Saint Lucia ReefFix Exercise



Economic Valuation of Goods and Services Derived from Reefs in the Soufriere Marine Management Area (SMMA), Saint Lucia.

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Executive Summary

ReefFix is an Integrated Coastal Zone Management (ICZM) tool that aims to build capacity within marine management agencies by providing cost-effective economic evaluation methodologies which can be used by managers to get a better understanding of the value of coral reefs and build awareness of the issues affecting the reefs. This programme, which is supported by the government of Chile, is currently being implemented by the Organization of American States' Inter-American Biodiversity Information Network (IABIN) programme at case study sites around the region.

This report presents the results of the economic evaluation of some of the ecological goods and services provided from the Soufriere Marine Management Area in Saint Lucia using three methodologies two of which were developed by the World Resource Institute and the other by Troy/Wilson (2006). The results were based on data gathered from key informants and available local and national statistics and is therefore limited by the quantity and quality of data available during the short study period. It serves mainly as an example of how the valuation methodologies could be utilised within Saint Lucia for comparisons to other sites employing the same techniques. Some of the key findings of this study are:

Results

- ✓ WRI Fisheries Tool: US$46,628,392
- ✓ WRI Tourism and Recreation Tool: US$$21,656,973
- ✓ Valuation Transfer Method: US$
- ✓ Significant disparity in accommodation and diving as major source of clients emanate from hotels outside of SMMA
- ✓ Contribution from fisheries significantly larger than tourism and recreation. This could be due to the valuation model which does not make a proper distinction between number of boats and number of fishers. The ratio should approximate 1:5 (boats: fishers.)
- ✓ Cruise ship business is a significant contributor but is not measured currently
- ✓ Important contributions from the informal sector (watertaxis)
- ✓ Significant contributions by added value (Fish cleaning)
- ✓ Sustainable revenue generation for park however it may be further enhanced with more resources to facilitate revenue collection
- ✓ Low local use of marine park for recreation

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Project Description & Background

The Inter-American Biodiversity Information Network (IABIN) is a web based forum that seeks to promote greater use and sharing of existing biodiversity information in order to improve decision-making and education amongst countries of the Western Hemisphere (Department of Sustainable Development 2009). At the Summit of the Americas on Sustainable Development in 1996, (convened on by the OAS in Santa Cruz de la Sierra, Bolivia) IABIN was officially mandated to promote sustainable development and the conservation and sustainable use of biological diversity in the Americas. This is to be accomplished by improving the management of and access to biological information.

IABIN has 5 Thematic Networks, (i) Species-Specimens, (ii) Ecosystems, (iii) Protected Areas, (iv) Pollinators, and (v) Invasive Species, and a metadata catalogue. The vision for IABIN is to become a data distribution system for technical and scientific information where providers control and maintain the source data. The main output for IABIN is to strengthen coastal management frameworks and develop a climate change adaptation plan for coral reefs and mangroves. More specifically:

1) Improved ecosystem valuation technical capacity of individual Caribbean countries to collect and manage their protected areas data in a way that meets their specific needs and context;
2) Improved individual country's protected areas data management systems based on output from case study sites;
3) Centralized data management system for the Caribbean region (drawing from protected areas databases where they exist or from other sources of protected areas information) which serves as a regional node for input to the Americas Database on Protected Areas and the World Database on Protected Areas (WDPA);
4) Capacity building activities in the Integrated Coastal Zone Management (ICZM)

(Department of Sustainable Development 2009)

ReefFix Exercise

As a component of IABIN, ReefFix falls under the ICZM Capacity Building Program (output 4). This exercise, supported by the government of Chile is an ICZM tool that trains participating countries in ecosystem valuation methodologies and management techniques in order to better enable them to conserve marine ecosystems and the associated watersheds. ReefFix was recently used to assist the IABIN Caribbean Protected Areas Database Initiative (CPADI) through implementation of its activities in Jamaica, Dominican Republic, Bahamas, and Haiti. This exercise aims to:

- ✓ Support education and training efforts and model demonstration programmes aimed at improving the management and conservation of coastal and marine resources;

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- ✓ Educate the public about the ecological goods and services provided by coastal and marine ecosystems;
- ✓ Improve the understanding of the status and trends of coastal and marine resources;
- ✓ Support implementation of the International Coral Reef Initiative (ICRI) at the national and regional levels;
- ✓ Strengthen monitoring of coastal and marine resources, while supporting the IOC Global Coral Reef Monitoring Network;
- ✓ Support ongoing efforts to develop and implement ICZM plans and marine protected areas.

(Department of Sustainable Development 2009)

SMMA Exercise

The SMMA represents a single most success story in natural resource management in Saint Lucia. It is an area of tremendous ecological diversity, well developed coral reefs and rich forests. The economy is based on agriculture, fishing and tourism. Management activities began in the early 1980s in response to environmental and developmental issues. The SMMA was established in 1994 and successes include managing user conflicts, participatory management processes, and self-financing through tourism activities.

For this reason, these SMMA was selected as the case study site for the ReefFix exercise, the results of which can be found in this report. The exercise was conducted over the months of January to February 2010 with the assistance of several agencies and individuals listed in the report. With a greater understanding of the economic value of the SMMA, managers as well as policy makers can have a better appreciation of the significant contribution being made to the national economy, not to mention contributions to the livelihoods of a significant number of people both within Soufriere and elsewhere. By sensible management practices, the resources of Soufriere may be used and conserved in support of the livelihoods of present and future generations.

Workshop

The results were presented to stakeholders during a one day workshop on March 30th 2010 (Appendix III) with discussions on the collection of reliable data to influence policy decision making as well as the debate on the comparative contribution of fisheries and tourism to the national economy. The workshop also discussed how the tools can be used as a reliable tool to improve resource evaluation and more importantly, conservation and management of marine resources within the country.

In the afternoon presentations were made by various organisations on the current activities of their organisations which was followed by questions and a very healthy debate.

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The field trip to the SMMA was pre-empted on the second day, as workshop participants were all very familiar with the SMMA, and it was not felt that the filed visit would have added anything significant to the already rich discussion.

The participants expressed a keen interest in the valuation methodologies and the vast amount of data inputted into the tool. However some concern remained about the accuracy of the calculating tool and of the efficacy and reliability of results.

That concern aside, it was unanimously agreed that the tool presented some level of valuation, which in most cases appeared accurate, and which provided a bargaining position in support of conservation for which there was none, prior.

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Study Site Description & Background

Country Background

In the Caribbean, the annual net benefits provided by coral reefs from dive tourism were estimated to be $2.1 billion in 2000 (Burke and Maidens, 2004). The annual net benefits provided by coral reefs in terms of fisheries were estimated to be about $300.0 million (Burke and Maidens, 2004).

Direct spending by coral reef-associated tourists contributed an estimated $91.6 million to the economy of St. Lucia in 2006 — approximately11% of the GDP. Additional indirect economic impacts from coral-reef associated tourism totalled an estimated $68–$102 million for the same year (Burke et al., 2008). Although this figure may surprise many, the truth is that the recent introduction of Tourism Satellite Accounting (TSA) to measure tourism's contribution to GDP in Saint Lucia, placed tourism's injection into the local economy at US$630 million (EC$1.7billion) with 64% of economic output attributable to tourism either directly or indirectly in 2008 (TAC, 2009). Considering that 69% of all visitors to Saint Lucia visit Soufriere mostly by sea and disembark at the port within the Soufriere Marine Management Area (SMMA), it is not surprising the contribution of this sector to the national economy.



Figure 1. Map of the Caribbean area showing location of Saint Lucia. Inset showing St. Lucia and SMMA

Site background

The Soufriere Marine Management Area (SMMA) is a very attractive location for reef related tourism. It also possess tremendous fishery potential and a variety of fishing activities occur including seine fishing, pot fishing as well as the land base for deep sea pelagic. The SMMA is a marine management area comprising of 11km of coastline with a contour depth of 75 metres and adjacent marine area, to include marine reserves, fishing priority areas, multiple use areas, recreational areas and yacht moorings. The users of the area include fishers, yachtspersons, recreational divers and the wider community for other recreational purposes (Renard, Y., 2001). Reef related tourism as well as fishing activities are critical components of this management area as there are resources which provide opportunities for a variety of economic and livelihood activities. In fact the SMMA has four main marine reserves all of which contain a rich coral resource and they include: Anse Chastanet, Rachette Point, Petit Piton and Gros Piton (SMMA, 2005). The management guidelines for the SMMA provide for effective and efficient use of the multiple resources within this area.

