MA KÔTÉ MANGROVE MANAGEMENT PLAN

2017 – 2022

Prepared for the

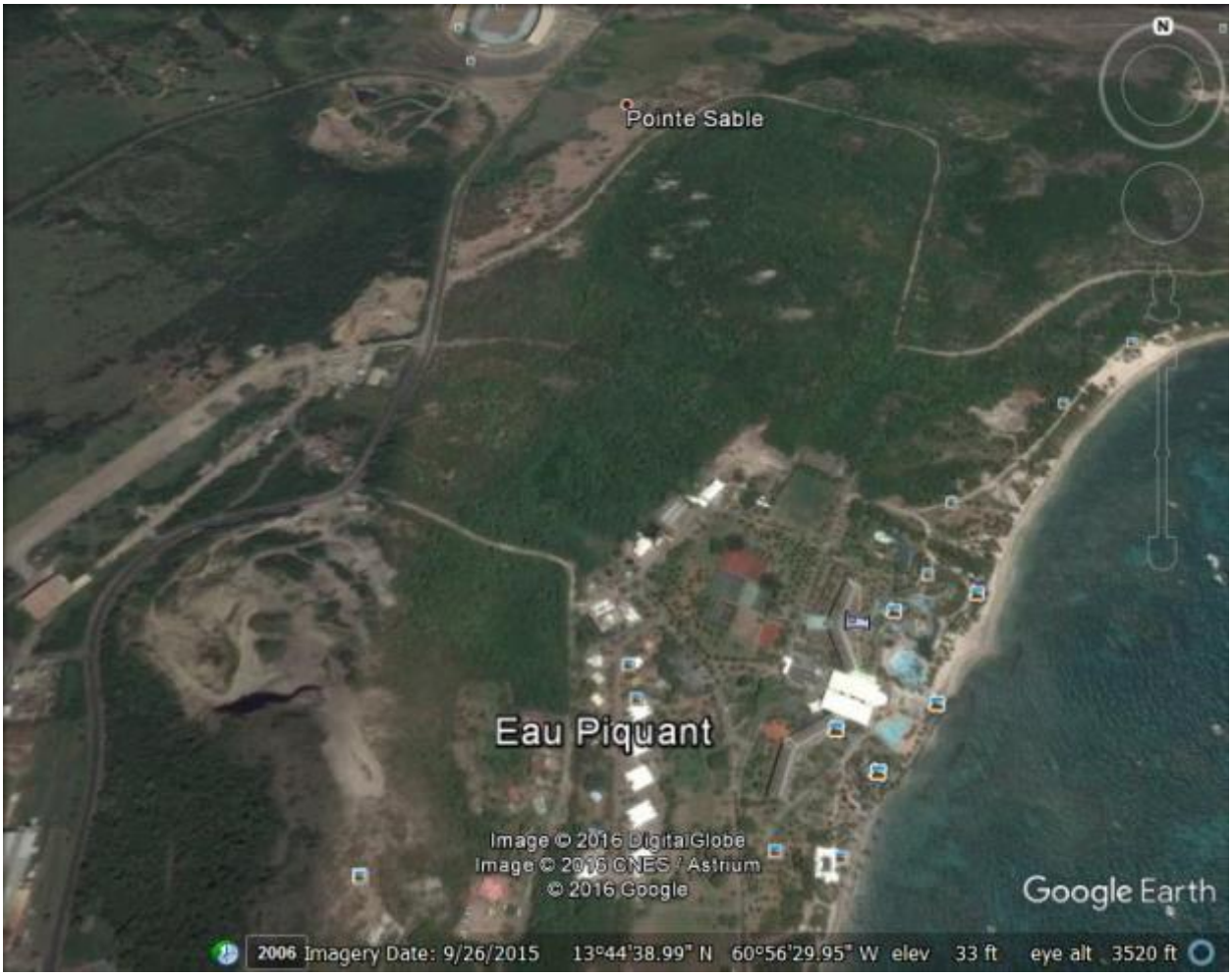
Aupicon Charcoal and Agricultural Producers Group (ACAPG)

Funded by

GEF SGP UNDP; The SLNT; ACAPG

Management Plan for the Ma Kôté Mangrove

March 2017



Google Earth Image of Ma Kôté Mangrove

Produced by Marie-Louise Felix, ***4Blu C's***

Commissioned by the Aupicon Agriculture and Charcoal Producers, Aupicon, Vieux-Fort.

