirect benefits (economic valuation of ecosystem services) with increase in discount rates. For both the upper and lower bound estimates of ecosystem services benefits, NPV remained positive as discount rates varied from 1 to 12 percent, indicating that the potential benefits to be derived from the proposed park outweigh the costs involved in setting it up.

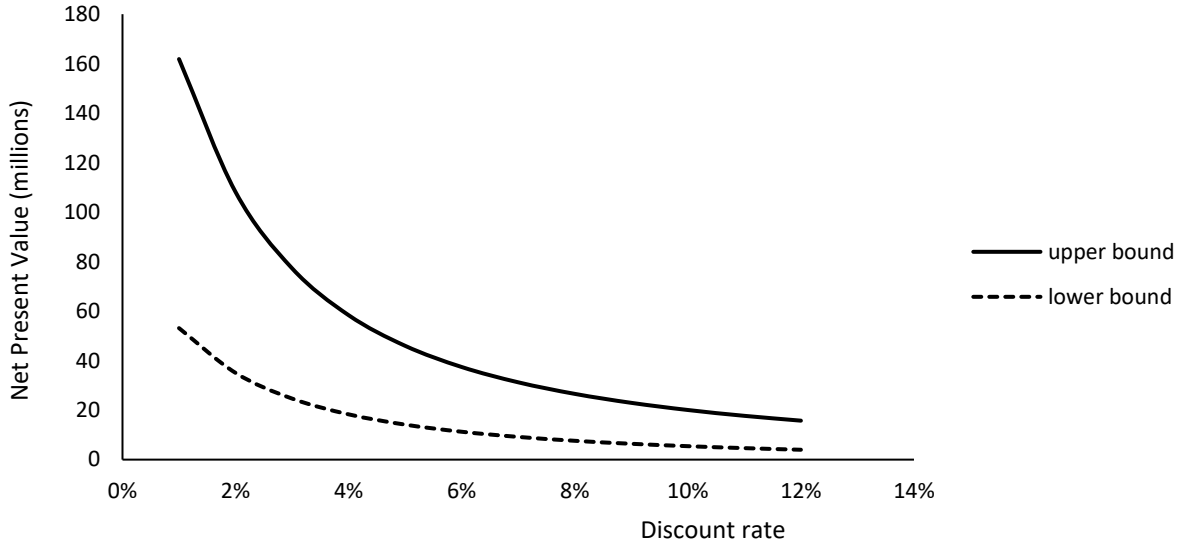

Figure 5: Net Present Value (millions) of combined upper and lower bound estimates of ecosystem services value and estimated user fee income with change in discount rate from 1 to 12 percent.

When considered solely, the NPV of projected income from fees breaks even around 2 percent discount rate (Figure 6). At borrowing rates above 2 percent, the NPV of benefits becomes negative indicating that direct income would have to be over the projected $579400 for annual operating cost to be met at higher discount rate. Should earnings be approximately half of that projected, NPV is negative throughout the range of discount rates. While is it difficult to pinpoint exact earning projections for the proposed development, anecdotal evidence of income generated in the TCMP indicates that earnings in the proposed park are likely to be somewhere between half and the full value of income projected here in which case, NPV is almost certain to be negative.

Considering earnings derived from direct benefits only i.e. fee income, Figure 7 shows that NPV is equally sensitive to projected operating costs and projected fee income at 7 percent discount rate. Additionally, at this rate NPV is negative implying that the proposed development would not be