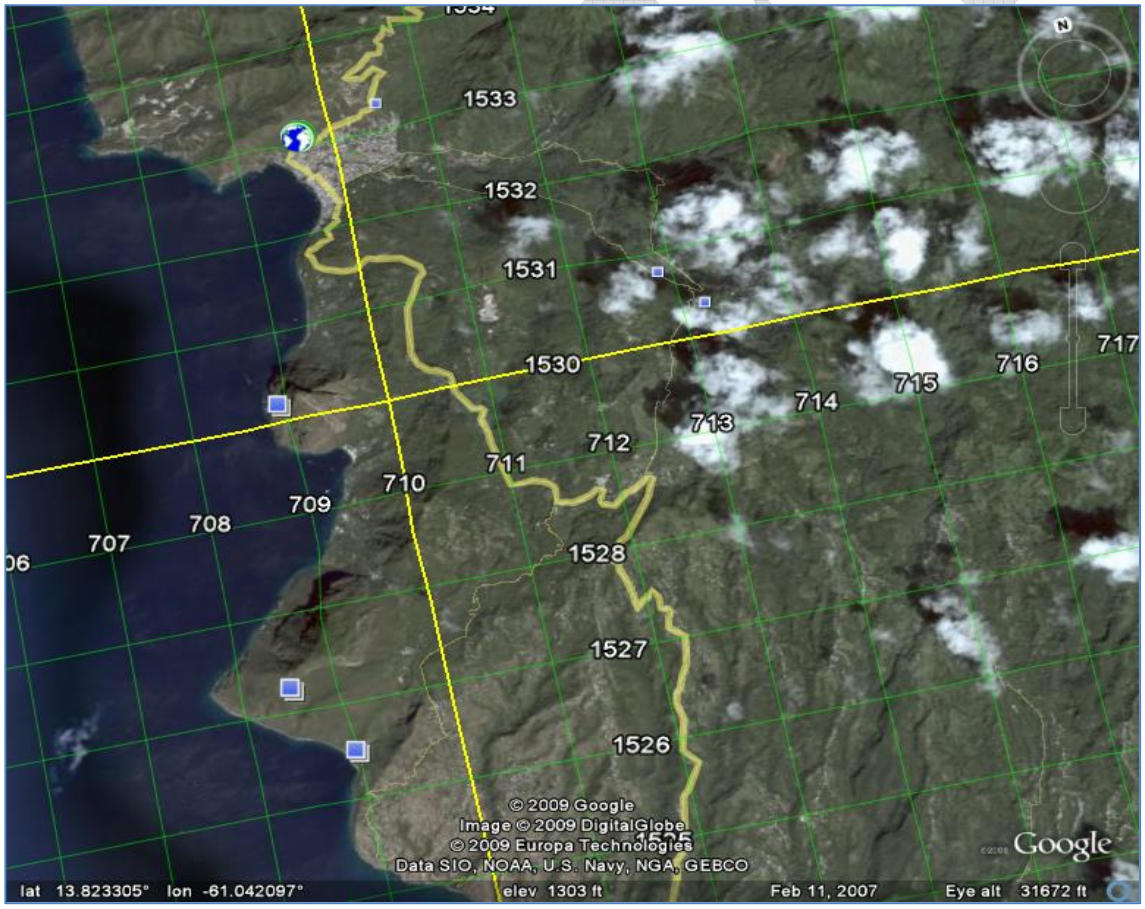


Figure 2. Map outlining SMMA (Google satellite Feb 11, 2007)

In order to manage sustainable use and development of marine resources in the area, the marine area has been subdivided and zoned into management areas. These are: -

- Marine Reserves – the area will allow fish stocks to regenerate. Being an area of high ecological value, it has been set aside for protection of all marine flora and fauna, scientific research and for enjoyment by divers and snorkelers.
- Fishing Priority Areas – this is the area for commercial fishing
- Recreational Areas – identified for public recreation
- Multiple Use Areas – Fishing, diving, snorkeling and other legitimate uses as long as general rules of the Soufriere Marine Management Area are followed
- Yacht Mooring Areas – moorings have been provided since anchoring is not allowed



Figure 3. Map outline management zones of the SMMA (Copyright SMMA, 1999)

History

The SMMA was established in 1994 following an 18 month period of participatory planning exercises. In the mid 1980s, increase user conflicts resulted in the declaration of marine reserves and fishing priority areas, but these efforts were met with ever increasing challenges as the management zones were designed and established without the participation of the resource users. With the rapidly expanding tourism sector, technological improvements in the fishing industry and increasing negative impacts from land-based activities like agriculture, industry and construction, the area was becoming increasing at threat.

The main environmental problems prior to the establishment of the SMMA can be summarized as follows:

- Degradation of coastal water quality, with direct implications for human health and for the protection of the reef ecosystem;
- Depletion of near-shore fisheries resources;
- Loss of the economic, scientific and recreational potential of coral reefs, particularly in the context of diving tourism;
- Degradation of landscapes and general environment quality, notably on or near beaches,
- Pollution generated by solid waste disposal in ravines or directly in the sea.

Problems of resource management in turn manifested themselves in growing conflicts among users of the resource. The following represents the main issues:

- Conflicts between commercial dive operators and fishermen over the use of, and the perception of impact on, the coral reefs;
- Conflicts between yachts and fishermen because of anchoring in fishing areas;
- Conflicts between the local community and hoteliers over the access to beaches;
- Conflicts between fishermen and authorities at both the local and national levels over the location of a jetty in a fishing priority area;
- Conflicts between fishermen and hoteliers over the use of the beaches for commercial fishing or recreational, tourism oriented activities.
  (Adapted from Roberts et al, 2001)

Since the establishment of the SMMA, there have been new threats which include the accidental release of harmful industrial waste into the river just 500 metres upstream from the coast; heavy sedimentation as result of road construction; and from severe storms notably an un-named storm in 1996, Tropical Storm Debbie in 1994; Hurricane Lenny in 1999, and more recently Hurricane Omar in 2008. Big barrel sponges have been severely affected by sedimentation but timely intervention saved major parts of the reef habitat from suffocation. The most recent threat occurred early in 2010 from toxic materials escaping from containers from a sunken shipping vessel which were washed into the SMMA.

The straightening of the Soufriere River in 1994 resulted in the removal of the natural river bends, which acted as natural sediment traps. This has exacerbated the problem of sedimentation in the bay. The quality of the coastal waters is also influenced by the discharge of untreated sewage and grey water from residences and commercial

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establishments in the waterfront area, as well as discharge from the Soufriere River, which is severely contaminated with faecal coliform and *enterococci*. It is likely that the river is also contaminated by pesticides and fertilizers contained in runoff from the agricultural lands upstream. (Smith Warner Int. et al, 2001)

Management, Legislation and Enforcement

The users include fishers (pot, line and seine), yachtspersons, recreational divers, and the wider community for other recreational purposes. The management institutions include the Department of Fisheries, which through the Fisheries Act of 1984 is authorised to establish and manage Fishing Priority Areas and Marine Reserves; Soufriere Regional Development Foundation (SRDF) a community-based organisation, to which power has been devolved from Government for the purpose, among others, of developing and managing the coastal area of the town; and the Soufriere Marine Management Association (SMMA), which is responsible for coordinating management activities and guiding the formulation of a comprehensive management plan.

The following monitoring activities should be undertaken by the marine management authority.

- Sedimentation rates: biweekly by and external agency and the SMMA rangers;
- Water Clarity: daily Secchi disk measurements by the SMMA rangers;
- Water Salinity: daily refractometer measurements by the SMMA rangers;
- Analysis of photo quadrates by an external agency monitoring the coral growth/mortality on an semi annually basis;
- Participation in the ReefCheck programme: twice annually by an external agency, dive operators and the SMMA rangers;
- Fish-landings in Soufriere by the Department of Fisheries on a permanent basis.

Mission statement

Between 1997 and 1998, the SMMA experienced a period of severe instability which resulted in a comprehensive institutional review, renewed stakeholder consultations, and the setting up of new management arrangements. At the end of this process the SMMA adopted a new mission statement, which is as follows:

The mission of the Soufriere Marine Management Area is to contribute to national and local development, particularly in the fisheries and tourism sectors through management of the Soufriere coastal zone based on the principles of sustainable use, cooperation among resource users, institutional collaboration, active and enlightened participation, and equitable sharing of benefits and responsibilities among stakeholders.

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Legal and new institutional arrangements

As a result of the review, new arrangements are being put in place, with the following features:

- The Soufriere Marine Management Area remains the portion of coast between Anse l'Ivrogne in the south and Anse Mamin in the north, from the shore to a depth of seventy-five meters;
- This area will be established as a Local Fisheries Management Area under the provisions of the Fisheries Act 1984;
- The management of the area will be governed by a new agreement, which has been negotiated among the members of the Technical Advisory Committee (TAC), and which defines the vision, mission, objectives, regulations, zoning, programmes and institutional arrangements of the SMMA;
- Current zoning and regulations will be maintained, and a detailed map identifying all zones forms part of the proposed new agreement;
- The coordination of management will be the responsibility of a new organisation, called the Soufriere Marine Management Association, a not-for-profit company created under the Companies Act. This Association will be comprise all the agencies which have a demonstrated management function in the Area.
- Its members will therefore be, initially, five community and non-governmental organisations (the St. Lucia Dive Association, the Hotel and Tourism Association, the Soufriere Fishermen's Cooperative, the Soufriere Regional Development Foundation and the Soufriere Water Taxi Association), five government agencies (the Ministries of Planning, Fisheries and Tourism, the National Conservation Commission, and the Air and Sea Ports Authority), and one or two individuals nominated by the District Representative and the Cabinet of Ministers.
- It will be made a Local Fisheries Management Authority under the provisions of the Fisheries Act 1984.