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GLOSSARY of ACRONYMS

ACAPG	Aupicon Charcoal and Agriculture Producers Group
BMUB	The German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
CANARI	Caribbean Natural Resources Institute
CARPHA	Caribbean Public Health Agency
CC	Climate Change
DOF	Department of Fisheries
EBM	Ecosystem Based Management
ECMMAN	Eastern Caribbean Marine Managed Area Network
EST	Eco-South Tours
FAO	Food and Agriculture Association
GEF SGP	Global Environmental Fund Small Grant Project
HIA	Hewanorra International Airport
IAS	Invasive Alien Species
ISL	Invest Saint Lucia
LBS	Land Based Sources of Pollution
MEAs	Multilateral Environmental Agreements
MMAs	Marine Managed Areas
MP	Management Plan
NGO	Non-Government organizations
NW&SC	National Water & Sewerage Commission
OECS	Organization of Eastern Caribbean States
OPAAL	OECS Protected Areas and Associated Livelihoods Project
PES	Payment for Ecosystem Services
PRCO	Public Relations and Communications Officer
PSEPA	Point Sables Environmental Protection Area
RSLPF	Royal Saint Lucia Police Force
SALCC	Sir Arthur Lewis Community College
SLHTA	St. Lucia Hotel and Tourism Authority
SLNT	Saint Lucia National Trust
SMMA	Soufriere Marine Managed Area
STDC	Southern Tourism Development
SWMA	Solid Waste Management Authority
TNC	The Nature Conservancy
UNEP	United Nations Environment programme
UWI	University of the West Indies
WASCO	Water and Sewerage Company

EXECUTIVE SUMMARY

1.0 INTRODUCTION

Mangroves provide an array of benefits to coastal communities, including the provision of wood and non-wood forest products and environmental services encompassing coastal protection, erosion control, water filtration and bio-diversity conservation. Mangroves are also valuable in terms of climate change mitigation due to high rates of primary productivity and the large amounts of carbon stored in the vegetation, both above and below the ground (via the intensive root networks that exists within the mud layers). The level of biomass found within a mangrove system can be significant per unit area, especially in a healthy, thriving ecosystem. In spite of their many values, mangroves in the Caribbean still face threats of conversion to other land uses. This is especially the case when sustainable financing for their protection has not been forthcoming. The mangroves in the Caribbean, with the Ma Kôté mangrove included, typically suffer from poor management, even when systems have been legally designated for special management. In some cases within mangrove areas, land ownership remains unclear, governance structures are poorly defined, and despite healthy and vibrant forested areas, no provisions exist for established Payment for Ecosystem Service (PES) schemes.

1.1 GOALS OF THE MANAGEMENT PLAN

This MP seeks to:

- establish an administrative and legal or governance structure for the management of the Ma Kôté Mangrove;
- define and facilitate the delineation of the boundaries of the mangrove;
- protect and manage the natural resources of the Ma Kôté Mangrove ensuring that ecological, social and economic contributions to the wellbeing of users are optimised;
- identify and safeguard historical, cultural, traditional and perceived future contributions of the Ma Kôté Mangrove to local livelihoods;
- promote the concept of sustainable management of the Ma Kôté Mangrove forest amongst all users and decision makers;
- support improved understanding of structure and function of the mangrove through focussed and relevant research;
- identify and facilitate the implementation of sustainable financing programmes that are in line with national and regional development goals and targets;
- explore the option of establishing projects along the line of PES;
- increase public awareness and education on the benefits of the mangrove forests;
- strengthen the legal instruments that will be used for the management of the mangrove, addressing legislative gaps and shortfalls, and institutional deficiencies, amongst other things; and

- ensure that the management framework that is ultimately adopted adequately makes provision for community-based participation or co-management arrangements in mangrove management.

1.1.1 *Implementation Period*

Time Frame: This is designed to be a five year management plan. This management plan will be commenced by April 2017and be completed by March 2022. In addition, the management plan should meet at least 50% of its targets by December 2019. Implementation will be contingent upon the availability of external sources of funds which will, in turn, be heavily dependent of either legal interest or management arrangement with the owners.