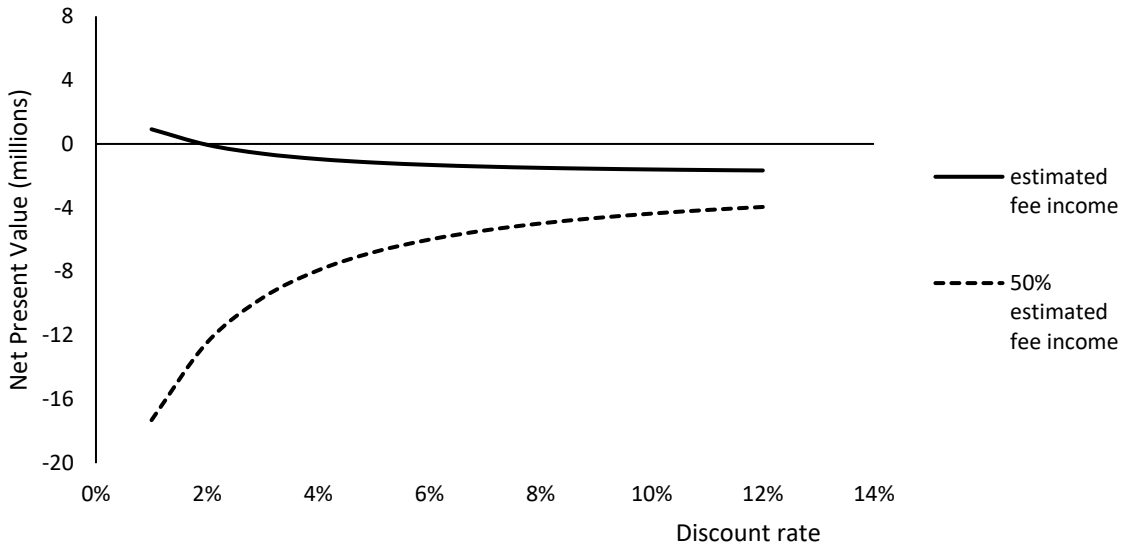

Figure 6: Net Present Value (millions) of estimated direct benefits in the SCMCA with change in discount rate from 1 to 12 percent.

financially profitable, should only direct benefits be considered. Approximately 20 percent more income from fees would have to be earned for the development to break even with projected operating costs of $555,564. Conversely, costs would have to decrease by just under 20 percent for the development to break even with current estimates of $579,400 of direct earnings from user fees.

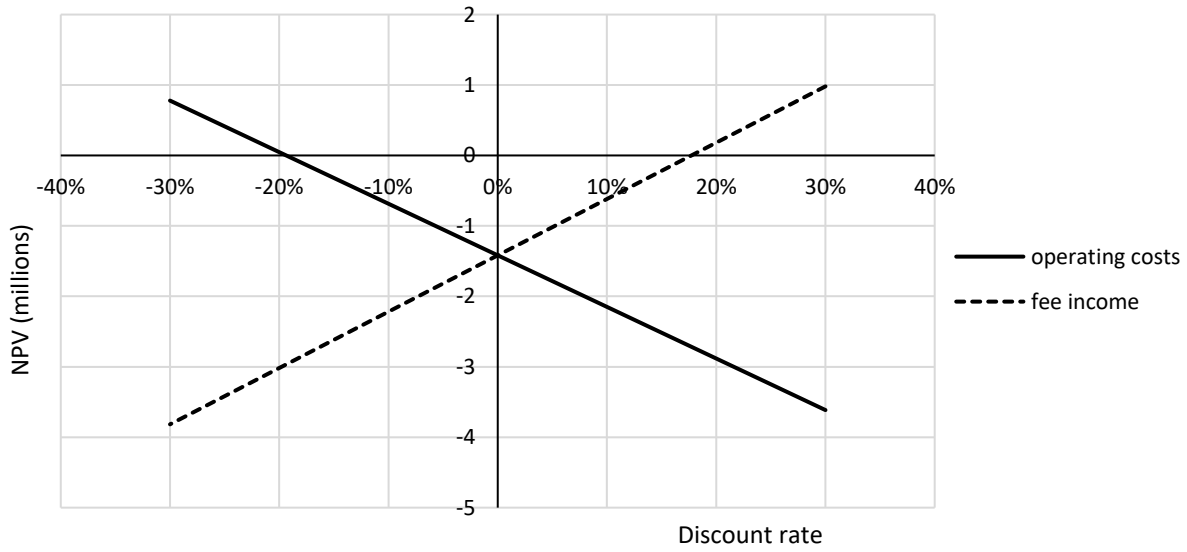

Figure 7: Net Present Value (millions) with +/- 30 percent change in projected fee income and operating costs estimates at 7 percent discount rate.

5 DISCUSSION

The analyses contained herein indicate that when weighed against potential benefits, the costs of upgrading the South Coast Marine Conservation Area to a marine park are justified. These results seemingly add strength to ongoing initiatives to upgrade the SCMCA into a marine park. With indirect benefits constituting the bulk of benefit estimates used in analysis herein, these results also reiterate the fact the ecosystem goods and services provide substantial economic value that should not be overlooked.