An important provision of the new management arrangement was the establishment of a Stakeholder Committee. This broad-based advisory body was mandated to provide a forum for all stakeholders to express their needs, views and concerns. This Committee is expected to meet at least once per quarter, and will be an essential component of the new SMMA, as it is intended to represent the avenue where the views of various stakeholders could be heard, and to help preempt the escalation of conflicts into a crisis situation, like what had threatened to destroy the management body in the 1997-98 period.

Enforcement

The SMMA continues to suffer from unclear and inefficient structures for the enforcement of regulations within the marine park. This concern is expressed by both users as well as management agencies. Most of the problems stem from human resource deficiencies related to both the SMMA as well as law enforcement personnel who complain of manpower and equipment constraints. The SMMA Wardens have since been elevated to Police Constables with powers of arrest. However, only one warden has this designation at present. The Marine Authority continues to complain that financial constraints militate against attracting new wardens and facilitating their training and elevation to Police Constables.

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Ecosystem Health

Recent studies on the success of the SMMA are limited and there have been no notable ones since the turn of the century. However a study conducted in 2001 to measure the movements of fish species from reserves to non reserves identified 76 species or types from 31 families in the two study sites selected. These sites were chosen from shallow (9 m depth) fringing coral reefs: a protected site within a no-take marine reserve (Anse Chastanet), which has been protected since August 1995, and an adjacent unprotected site (Grand Caille), which was initially closed to fishing in 1995 but reopened in late 1997.

The study concluded that although Anse Chastanet had significantly higher reef fish diversity than Grand Caille there was no significant difference in overall densities of resident fishes between the sites. However, the study was able to identify that the most abundant reef fish families were the Scaridae, Pomacentridae, Synodontidae, Apogonidae and Blennidae. Each was represented by more than 200 individuals and together these families constituted 79·3% of the total reef fish catch. The most abundant species overall were the stoplight parrotfish *Sparisoma viride* Bonnaterre, the dusky damselfish *Stegastes dorsopunicans* Poey, the sand diver lizardfish *Synodon intermedius* Spix and Agassiz and the bicolor damselfish *Stegastes partitus*. (Valles, Sponaugle and Oxenford, 2001).

Perhaps the most positive findings were undertaken by Roberts et. Al, (1997) which confirmed increases in fish stocks of commercially important species, with especially strong increases in marine reserves. This suggested that the management efforts at the SMMA were in fact yielding success. (Roberts et.al, 1997)

However, reef fish populations are still under threat and there is urgent need to re-establish declining red snapper population. Electric rays have all but disappeared from the Soufriere Bay, however divers report that there appears to be a resurgence of angel fish populations.

Tourism

The Caribbean is perceived as a premier tourism destination; attracting 23 million visitors in 2008 with $US27 billion dollars in visitor spend (CTO, 2009). It is also the most tourism-dependent region in the world, averaging approximately 9% contribution to GDP. Turbulent economic fortunes of several Caribbean states have further enhanced the importance of tourism as an alternative economic development strategy. The onslaught of devastating hurricanes particularly over the past 15 years, the decline in banana and sugar fortunes, compounded by the inability to compete in agriculture and manufacturing, has forced many islands to turn to tourism, which they perceive as having a comparative advantage.

But this positive shift in economic fortunes has not always been “smooth sailing” as visitor arrivals, though growing steadily at a rate of over 5% in some destinations, have experienced severe cutbacks due largely to external factors. Arrivals declined after the 9/11 twin tower bombings in New York (2001), and although most destinations enjoyed a sustained recovery by 2003, decline commenced again between 2006 and 2009. The

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reason for this include reduction in seating capacity in the aftermath of the LIAT, Caribbean Star merger; BWIA closure and the activity of new replacement airline Caribbean Airlines on a scaled down version; cut back in airlift from American Airlines and its subsidiary American Eagle, the main carrier supplying US visitors (accounting for 52% of the Caribbean visitor market); increasing unemployment in major markets; relatively high airfares, chop and change schedules by airlines in response to weakening demand; heavy promotion and discounting by hotels and cruise lines thus reducing revenue; have characterized the tourism industry over the last three years. Although it may be argued that cruise ship arrivals have shown more resilience and grown during this period, paradoxically, cruise lines are also stuck with recently acquired inventory, that they are unable to commission. However, there are indications that the decline is over with the resurgence in the arrival figures of 2009. The decline which was estimated at 6.6% in the first quarter of that year has slowed down throughout the year, and an increase of 1% was recorded in the last quarter (CTO Statistical Report, 2010). Saint Lucia has recorded an increase in visitor arrivals of 13.2% for the first month of 2010.

Tourism's direct contribution to Gross Domestic Product (GDP) in Saint Lucia for 2008 stood at EC$ 656 million or 30%, which clearly reveals the significant impact that this leading sector has on the economy of this island. It is also worthy of note that 64% of economic output is attributable to tourism, both directly and indirectly, with tourism activity injecting EC$ 1.7 million into the Saint Lucian economy in 2008 (SLTAC, 2009). These statistics also clearly show that tourism is the single greatest generator of economic activity for Saint Lucia, categorized as the top ranked sector in the economy.

The United States remains the main source of tourist arrivals to Saint Lucia (36%) followed by the United Kingdom market which stands at 28.3%. There has been a recent trend of an increase in tourist arrivals from Germany and Canada (SLTAC, 2009). However the last three years have experienced general reduction in tourist arrivals due to rising costs of travel caused largely by the rising cost of oil. There is also concern that given that Europe as a whole, especially the U.K., seems to be taking a longer time to recover from the world wide recession, this may mean that there will be an even greater dependency on the North American market in the foreseeable future.

In Saint Lucia, small hotels represent 34% of total properties with a provision of less than 75 rooms. Large hotels on the other hand represent the highest occupancy rate but it is envisioned that the growth potential lies in small properties (SLTAC, 2009). This is a good pointer for Soufriere which is the focus of this report as in Soufriere there are a good number of small hotels which could benefit from greater tourism arrivals. It should be noted that the average occupancy rate for hotels in St. Lucia for the period January to September 2009, was 56.1% compared to 52.3% in 2008 (SLTAC, 2009). As indicated earlier there has been an improvement in tourist arrivals during 2009 indicating that the decline is over and recovery is expected to be more fully demonstrated for the 2010 period.

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Tourism Attractions in Soufriere

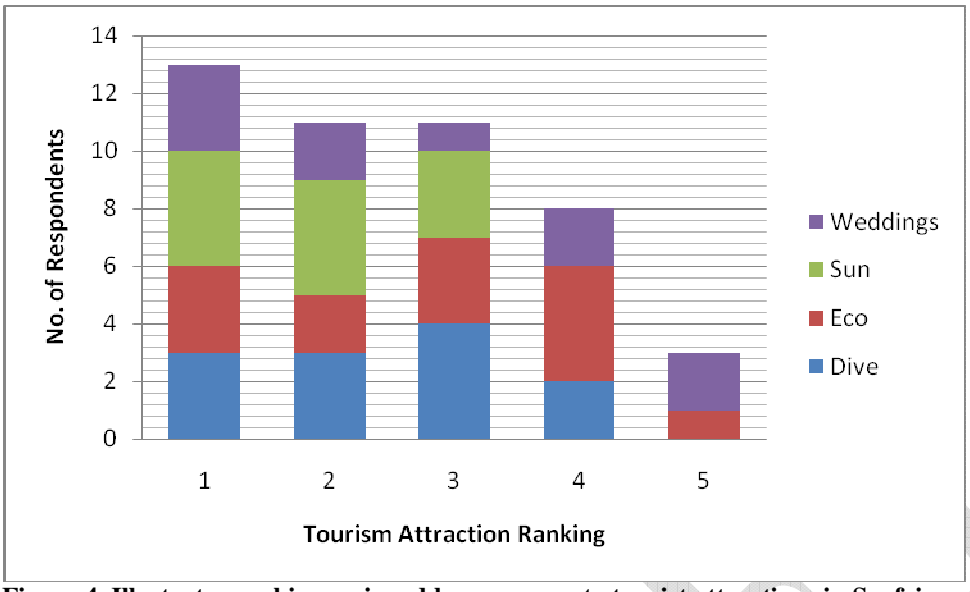


Figure 4. Illustrates ranking assigned by resources to tourist attractions in Soufriere

In Saint Lucia, the major pull for visitors to the island is the warm weather and the lure of sun, sea and sand. The destination has also developed an excellent reputation for weddings and honeymoons. Increasingly, however, the tourism product is widening and becoming more diverse to include visits to parks and reserves, waterfalls and reef related tourism such as snorkelling, scuba diving and trips on glass bottom boats. There is greater evidence which suggests that the number one factor which attracts people to Saint Lucia is the natural beauty of the island followed by the friendliness of the people. This fact augurs well for the people of Soufriere as the major comparative advantage for Soufriere is its natural attractions, especially the Pitons, the Sulphur Springs, the various waterfalls and reef related tourism within the Soufriere Marine Management Area (SMMA).