1.1.2 *Scope of the Management Plan*

The proposed management plan will be guided by the following principles:

1. An ecosystem based management (EBM) approach will be adopted to ensure that all resources, flora and fauna, terrestrial, freshwater and marine are managed in an integrated way and used to meet local, regional or national needs.
2. Plans will be objective oriented. Outcome of the management plan must be to achieve the greatest good for the greatest number of people in the long term.
3. The ecological carrying capacity of the mangrove and its associated ecosystems cannot be exceeded and resource sustainability will be given high priority. This is a non-negotiable requirement, if sustainable production is to be achieved.
4. The need for the conservation of biological diversity and wildlife will be clearly articulated.
5. Planning is an on-going dynamic process. The plan will need to respond to changes in the socio-economic, environment and or political landscapes of the country and or the associated communities.
6. The plan will contribute to an expansion of the information base on the biological status of the mangrove.
7. The decision-making process must be visible and equitable. Involving the public in the decision-making process is non-negotiable. This is essential in order to promote local support and acceptance for integrated forest management planning. It is the duty of the designated mangrove management authority to explain to the public the implications of various decisions.
8. Traditional rights of access will be respected as much as possible. Customary or traditional incomes of local people nor their access to forest products must be altered without offering practical and acceptable alternatives.
9. Planning functions and responsibilities. The responsibility for planning functions should be clearly spelt out at different levels, from the local forest management unit level towards the national level.

Adapted from **FAO**. 1994. *Mangrove forest management guidelines*. FAO Forestry Paper No. 117. Rome.

1.2 STAKEHOLDERS AND CONSERVATION PARTNERS

The following are expected to directly benefit or be impacted by changes in the structure and or function of the mangrove.

- Aupicon Charcoal and Agriculture Producers Group (ACAPG)
- Aupicon community
- Beausejour and Vieux-Fort Residents
- Saint Lucia National Trust
- Invest Saint Lucia
- Department of Fisheries
- Department of Forestry
- Crown Lands
- National Conservation Authority
- Coconut Bay Hotel
- Savannes Bay Fishers
- International Community (bird watchers, wetland managers, mangrove researchers etc.)

Fig. 1 Students of Vieux-Fort, November 2016

The following are expected to play an important role but only with respect to assisting in the management of the mangrove:

- Heritage Tourism
- CARPHA
- Tour Operators
- St. Lucia Hotel and Tourism Authority (SLHTA)
- Aupicon Charcoal and Agricultural Producers Group
- Royal Saint Lucia Police Force
- Solid Waste Management Authority (SWMA)
- Goodwill Fishers Cooperative
- National Conservation Authority
- Saint Lucia national Trust
- Vieux For Constituency Council

1.3 DEVELOPMENT OF THE MANAGEMENT PLAN

1.3.1 *Field Evaluations*

The development of this management plan is based on multiple field visits to the mangrove spanning a period of most recently, 4 years. The consultant has been working closely with charcoal producers and horse owners who operate within the mangrove, as part of a project designed to assist them improve their livelihoods whilst supporting the conservation of the mangrove's natural resources. As part of the project work the consultant has had to visit the Ma Kôté Mangrove multiple times and has been involved in several field activities that have enabled a good understanding of the current status of the biological diversity of the mangrove and the activities that threaten the conservation of these resources. However, just prior to the commencement of this management plan a number of visits were made to Ma Kôté Mangrove. These visits occurred from the months of November 2016 to January 2017, and from March to April 2017. The intention was to observe the physical components of the area, assessing the density and composition of the vegetation, the presence of wild fauna such as migratory birds, crabs, lizards and small rodents. Attention was also paid to the presence of invasive species such as the Giant African snail, *Achatina fulica* and the leucena plant, *Leucaena leucocephala*. The salinity of the flooded grounds was measured to better understand the tidal influence on the area. The presence of solid wastes was recorded, distinguishing between the type and quantity of the garbage seen. Access to the various parts of the mangrove was evaluated by noting the condition and number of roads and foot paths throughout the mangrove. The level of human activity specifically with respect to resource extraction was also noted. Of specific interest was the level of charcoal production ongoing in the area as this was, in the past, considered one of the greatest threats to the area. Several of the charcoal producers were observed whilst they worked and discussions were held with them in order to better understand how their method of harvesting, how many members of each family are involved in charcoal production and what challenges, if any, they currently faced whilst working in the mangrove. The harvesting of crabs in the mangrove was also investigated by observing some young men hunt for the crustaceans. The crab harvesters were questioned with regards to how often they "crabbed", the main reason for harvesting, and how often they harvested.