However, while there is real economic value provided by ecosystem services, they represent unrealized monetary gains, not direct cash flow needed to cover the operating costs of a marine park. These analyses reveal that projected income based on user fees may not be sufficient to allow the proposed park to sustainably fund its operating costs. This is of particular concern as while start-up funds for the new park have already been sourced from donor agencies, no other budgetary provisions have been made for recurrent costs to be met after the proposed park becomes operationalized. Alternative means through which funding gaps can be met would thus need to be identified.

Though provisions have been made for the development of a sustainable financing plan for the proposed park, it is not known when work on this will begin. Meanwhile, other activities such as habitat assessments have already begun, some already completed, under the 29-month project. Given the potential funding gap highlighted by these analyses, it is recommended that a sustainable finance plan be prioritized sooner rather than later. This to ensure that the requisite financing mechanisms are in place to enable the proposed park to sustainably meet its financial obligations from the onset of its operation, and therefore avoid the funding difficulties and mismanagement that defined the early development of the TCMP.

This study is limited by the fact that it only considered indirect benefits of ecosystem services and direct benefits from fee income. While a full-scale valuation of all use and non-use values was not within the scope of this study, assessment of the total economic value provided by the SCMCA would allow even more robust analysis of costs and benefits. Assessment of other costs factors, such as the opportunity costs of foregoing potential hotel or marina development in the SCMCA, can also help to better inform decision makers. Failure to consider these costs can result in underestimation of financing needs which can then undermine MPA sustainability (Emerton *et al.* 2006).

This study is also limited by the unavailability of visitor arrival data. In the absence of site specific data, it is difficult to produce accurate projections of costs and income for the proposed park. The development of an efficient data collection system for yachts that visit the SCMCA can help to further refine projections made herein. Establishing an official port of entry in the SCMCA is one possible solution to this problem (ECLAC 2002). It is not unreasonable however, to think that estimates projected for TCMP are acceptable proxies for the SCMCA. While the TCMP is arguably more popular among tourists than the SCMCA, the added allure of marine park designation, and the tangible improvements in infrastructure, attractions and resource quality that such designation

can bring to the SCMCA, can serve to increase its popularity and attractiveness and thus generate more income.

Given general inflation and increases in the price of supplies such as fuel, actual operating costs for the SCMCA are likely to be higher than those projected in 2007 for the TCMP. Operating costs of course would vary depending on the number of staff, operating activities and fixed assets. Still, at feasible borrowing rates such as those modelled in this study, operating costs would have to be approximately 20 percent lower ($463,520) for the new park to break even. This is an important point to consider as it essentially represents the maximum level above which spending becomes unsustainable from a cash flow standpoint. Prudent consideration and prioritization of objectives is recommended to ensure that conservation, economic and other objectives are practical and attainable at sustainable cash flow limits.

In any event, this highlights the importance of clarifying what goal(s) the proposed park is intended to achieve. Specific, measurable objectives should be defined in term of outputs and outcomes and indictors of success defined, so that impacts can be monitored and evaluated over time. This not only to enable assessment of effectiveness, but also to highlight lessons learnt that can be applied to future initiatives.

5.1 Co-management in the SCMCA

Given the financial effort needed to establish a new park, the concerns that park planners hope to address with the establishment of a new park, may be more effectively achieved through alternative means.

This may include co-management arrangements with stakeholders. Dive operators and the Fisheries Division for instance can work together to monitor and assess resources. This allows the Fisheries Division to piggy back on resources and expertise of the dive operators, who in turn benefit from increased/additional training and education opportunities. Such collaboration provides opportunity for both parties to cut costs and also helps to strengthen bonds between stakeholders. Similarly, establishing a management or advisory board can also provide a cost effective forum for stakeholder views to be heard, and conflicts to be addressed.