Figure 5. The natural beauty of the SMMA

Reef Related Tourism in Soufriere for Resource Users

As mentioned earlier, reef related tourism in the SMMA refers specifically to scuba diving, snorkelling, operation of day charters and the operation of glass bottom boats. As regards diving and snorkelling, there are independent companies as well as dive departments attached to specific hotels. In this study, there were 16 resource users altogether who formed part of the survey, six of whom are dive centres attached to hotels both in Soufriere and the North of the island, four of whom are independent dive companies, one day Charter Company, two water taxi companies, two informal stakeholders and one boat boy. Each of these groups benefit directly from reef related tourism.

2005 represented the best year for tourism arrivals in the history of Saint Lucia, recording 317,939 stay-over arrivals. Although there has been some recovery since 2008, these figures are still short of the 2006 arrival figures. 2008 recorded 295,761 visitors.

Fisheries

Like most small island States of the Caribbean, Saint Lucia's maritime area is larger than its total land mass; and as is common to other small islands, fishing is traditionally and culturally important to island life. Growth within the Fisheries Sector continued with a 2.60% increase in estimated fish landings for 2009 (1857 tons) over the figure for 2008, with the ex-vessel value for 2009 fish landings reaching 24.06 million dollars.

The increase in landings may have been the result of the deployment of a number of Fish Aggregating Devices (FAD) island-wide. Each FAD attracts migrating fish and provides a known, moored location in deep waters for fishers to target. They are designed to reduce on fuel consumption for offshore fishing and to attract fishers away from sensitive coastal reef areas.

For the most part, the island's fishing sector can be described as artisanal. That is, most Saint Lucian fishers go out to fish in either fiberglass pirogues or wooden canoes powered by outboard motor (40-115Hp) and remain relatively close to shore. Review of **Table 2** indicates that the number of pirogues in the fishery has increased and the number of canoes has decreased in the last few years due to an intensive programme by the Department of Fisheries to get persons to convert to the more stable pirogue.

Table 1: Summary of the number of fishers registered by the Department of Fisheries

Year	Full Time	Part Time	Non-fisher/ Boat owner	Total
2000	1172	797	**36**	**2005**
2001	1232	819	**42**	**2093**

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Year	Full Time	Part Time	Non-fisher/ Boat owner	Total
2002	1254	828	**55**	**2137**
2003	1256	834	**73**	**2163**
2004	1262	834	**85**	**2181**
2005	1310	844	**113**	**2267**
2006	1333	851	**127**	**2311**
2007	1365	867	**142**	**2374**
2008	1355	870	**162**	**2387**
2009	1361	880	**188**	**2429**

Source: Department of Fisheries **Registration as of December 31st of all years**

The number of fishers engaged in the fishing sector has grown over the last few years and this may be attributed to persons moving out of the banana industry and entering other sectors **(Table 1).**

Due to a very limited continental shelf, catches are predominantly made up of (migratory pelagics (dolphin fish, wahoo, tuna species and flying fish). This fishery tends to be seasonal due to the migratory patterns of the targeted species with the majority of fish being landed during the months of December and June.

The sector is regulated under the Fisheries Act No. 10 of 1984 and the Fisheries Regulations No. 9 of 1994 which cover the establishment of a fisheries advisory committee, fisheries access agreements, local and foreign fishing licensing, fish processing establishments, fisheries research, fisheries enforcement and the registration of fishing vessels. The Department of Fisheries, Ministry of Agriculture, Lands, Forestry and Fisheries is the lead agency responsible for the development and management of fisheries through the implementation and enforcement of the island's fisheries legislation.

Table 2: Number and type of vessels engaged in artisanal fishing in Saint Lucia

Year	Canoe	Pirogue	Transom	Shaloop	Whaler	Other	Long Liner	Total
2000	346	426	86	44	9	15	5	**931**
2001	353	496	88	47	8	15	6	**1013**

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2002	363	551	90	50	8	15	6	**1083**
2003*	168	418	41	26	6	4	5	**669**
2004	142	440	41	30	7	5	4	**669**
2005	134	456	43	30	9	3	5	**680**
2006	131	466	48	29	9	3	4	**690**
2007	129	496	51	30	8	2	5	**721**
2008	83	429	31	17	3	4	7	**574**
2009	87	445	37	15	3	4	8	**600**

Source: Department of Fisheries **Registration as of December 31st of all years**

*** In 2003, the Department of Fisheries conducted a verification exercise of its database on registered vessels. This exercise was undertaken by the Fisheries Extension Unit, and it determined that vessels that no longer exist and that are no longer engaged in the fishery be taken out of the database**

Fishers in Soufriere

Most fishermen are above the age of 35 and are the breadwinners in their families. These fishermen have been fishing for over 15years and fish 6-7 days a week. They spend an average of 8 – 16 hours on the sea. In most cases, fishing is the only form of income which they depend on. Some also have part time jobs such as masonry, fruit vendors and handymen.

There are also part time fishermen who go fishing 3-4 days a week. These persons have full time jobs and do a lot less fishing when the season is slow. Their main jobs range from water taxi operators, hotel workers and have management jobs.

Fishermen tend not to stick to one type of fishing. The type of fishing is largely dependent on the season. December to June is the flying fish season and June to November is coastline fishing, pot and net fishing. Many have indicated that they hardly do any reef fishing due to the reserve area. Deep sea fishing can be done year round. Most fishermen do more than one type of fishing with the majority doing deep sea fishing. Deep sea fishing and fillet/seine fishing are seen as the most profitable type of fishing. Fishermen have indicated that flying fish tend to be quite profitable when in season.

The majority of fishermen are from Baron's Drive, Soufriere. Others also come from New Development, Ravine Clear, Palmiste, Bridge Street, Cemetery Road and Market Road.

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During the various fishing seasons, if no fish is caught on a trip, fishermen do not return to the area on the next day. They wait until the day after to go fishing. This is due to the expenses now associated with fishing, such as the high cost of fuel.

Most of the fish caught is for sale; however fishermen also take some of their catch for consumption. Very few pay their crew members with fish. Instead a share system is used. Following sale of catch, expenses are taken care of such as gas. Following this, the boat owner is given one share. It should be noted that not all fishermen own boats. In the case where the fisherman owns the boat and is the captain, he is entitled to two shares. The remaining money is then divided among the crew.

However with net/seine fishing share system differs. Following sale of catch, owner of net receives half of the sale and the remaining is divided equally among the crew.

Methodology

World Resource Institute (WRI) Valuation Methodologies

Coral reef valuation involves the estimation of the economic benefits that are gained from the presence of reefs. However some of the less tangible benefits such as future use and existence value (Figure 5) are much more difficult to quantify. As such, the WRI Valuation Tools only account for estimates of revenue generated (direct use value) from the reefs and not other values such as those derived from primary production and shoreline protection. The result would therefore be an underestimation of the overall value of the goods and services provided by the reefs.

Data were gathered through information received from the Soufriere Marine Management Authority, the Department of Fisheries, the Saint Lucia Dive Operators Association, the Soufriere Fishermen's Cooperative Society and the Saint Lucia Tourism Board. This information was collected using prepared questionnaires and comprised a combination of statistical data and information based on the expert opinion of resource users. Additional research was used to supplement this data so as to fill information gaps where possible. To account for errors in the data and the assumptions made in the study, the sensitivity analysis was employed using a range of $\pm$ 20% (for most values) as used in similar valuation studies (Cooper *et al.* 2009, Burke *et al.* 2008).

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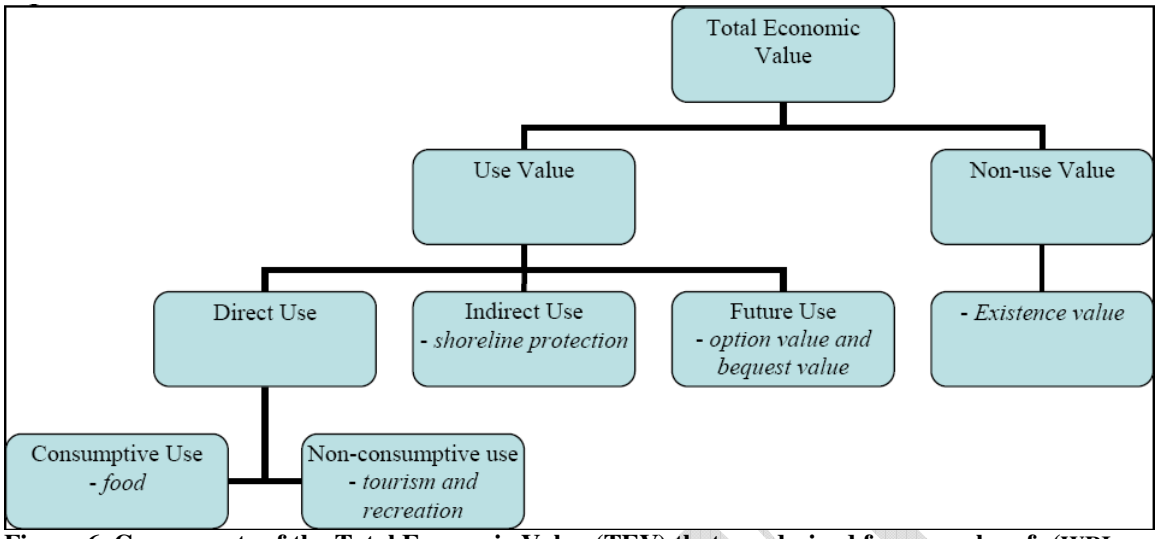


Figure 6. Components of the Total Economic Value (TEV) that are derived from coral reefs (WRI 2009)

Tourism and Recreation

The tourism data were compiled and analysed using the World Resources Institute's (WRI) Coral Reef Valuation Tool (v2.0): *A Tool to Guide the Economic Valuation of Goods and Services from Coral Reefs (Tourism and Recreation Component)*. This creates an estimation of the direct economic impacts from the reef-based accommodation and recreation (snorkelling, diving,) sectors using existing data. It was not possible to estimate coralline beach use by locals or visitors as most of this may be calculated from day boat excursions, which was not included in the study.

Tourism data was readily available and this allowed for easy entry of data. Where information was lacking, the following assumptions were made:

- ✓ **Accommodation (cost, taxes and service charges)**: Average work week was estimated at 48 hours, earning US$2.00 per hour with 2 employees per room.

- ✓ **Accommodation (occupancy rates)**: In Saint Lucia, small hotels represent 34% of total properties with a provision of less than 75 rooms. Large hotels on the other hand represent the highest occupancy rate at 60% and small properties at 38% (SLTB, 2009). Average occupancy rate for hotels in St. Lucia for the period January to September 2009, was 56.1% compared to 52.3% in 2008 (SLTAC, 2009). 56% occupancy rate was used as this represents a more accurate average occupancy rate for Saint Lucia. To account for the wide range in occupancy rates between small and large hotels, a ± 20% variation was used in the sensitivity analysis (35-75%).

- ✓ **Diving**: The greatest number of reef tourism resource users within the SMMA for the year 2008 is Snorkelers. According to SMMA figures (2008), 3%, that is 7,988 of the

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295,761 stay over arrivals are scuba divers and 6%, that is 17,673 of the 295,761 stay over arrivals are snorkelers. Therefore, the figure in regard to the percentage of stay over visitors who use the reef can be rounded off to 10%. The national figure for reef tourism is approximately 25% with 90% of dives taking place within the SMMA (Clauzel/WRI, 2005). This reveals that 10% may very well be a very conservative estimate of reef tourism business out of the SMMA.

- ✓ **Diving (costs):** The majority of the dive companies offer an all-inclusive service which includes lunch, transportation and equipment. Other hotels in Soufriere offer equipment and transportation only. One independent dive company provides only equipment. The all-inclusive hotels do not charge the guests as diving is part of the all-inclusive package. However, the other companies tend to offer different rates for the dives ranging from US$50 to $100 per dive. It should also be noted that the basic cost of obtaining certification diving is approximately US$300. There are different levels of certification but the figure quoted is the most basic package which is what is most often requested by visitors.

  Additionally, all the independent companies are required to pay a commission of approximately 10 to 20% to the hotels for the purpose of obtaining clients or patrons. Lastly, the average number of trips per week for the companies range from three to five times with a load of approximately 8 persons per trip.

Fisheries

Similarly, fisheries data were compiled and analysed using the other WRI's Coral Reef Valuation Tool (v2.1): *A Tool to Guide the Economic Valuation of Goods and Services from Coral Reefs (Fisheries Component)*. This section focuses on the contributions to the economy derived from reef-associated fishing as well as other added value (e.g. local use for enjoyment and consumption). As data were also limited for this component, major assumptions were made regarding the data. These include:

- ✓ **Commercial and Local Fishing**: There are 220 fishers of which 103 are registered with the Soufriere Fishermen's Cooperative Society Ltd (SFCSL).There are 69 full-time and 151 part-time fishers.

Fishing Type	No. of Fishermen
Deep Sea Fishing	65
Seine & Fillet	45
Pot Fishing	10
Fishing Aggregate Device	48
Small Pots	5

Table 3: Number of fishers per fishing type

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Crew in relation to fishing types: -

Deep sea fishing	– 3 persons on a big fiberglass pirogue
	– 2 persons on a medium sized pirogue
Seine	– 2 boats and 6-8 fishermen
Seine Fillet (flying fish)	– 3-4 fishermen
Pot fishing	– 1 fisherman

- ✓ **Commercial Fisheries.** The tool allows for three ways to calculate commercial fisheries value. Each of these involved major assumptions to produce an estimate of annual revenue. However because data was available from the Soufriere Fishermen's Cooperative Society Ltd (SFCSL) as well as from interviews with local fishermen, this was used to calculate the commercial fishery.

- ✓ **Estimate by landings data):** Fish is landed at the Soufriere Fishermen's Cooperative Society Ltd (SFCSL). The SFCSL does not purchase fish. It merely provides a storage area for fishermen. Fishermen are provided with ice and the Cooperative also sells equipment to fishermen. Items are usually cheaper at the SFCSL. Members receive a patronage refund. Approximately $28,000 is paid to members under patronage refund.

Type of fishing	Cost ($)
Deep Sea	150
Deep Sea/ All	500
Deep Sea/ FAD	750
Deep Sea/ Fillet	700
Deep Sea/ Fillet (flying fish)	430
Deep Sea/ Reef	700
Deep Sea/ Reef/ FAD	350
Deep Sea/ Seine	1100
Nearshore/ Reef	210
Reef/ Seine	100
Seine	6750
Turtles	450

Table 4: Average catch per trip

- o **Processing of Fish**

  Fish is not usually cleaned before it is sold. Only guts are removed. Persons who purchase fish are responsible for its cleaning. There are however, individuals who offer their services as fish cleaners. They charge EC$10-15 per fish depending on the size. The valuation used EC$12 as an average. Cost of cleaning is largely dependent on the size of the fish. At least 75% of the persons who purchase fish opt to have it cleaned by these individuals. Persons who clean fish tend to position themselves on the Soufriere Square on weekdays as fishermen sell their fish in that area and stay near the

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Cooperative on Saturdays. The services of persons who clean fish are largely dependent on the catch.

- **Middle Men**

  Middlemen purchase fish from fishermen and sell this fish to hotels such as Anse Chastanet, the largest hotel in Soufriere catering directly to the dive market. To some, this is a full time job and main source of income. The frequency at which fish is purchased depends on the season and the hotel demand.

  Fish is not cleaned by fishermen before it is sold. Middlemen sometimes hire persons to assist with freezing and carrying fish to hotels. These persons are hired on a needs be basis and paid EC$20-30 for the job. Price is determined on the volume of fish to be processed.

Species	Purchase price (EC$)	Selling price (EC$)
Snappers	9.00	11.50
Tuna	8.00	9.00 – 10.00
Kingfish	8.00	9.00-10.00
Dolphin	8.00	10.00-11.00

Table 5. Species, purchase and selling price.

- **Sport Fishing**

  This is offered mainly to visitors. Tours are either for a half day or whole day. Few fish are caught on such trips, probably 1-2 fish per trip. Any fish caught weighing less than 300lbs is released however fish such as tuna or Dolphin locally know as "Dorado" is usually kept. Fish caught belongs to the boat but is usually shared with guests.

  December to March is the season for dolphin and tuna, blue marlin is caught all year round.

  Charges for sport fishing:
  Half day - $350.00US
  Whole day - $700.00US

  Expenses of Sport Fisher:
  Owns two boats, one is gas-powered with outboard engine, and is usually used for half day trips. Uses ~$400.00 for expenses which includes fuel and refreshments

  Diesel powered boats - ~$200.00 in expenses for half day trip.
  Boat is serviced monthly costing ~$400.00EC
  Other expenses which are covered – insurance, commission, staff (4 persons)

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Value Transfer: Spatial Distribution of Ecosystem Service Values

The third methodology utilises a "benefits transfer" technique that uses economic values derived from heavily-studied reefs in other areas and applying them to the similar sites (Department of Sustainable Development 2009). For the purposes of this study, land cover will be classified into a unique typology developed by Troy, Austin and Matthew A. Wilson in "Practical challenges and opportunities in linking GIS and value transfer" (*Ecological Economics* 60 (2006)435-449). Categories of land cover types include coral reef environs, mangroves, beaches, freshwater herbaceous swamp grasslands and coastal forests (Table 8). This method, unlike the WRI Valuation Tool, includes indirect use values such as shoreline protection.

Terrestrial area values for the SMMA were derived from Google Earth™ satellite imagery where the desired land cover types were outlined and exported into ArcMap 9.2 in order to calculate surface area. Marine data were derived from the Marine Resource and Space-use Information System (MarSIS) GIS database developed by Ms. Kimberly Baldwin (PhD candidate). The MarSIS project seeks to aid marine space use planning and management in the Grenadines by gathering information on marine space use such as critical habitats, representative marine ecosystems, areas of high aesthetic value and cultural importance, fishing grounds and marine-based tourism, areas of highest human threat and space use conflict (CERMES, 2006). During the development of the MarSIS database, the surface area values were identified through site surveys of the bottom habitats and include deeper reefs that cannot be correctly defined by Google Earth™ satellite photographs.