However, though good in theory, co-management arrangements can prove practically problematic. While majority of stakeholders believed that joint effort between government and the community was needed for responsible management in the SCMCA (Lockhart *et al.* 2013), sufficient incentive must exist among stakeholders for co-management to work successfully (Jones *et al.* 2011). Under the right conditions however, co-management can be effective. For success to be achieved, authority and responsibilities should be clearly outlined in formalized agreements, with clearly defined rules for decision making and conflict resolution (Jones *et al.* 2011). This not only to incentivise stakeholders, but also to build a sense of empowerment and enablement among stakeholders particularly where co-management is more of a top down or state led approach (Jones *et al.* 2011). Building on experiences in the TCMP, it is also important that relevant training be conducted with stakeholder groups to increase their capacity to engage and effectively participate in management (Simmons and McConney 2006).

It must be noted though that institutional capacity within protected area management agencies remains limited. In the Fisheries Division for instance, MPA management activity falls under the ambit of the conservation unit however, this unit is currently manned by only one biologist. The situation is not much improved at the National Parks Rivers and Beaches Authority as relative to their responsibilities, they remain understaffed. These inadequacies limit institutional capacity to effectively engage with stakeholders and lead to sporadic, adhoc collaboration instead of more meaningful, sustained institutional engagement of stakeholders. This in turn can lead to mistrust, frustration and disenchantment on both sides. More support therefore needs to be provided at the institutional level to not only increase the likelihood of successful co-management, but also to enable better institutional capacity to manage MPAs.

5.2 Directly address main threats to human health

In their economic valuation of ecosystem services provided by the SCMCA, Christie and Teeklucksingh (2012) reported that interventions that reduced human health risks, namely stopping sewage and land based sources of pollution, were of highest concern to both residents and tourists and added the greatest value in the SCMCA. These results concur with the top three threats as identified by householders in the Lockhart *et al.* (2013) socioeconomic survey of the SCMCA. The lack of sewage treatment facilities and lack of onshore waste management receptacles for waste from yachts was also previously noted by ECLAC (2002). However, implementing a marine protected area in the SCMCA will not in itself adequately address these threats. While there are plans under the proposed park development project to assess and make recommendations for improved waste management, no activities that directly address this issue, such as developing sewage treatment facilities or pump out stations for yacht sewage waste, are planned. The medium to long term costs of mitigating these threats may or may not be a more cost effective use of currently available development resources. However, from a public health perspective, it may be in the best interest of the public to implement long term solutions to these threats.

5.3 Develop alternative sites

While the SCMA still holds appealing natural attributes, decline in resource quality and increasing use conflicts have led to decreased diving activity within recent years (K. Wilson pers comm., 2014). The SVG protected areas system plan proposes the establishment of three other new marine protected areas in St. Vincent at Chateaubelair, Petit Byahaut and Anchor Reef respectively. These all contain relatively healthy ecosystems and at face value, have the ability to support dive and other income generating activities. Protecting these alternative sites can help to prevent degradation or their resources, enhance the attractiveness of St. Vincent as a dive and general tourist destination as well as earn revenue for government and provide employment for communities (Simmons and McConney). It also provides opportunity to mitigate existing and potential conflicts among user groups and in use patterns. Similar examination of the costs and benefits of developing these other sites should thus be conducted so as to enable comparative analysis of the economic potential of each proposed MPA.

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Appendix 1: Economic valuation methods, typical applications, examples and limitations (adapted from van Beukering *et al.* 2007).

Valuation method	Approach	Applications	Examples	Limitations
Market prices	Observe prices directly in markets	Environmental goods and services that are traded in markets	Timber and fuel wood from forests; clean water from wetlands	Market prices can be distorted e.g. by subsidies. Environmental services often not traded in markets.
Replacement cost	Estimate costs of replacing environmental service with manmade service	Ecosystem services that have a manmade equivalent that could be used and provides similar benefits to the environmental service	Coastal protection by mangroves; water storage and filtration by wetlands	Over estimates value if society is not prepared to pay for manmade replacement. Under estimates value if man-made replacement does not provide all of the benefits of the environmental service
Damage cost avoided	Estimate damage avoided due to ecosystem service	Ecosystems that provide protection to houses or other assets	Coastal protection by mangroves/reefs; river flow control by wetlands	Difficult to relate damage levels to ecosystem quality
Hedonic pricing	Estimate influence of environmental characteristics on price of marketed goods	Environmental characteristics that vary across goods (e.g. houses)	National parks, air pollution, proximity to dumps	Technically difficult. High Data requirements
Travel cost	Travel costs to access a resource indicate its values	Recreation sites	National parks, MPAs	Technically difficult. High Data requirements
Contingent valuation	Ask survey respondents directly for WTP for environmental services	Any environmental good or service	Species loss, natural areas, air pollution	Expensive to implement
Choice modelling	Ask survey respondents directly to trade-off environmental and other goods to elicit WTP	Any environmental good or service	Species loss, natural areas, air pollution	Expensive to implement Technically difficult
Value Transfer	Use values estimated at other locations	Any environmental good or service	Species loss, natural areas, air pollution	Possible transfer errors. Can be as technically difficult as primary valuation