Economic Valuation Results and Discussion

Tourism

Table 6. Summary of Total Economic Impact of Reef-Related Tourism and Recreation

1. Accommodation	**US DOLLARS**
Percent of accommodation revenue that is reef-related	35%
Reef-associated Gross Revenue	$13,581,944
Reef-associated Net Revenue (Gross minus costs)	$7,035,443
Net revenue remaining in the country (net revenue - leakages)	$2,814,177
Transfers to the economy (taxes, via wages and service charges)	$5,595,765
Total Value	**$8,409,942**
2. Diving	
Gross Revenue	$10,647,396
Net Revenue (Gross minus costs)	$2,661,849
Transfers to the economy (taxes, via wages and service charges)	$6,175,490
Total Value	**$8,837,339**

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3. Snorkeling and Boating	
Gross Revenue	$1,217,280
Net Revenue (Gross minus costs)	$304,320
Transfers to the economy (taxes, via wages and service charges)	$706,022
Total Value	**$1,010,342**
4. Marine Parks	
Gross Revenue	$432,741
Net Revenue (Gross minus costs)	$432,741
5. Other Direct Expenditures - Total Value	**$440**
TOTAL DIRECT ECONOMIC IMPACTS	**$18,690,804**
6. Total Indirect (secondary) Impacts (from multipliers)	$0
TOTAL DIRECT AND INDIRECT IMPACTS	$18,690,804
7. Uncaptured Value	
Local Use of Coralline Beaches	$0
Local Use from reef recreation	$0
Diving Consumer Surplus	$2,661,849
Snorkeling Consumer Surplus	$304,320
TOTAL ECONOMIC IMPACT OF REEF-RELATED TOURISM AND RECREATION	**$21,656,973**

Table 5 outlines the summary of the results from the WRI Tourism and Recreation Valuation Tool using average values. When the uncertainties surrounding the estimates are accounted for (details in sections below), the total economic impact of reef-related tourism is between US$21,656, 973.00.

Accommodation Sector

Data were available for a total of 10 accommodation properties with clients using the SMMA. These included 6 small and 2 large properties in Soufriere, as well as 2 large properties in the North of the island. Soufriere attracts a generally high-end discerning visitor market. Average room rate per night for small properties was US$200 and large properties were US$250. The large properties in the north attract an average of US$300 per night. Average occupancy rate for small properties in Soufriere is above the national average at 50% with large properties at 55%. (See Table 6)

Accommodation Type	Average number of rooms	Average Occupancy)	Average Room Rate (per night)	Percentage of visitors using reef

Accommodation Type	Average number of rooms	Average Occupancy)	Average Room Rate (per night)	Percentage of visitors using reef
Small Hotels	40	50%	$200	25%
Large Hotels	150	50%	$250	25%
Large Hotels in North	200	60%	$300	25%

Table 7. Performance of accommodation types

Visitor Reef Use

It was estimated that 35% of the visitors to all the properties use the reef. This is a conservative figure as approximately 90% of the visitors to the largest property in Soufriere use the reef. In addition, a significantly large number of visitors come to the SMMA via day boats or catamarans, many coming off cruise ships. Cruise ships accounted for 699,306 visitors in 2009 up by 12.8% over 2008 (SLTB Summary Report, 2009). It is estimated that close to 70% of visitors to Saint Lucia come to Soufriere. However, the number of cruise ship visitors who come to Soufriere on day boat charters is not officially recorded. Further investigations must be conducted in order to acquire more accurate values.

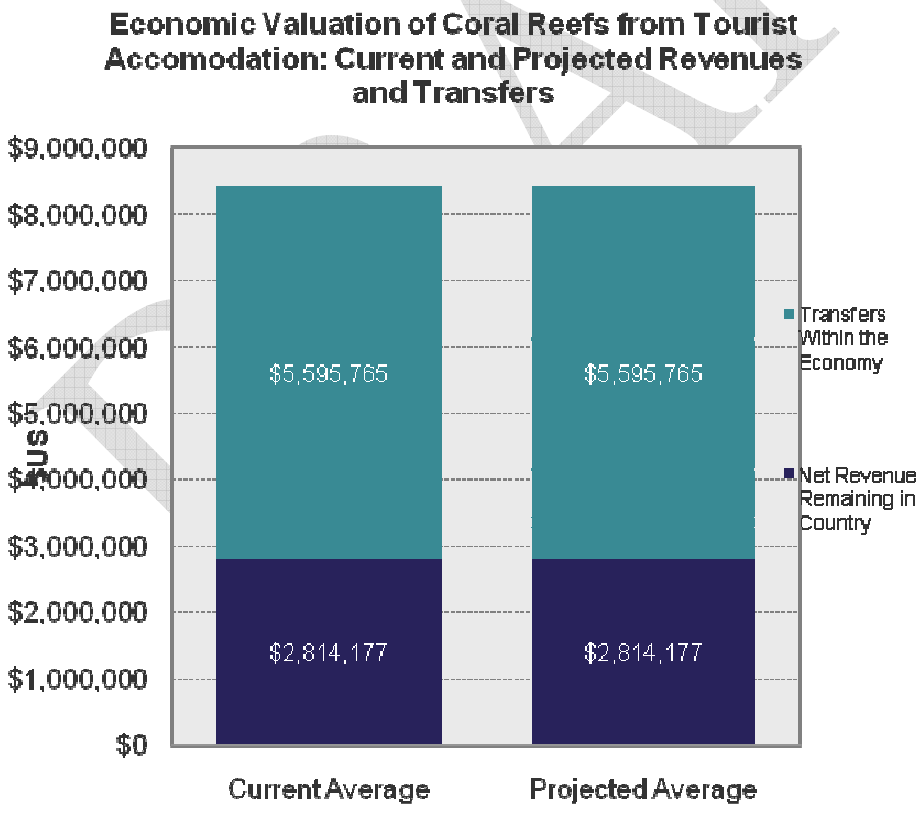


Figure 7. Sensitivity analysis of accommodation revenue (Occupancy rate = 56%)

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Leakages

Economic leakages are a significant problem in Saint Lucia and the Caribbean, as most of the properties are foreign-owned and the majority of consumable (foods) and non-consumable materials (furnishings, linens) used by guests are imported. According to most reliable sources, the leakage rate could be as high as 75% due to the exceptionally small number of locally owned properties. If so, the net revenue from accommodation remaining in the country would decrease by as much as 40% (Table 2).

Table 8. Variations in accommodation revenues with a current leakage rate of 30% (2nd column)Unable to project for leakages. Values in US dollars

CURRENT AND PROJECTED REVENUES			
Net Revenue Remaining in Country	$2,814,177	$2,814,177	0%
Transfers Within the Economy	$5,595,765	$5,595,765	0%
TOTAL REEF-RELATED ACCOMMODATION VALUE	$8,409,942	$8,409,942	0%

Marine Park Revenue

The SMMA receives a regular fee from boats which dock at their port as well as dive companies which use the marine park. According to the SMMA website (2005), the annual marine reserve dive fee is EC$ 13.50; the daily marine reserve fee is EC$ 40.50 and the snorkelling fee is EC$ 3.00.

Based on figures received from the SMMA Office, marine park revenue for 2008 grossed at US$432,741. This represented 141,326 from diving and 291,415 from snorkelling and other recreational concessions. The operational costs of the marine park authority was not available, as such it was not possible to calculate the net revenue. As the additional cost figures are not available it was not included into the analysis to allow for comparative results.

Marine Recreation

According to the SMMA staff and supported by dive operators, it is estimated that a significant number of visitors enter the marine park without paying the user fee. These include day boat charters carrying excursionists from cruise ships as well as other hotels in the north of the island. This does not even include locals resident in Saint Lucia or the Soufriere area. The majority of these persons engage in various forms of marine recreation however only diving, snorkelling and boating, as recorded by the SMMA and from the authorised dive operators and day boat charters, were included in the analysis.

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Diving

Table 9. Estimated annual revenue earned from scuba diving on reefs in and around the SMMA (values in $US)

Total Valuation of Coral Reefs from Diving	
Number of Dives Taken:	
At All-Inclusive Resorts	11,830
At Other Resorts	47,322
a. Gross Dive Revenue	
TOTAL	$10,647,396
b. Dive Costs	
Total Wages	$4,258,958
Non-Labor Operating Costs	$3,726,589
NET REVENUE	$2,661,849
Transfers within the Economy	
Transfers to employees:	
Total Wages	$4,258,958
Service Charges	$1,064,740
Transfers to the Government:	
Taxes	$851,792
TOTAL DIVING VALUATION *(net revenues plus transfers)*	**$8,837,339**
All-Inclusive Resort Revenue Attributable to Diving:	$1,183,044

It is estimated that 90% of the dives take place within the SMMA (Clauzel, WR, 2005). This is borne out by this current study which clearly reveals that all the hotels and independent dive companies surveyed, take their dive clients to the SMMA. In fact, 64% of the resource users indicated that their clients had a preference for the SMMA reef sites. The most popular reef sites within the SMMA according to the respondents include, Superman's flight, Anse Chastanet, Fairy Land and Pinnacles. The first ones mentioned are considered very popular due to the significant amount of marketing which takes place in respect of those sites. One dive instructor pointed out that Anse Chastanet is very popular but not necessarily the best in terms of quality.

The gross revenue generated from diving was estimated at US$10,647,396 per year (Table 4) with the government receiving an estimated US$851,792 in tax revenue. Non-labour operating costs were moderate (35% of gross income) and include insurance,

operating costs (i.e. fuel) and boat and equipment maintenance (US$3,726,589). Labour cost is significant however and accounts for an addition 40% (US$4,258,958) of operating costs.

Snorkelling

Table 10. Estimated annual revenue earned from snorkelling in the SMMA (values in $US)

Total Valuation of Coral Reefs from Snorkeling and Boating	
a. Gross Revenue	
TOTAL	$1,135,722
b.Costs	
Total Wages	$454,289
Non-Labor Operating Costs	$397,503
NET REVENUE	$283,931
Transfers within the Economy	
Transfers to employees:	
Total Wages	$454,289
Service Charges	$113,572
Transfers to the Government:	
Taxes	$90,858
TOTAL VALUATION *(net revenues plus transfers)*	**$942,649**
All-Inclusive Resort Revenue Attributable to Snorkeling and Boating:	$283,931

Snorkelling is more popular among the day-boat and catamaran visitors to the marine park, who are not captured in this survey. Further snorkelers represent the greatest number of reef tourism resource users within the SMMA for the year 2008. According to SMMA figures (2008), 3% (7,988) of the 295,761 stay over arrivals can be said to be scuba divers and 6%, (17,673) of the 295,761 stay over arrivals can be said to be snorkellers. Based on these estimates the figure in regard to the percentage of stay over visitors who use the reef can be rounded off to 10%. The national figure for reef tourism is approximately 25% (Clauzel/WRI, 2005) which reveals clearly that the SMMA takes a relatively large share of the reef tourism figure.

The gross revenue generated from snorkelling and boating was estimated at US$1,135,722. Non-labour operating costs, i.e. fuel, food for patrons and maintenance costs, ($397,503) plus labour costs ($454,289) retains net revenue from snorkeling and boating at $283,931. The all-inclusive hotels do not charge the guests as this a part of the package. However, the other companies tend to offer different rates for the dives ranging from US$ 50 to 100 per dive. It should also be noted that the basic cost of obtaining certification diving is approximately US$300. There are different levels of certification but the figure quoted is the most basic package which is the more often requested by visitors.

Local Use Valuation

Locals are said to equate to >1% of the total visitors to the marine park. Snorkelling is not a preferred activity for locals (>2%) and very few locals are said to be SCUBA certified with diving being associated mainly with visitors to the island and perhaps those persons involved in the fishing industry. No valuation was provided for local coralline beach use or for reef recreation.

Fisheries

Fisheries Profile

There are 220 fishers of which 103 are registered with the Soufriere Fishermen's Cooperative Society Ltd (SFCSL), of which there are 69 Full Time and 151 Part Time. Data was taken from 14 of the full time fishers and 8 of the part-time fishers.

Facilities and Landing Site

Fish is landed at the Soufriere Fishermen's Cooperative Society Ltd (SFCSL).

SFCSL does not purchase fish. It provides storage area for fishermen. Fishermen are provided with ice and SFCSL also sells equipment to fishermen. Items are usually cheaper at the SFCSL. Members receive a patronage refund. Approximately $28000 is paid to members under patronage refund.

Commercial Fisheries Analysis

Calculating from Official Landings Data

Based on the estimates from official landings data for 2009 from the SFCSL (see Methodology section for calculations and assumptions), the annual gross revenue from commercial fishing was US$2,185,001 or (EC$5,921,353) using a $\pm$ 20% range in the sensitivity analysis to account for the uncertainty of the data.

Calculating fish processing and cleaning

Fish is not usually cleaned before it is sold. Only guts are removed. Persons who purchase fish are responsible for their cleaning. Consequently a significant value added

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component to this industry is derived from individuals who offer their services as fish cleaners. They charge $5-10 per fish and have no overhead costs or employees. Cost of cleaning is largely dependent on the size of the fish. The average of $7.50 was used to calculate this value, using weight calculations. At least 75% of the persons who purchase fish choose to have it cleaned by these individuals. Local cleaners earned US$934,273 (EC$2,531,880) from this activity.

Local Use Valuation

This section required the use of default values for the following components:

- ✓ Average catch per trip (sale, consumption)
- ✓ Average annual days in activity (sale, consumption, enjoyment)
- ✓ Average time spent fishing (enjoyment)

Percentage of locals involved in fishing for sale, consumption and enjoyment is estimated at 3% of the population of 7935. Average catch per trip is 260 pounds with an average value of EC$7.57. Estimated time spent fishing is 2 hours per had and 52 days per year. The total value of local fishing was EC$121,817, 803 (US$44,951,219) per year.

Commercial Fisheries Results

As the latter two methods appear to be under and over-estimations of the landings around the Tobago Cays, calculations based on official landings data were selected and the results are outlined in Table 6. Based on a ± 20% variation in catch, the estimated economic impact of the fishery is between US$466,801 and US$980,282.

Table 11. Summary of Total Economic Impact of Reef-Related Fisheries around the Tobago Cays Marine Park based on data from official landing sites

1. Commercial Fisheries	*In EC Currency:*	*In US Dollars:*	
Gross Revenue	5,921,353	2,185,001	$US
Net Revenue	2,013,260	742,900	$US
Transfers to the economy (Wages)	0	0	$US
Total Commercial Fishing Value	2,013,260	742,900	$US
2. Fish Processing and Cleaning			
Gross Revenue from Processing			$US
Net Revenue from Processing Sale	0	0	$US
Transfers to the economy (Wages)	0	0	$US
Total Revenue from Cleaning Fish	2,531,880	934,273	$US
Total Fish Processing and Cleaning Value	2,531,880	934,273	$US

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3. Local Fishing				
Value of Local Fish Sale		121,817,803	14,951,219	$US
Value of Local Fish Consumption		0	0	$US
Value of Local Fish Enjoyment		0	0	$US
Total Local (non-commercial) Fishing Value		121,817,803	14,951,219	$US
Total Direct Economic Impacts (including local use)	126,362,943		46,628,392	$US
4. Indirect (Secondary) Economic Impacts				
Indirect Effects Overall Fisheries Multiplier		0	0	$US
Total Indirect Economic Impacts		**0**	0	$US
Total Economic Impact of Coral Reef Associated Fisheries	1 26,362,943		46,628,392	$US

Fisher Operating Costs

Another factor that will affect the accuracy of the calculation is the value given for non-labour operating costs. Fishers often complain that fuel is one of the most significant operating cost and that price increases can severely threaten their livelihood and the profitability of fishing. Members of the SFCSL get refunds on duty paid on gasoline. Gasoline at the time of study was sold at $12.09 per gallon. Members get a $0.75 refund on every gallon of gas of which $0.56 goes directly to fishermen, $0.19 goes to a distress fund and $0.10 goes to shares.

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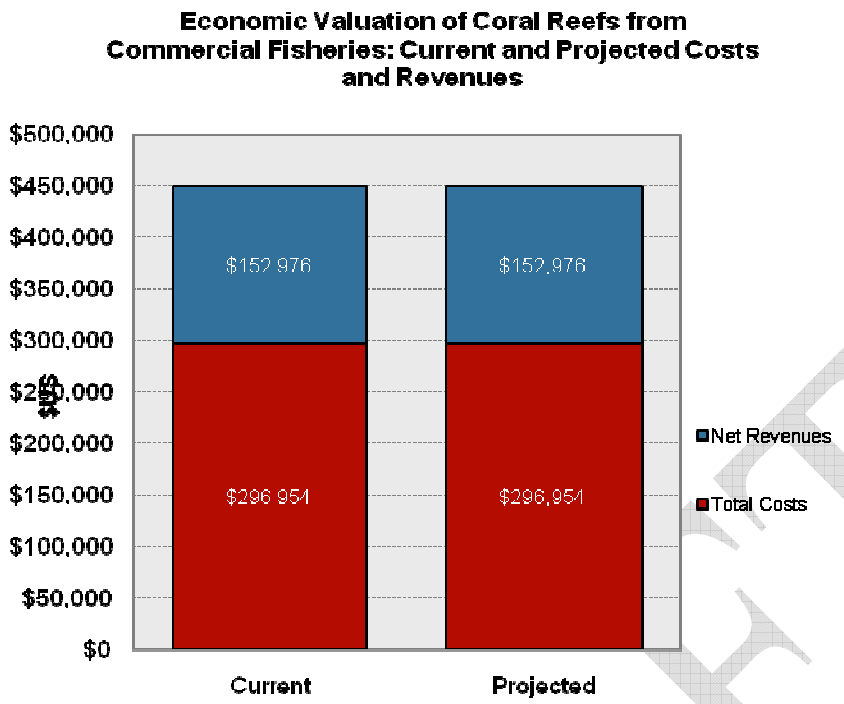


Figure 8. Variations in net revenue with an estimate of 66% of gross revenue paid to non- labour operating costs. Values based on estimations from official landings data

Conclusion

The devolution of power to local management bodies like the SMMA in Saint Lucia is a significant departure from standard government management practices in the Caribbean. The SMMA is boundaries by another local NGO the Soufriere Regional Development Foundation (SRDF), which also has management responsibility for several national assets in the Soufriere region confirming a government policy of devolution of power to community based organisations. The success of the SMMA in managing conflict in the bay and among users in the marine park is highly attributable to the generally non-political management regime. Further, the financial success that has derived from harmonious relations among stakeholders is also an incentive to ensure that the system works.