Appendix 2: Stakeholders with interest in the proposed South Coast Marine Park St. Vincent as indicated by key informants and householders in an SCMCA Socioeconomic survey (Adapted from Lockhart *et al.* 2013).

Stakeholder/organisation
Government (n=12)
Fisheries Division
National Parks, Rivers and Beaches Authority
Forestry Department
The Central Water and Sewage Authority
Ministry of Health Wellness and the Environment
Public Health Department
Bureau of Standards
SVG Port Authority
SVG Coast Guard
SVG Maritime Administration
Ministry of Agriculture, Rural Transformation, Forestry, Fisheries and Industry
Ministry of Tourism, Sports and Culture
NGOs and non-profit organisations (n=5)
SVG National Trust
SVG Hotel and Tourism Association
Chamber of Industry and Commerce
South East Development Inc.
St. Vincent and the Grenadines Marine Recreation Association
Community organizations and national service clubs (n=8)
CARDO – Calliaqua Area Development Organisation
CALFICO – Calliaqua Fisherfolk Cooperative
Calliaqua Police Youth Club
St. Vincent Yacht Club
Environmental groups
Lion's Club
Rotary Club
Sugar Mill Academy
Businesses (n=19)
KP Marine Ltd
Howard's Marine
Barefoot Yacht Charters
Dive St. Vincent
Fantasy Dive Tours
Sunsail Yacht Charters
TMM Yacht Charters

Stakeholder/organisation
LIAT
National Lotteries Authority
Digicel
LIME
Grenadines Air
Tony's Supermarket
Karib Kable
Sky Blue Apartments
Paradise Inn
X-Cape Restaurant
Mariner's Hotel
Canash Beach Hotel
Individuals (n=9)
Merton Sandy
Dr. Reynold Murray
Ms. Marlon Mills
Mr. Sandford Mofford
Ms. Joan Thomas (UPC Office)
Mr. Ronald John (boat business)
Mr. Keith Howard (K.P. Marine Ltd)
Mr. Kelly Glass (Karib Kable)
Mr. Jimmy Grecia (Charlie Tango Taxi)

Appendix 3: Stakeholder organizations contacted during the course of this study.

Organization
Fisheries Division
National Parks Rivers and Beaches Authority
SVG Port Authority
Ministry of Finance and Planning
Dive St. Vincent
Indigo Dive
Fantasea Tours
Blue Lagoon Marina
Environmental Services Unit
Ministry of Tourism
SVG Tourism Authority
Public Health Department
Tobago Cays Marine Park
Central Water and Sewage Authority

Appendix 4: Projected annual costs and (1) combined upper bound estimate of ESS value and projected fee income, (2) combined lower bound estimate of ESS value and projected fee income and (3) projected fee income only for first six years of NPV calculations.

(1) upper bound ESS value			(2) lower bound ESS value			(3) projected fee income only		
Year	Operating costs	Combined benefits	Year	Operating costs	Combined benefits	Year	Operating costs	Income from fees
2014	1081500	0	2014	1081500	0	2014	1081500	0
2015	1346782	289700	2015	1346782	289700	2015	1346782	289700
2016	530564	579400	2016	530564	579400	2016	530564	579400
2017	530564	1429400	2017	530564	3199400	2017	530564	579400
2018	530564	1429400	2018	530564	3199400	2018	530564	579400
2019	530564	1429400	2019	530564	3199400	2019	530564	579400
…								
	NPV	9174800,661		NPV	31233088,65		NPV	-1418162,498