However, of primary concern is the continued threat to the marine life of the Bay from land-based sources of pollution which warrants more attention. The SMMA has appeared to focus almost primarily on the marine components of management and only address land-based challenges when these present themselves. An integrated approach to watershed management which recognises the interplay between the ridge (hinterland) and the reefs is required. The ecosystem valuation methodology has particular significance in this regard.

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Appendix I: Agenda for Saint Lucia SMMA Workshop (March 30, 2010)

Soufriere Marine Management Area
OAS IABIN REEfFix /Government of St Lucia
Workshop Agenda March 30-31, 2010
The Beacon, Soufriere

Tuesday March 30

9:00 am	**Introduction: Newton Eristhee – General Manager – SMMA**
9:05	Welcome remarks: Mr.Thomas Edmund, chairman-SMMA
9:15	Opening Remarks: Ms. Anne Marie Blackman, Permanent Representative OAS
10:00	Richard Huber -- IABIN and the Thematic Networks -- IABIN's Marine Classification Standard -- The ETN Marine Ecosystem Standard Format MPAGlobal the development of the Caribbean Protected Areas Database Payments for Ecological Services in the Americas Hemisphere Ecosystem Valuation Methodologies Results of the Jamaica, DR, Grenada, and St Vincent Workshops
10:30 am	**Break**
10:45	Sylvester Clauzel – Presentation of 3 Valuation methodologies for SMMA (and environs). Facilitated discussion to discuss cost recovery in marine parks: Hotel bed tax vs entrée fee
12:30	Lunch
1:30-3:00	Review of Conservation and Marine Projects in St Lucia - Speakers are asked to make a 10 minute PPT presentation on the marine activities within their organization:

1. Mr Thomas Nelson — Department of Fisheries
2. Bob Hathaway — Saint Lucia Hotel and Tourism Association
3. Nadia Cazaubon — Soufriere Marine Management Association

Wednesday March 31 Tour SMMA -- Demonstrating tourism impacts, coastal zone management e.g. sewage treatment plant), reef health. SMMA staff introduces sites, showing key features and areas of concern and introducing the group to key persons (fishers, hoteliers, etc). Discussion looking at the problems that may decrease economic productivity and sustainability, what are the root causes, identify possible solutions, current projects addressing these issues, barriers to implementation & how Reeffix can help achieve the objectives.

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Appendix II – List of SMMA Stakeholders

Name of Manager	Company	Address	District
DIVE AND SNORKEL OPERATORS			
Mr. Terroll Compton	Island Divers St. Lucia Ltd.	Anse Cochon	Anse-la-Raye
Mr. Stephen Brussels	Scuba Steves Diving	Bishops Gap	Castries
Mr. Andre St. Omer	Dive Fair Helen	Marigot Bay	Castries
Ms. Marie Jean	Rainbow Divers	Union	Castries
Mr. Anthony Leon	Sandals Dive Center	Vigie Cove	Castries
Mr. James Emmanuel	Le Sport	Cariblue Beach	Gros Islet
	Rendezvous Resort	Malabar Beach	Gros Islet
Mr. Curtis John	Sandals Grande	Pigeon Point	Gros Islet
Mr. Eget Matyr	Eastern Caribbean Diving	Rodney Bay	Gros Islet
Mr. Bernd Rac	Scuba St. Lucia	Anse Chastanet	Soufriere
Mr. Chester Nathoniel	Action Adventure Divers	Hummingbird	Soufriere
Mr. Vitus Joyeux	Jalousie Plantation	Jalousie	Soufriere
Thomas DeNobrega	Frog's Diving		Castries
Charles Richards	Mystic Man Tours	Bay Street	Soufriere
Chris Hackshaw	Hackshaws Boat Charters	Ganters Bay	Castries
Bruce Hackshaw	Captain Mikes	Ganters Bay	Castries
RESTAURANTS			
Ms. Alexis	Anse Mitan	Malgretoute	Soufriere
Archie Monrose	Archie	Bridge Street	Soufriere
Margaret-Ann	Big Yard/	Bridge Street	Soufriere
Camilla	Camilla Restaurant	Bridge Street	Soufriere
Jeanette / Ryan Rivere	Gee's Bon Mange	New Development	Soufriere
Benedict Adjodha	Harmony Beach Restaurant	Malgretoute	Soufriere
Frederick Vite	New Venture	New Development	Soufriere
under new mgmt	Pirates Cove	Bay Street	Soufriere
Sandy	Sandy's Bar	Darnley Alexander Street	Soufriere
closed down	Still Beach Resort	Anse Chastanet Road	Soufriere
Joan Alexander-Stowe	Hummingbird Beach Restaurant	Anse Chastanet Road	Soufriere
David DuBoulay	The Still Plantation	La Pearle	Soufriere
Michael DuBoulay	Eat On	La Pearle	Soufriere
Michael Gustave	Morne Coubaril Estate	Morne Coubaril	Soufriere
Michael Gustave	Skippers	Darnley Alexander Street	Soufriere
Michael Gustave	Villa Des Pitons	Castries Road	Soufriere
Eroline & Lyton Lamontagne	Fond Doux	Chateau Belair	Soufriere
Hilary Charlemagne	The Beacon	Colombette	Soufriere
HOTELS (small and medium)			
Nick Troubetzkoy	Anse Chastanet Hotel & Jade	Anse Chastanet	Soufriere
Joan Alexander-Stowe	Hummingbird Beach Resort	Anse Chastanet Road	Soufriere
Andre Boersma	Jalousie	Jalousie	Soufriere
Toye Lawrence	Ladera	Rabot	Soufriere
	Stonefield		Soufriere

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Name of Manager	Company	Address	District
John Charles	Downtown Hotel	Bridge Street	Soufriere
Monica	Crystals	Colombette	Soufriere
Eroline & Lyton Lamontagne	Fond Doux Estate	Chateau Belair	Soufriere
	Whitton International	developers for new hotel at Malgretoute	
Small Businesses			
JoAnn Clovis	Gustave Wholesale	Bridge Street	Soufriere
Eroline Lamontagne	Erolines Foods/ Ti Js	Church Street	Soufriere
	Ultra Mart	next to the square	Soufriere
	Allain's Supermarket	Bridge Street	Soufriere
	Diamond Net	Bridge Street	Soufriere
Stephen Abraham	Texaco Gas Station	Bay Street	Soufriere
	Soufriere Service Station	Bridge Street	Soufriere
Julian Alexis	Soufriere Fishermen's Cooperative	Cemetery Road	Soufriere
	Justin's Place	Darnley Alexander Street	Soufriere
Ricky James	Big Yard	Bridge Street	Soufriere
Archie Monrose	Archie's Bar	Bridge Street	Soufriere
TAXI, Car Rental			
	Soufriere Taxi Association	Bay Street	
Herod Stanislaus	Almond Tree Taxi Association	Bay Street	
Stephen Abraham	Cool Breeze Car & Jeep Rental	Town Extension	
Harold Andrew	Envirorite	New Development	
Bernard Saltibus	West Coast Car Rental	Etangs	
WATER-TAXI			
Charles Richards	Soufriere Watercraft Association	Bay Street	
Bernard Saltibus	Soufriere Watertaxi Association	Barons Drive	
DAY CHARTER BOATS			
Hugh Cooper	CATS 1995	Endless Summer	Castries
Jonathan Boodhoo	Carnival Sailing	Carnival I-IV, Brig Unicorn	Castries
Tony Alexander	Passion	Passions	Castries
Charlotte Emmanuel	Richy J Cruises		Castries
Sean Devaux	Sea Spray Cruises	Tango, Tango Too, Jus Tango	Castries
Ship Agents			
Benedict Adjodha	agent for superyachts		
Bernard Saltibus	agent for superyachts		
Herblin	agent for Clipper cruise ships		
NGOs, Gov't Agencies			
Dominic Alexander	Soufriere Regional Development Foundation		
Julian Alexis	Soufriere Fishermen's Cooperative		
Henix Joseph	Pitons Management Area		
Somers Augustin	Customs & Excise Department		
Adrian Hilaire	SLASPA		
Pearle Alcindor	Soufriere Town Council		

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