Familiarity with the horseback riding and other tours taking place in the mangrove already existed but discussions were held with some of the young horse owners to confirm their interest in developing the tours within the mangrove. Several footpaths were followed and the various species of mangrove trees encountered were recorded.

Several visits were also paid to the portion of the mangrove where a large dieback area exist. Efforts are currently underway by the ACAPG in collaboration with the SLNT and TNC, to rehabilitate this part of the mangrove. The ACAPG has partnered with The Nature Conservancy, the Saint Lucia National Trust, the Government of Saint Lucia via its

Departments of Fisheries and Forestry in the Ministry of Agriculture, to identify the cause of this loss of mangrove vegetation, to establish a nursery of red and black mangrove trees, and to replant this area in order to achieve maximum restoration of the site. The consultant spent the better part of a day observing the replanting efforts of the stakeholders, including many volunteers and school groups from Vieux-Fort and the surrounding areas. Finally, repeated visits were paid to the Interpretation Centre and Savannes Stables (before and after construction) in order to assess the alternative livelihood endeavours of the ACAPG and the Savannes Stables group.

Fig. 2 The Die-Back Area at Ma Kôté Mangrove, Nov. 2016

1.3.2 *Stakeholder Dialogues*

Once the area had been visited, consultations of different types were conducted in order to better understand the value of the mangrove or the level of importance of the mangrove to various stakeholders. Some of these consultations were held during the month of November, during "Mangrove Awareness "week, when several persons turned out to volunteer their time to the replanting efforts in the area of the dieback. The consultant was able to interview both primary, secondary and tertiary school students, foresters and charcoal producers, and determine the level of importance that they attributed to the mangrove. This was done using a Participatory Action Research method. The PAR is an approach to research in communities It emphasizes participation and action. PAR emphasizes collective inquiry and experimentation grounded in experience and social history. Within a PAR process, "communities of inquiry and action evolve and address questions and issues that are significant for those who participate as co-researchers" Approximately 30 primary school, and 20 secondary school students and 38 environmental science (tertiary level) students were interviewed at separate times to determine their perceptions of the importance of mangrove forests. The primary students were interviewed as a group and were asked if they thought that mangroves were important and should be protected. In general, for approximately 80% of the students, the response was that "mangroves were important to people and should be protected." A few students thought that the mangroves were not so important and were a nuisance. The same question was posed to the secondary school students as they walked through muddy sections of the mangroves, with approximately 60% of respondents supporting conservation of wetlands. However, even amongst the 60% about 50% of these students admitted that they ranked hotel development and job creation higher than wetland conservation. Sir Arthur Lewis Community College (SALCC) students were given a 5 question handout on mangrove conservation. Ninety percent (90%) agreed that mangroves were important to livelihoods, should be protected and required proper

management. Of these students, 40% felt that mangrove conversions for agriculture and tourism was acceptable if jobs could be created.

The charcoal producers had discussions with the consultant, whilst working in the mangrove. The charcoal producers, based on the response to dialogue, indicated that they (100%) placed a high value on the conservation of the area. Discussions with members of the Eco-South tour members produced similar results with 100% giving high importance to mangrove conservation and management. Many persons interviewed were willing to trust in the word of the SLNT and TNC and the officers from the Forestry and Fisheries Departments, when they asserted that the mangrove was an extremely important ecosystem and that it was essential to the protection of the coastline, fisheries species and offshore habitats, coral reefs, and the nearby beaches. For this reason several volunteers were willing to give of their time and lobby for the restoration and conservation of the mangrove, and so were in support of the creation and implementation of a management plan for the site.

1.3.3 *Review of Existing Data*

The ManKôté Mangrove has been the focus of several social, economic, cultural and biological studies over the past 20, 30 even 40 years. Consequently, there is some data available on the area. Review of the literature available was instrumental in assisting the consultant to determine who the key stakeholders are for the area, the changes that have occurred over the years with regards to the physical state of the area, the most current data on species diversity, the accessibility of the site, and its attractiveness to visitors and residents. A general assessment of threats to the ecosystem was also possible. Based on this information, coupled with the feedback of the volunteers, a determination of the importance of the mangrove to a broad cross section of the Vieux-Fort residents was also possible.

1.3.4 *Drafting and Circulation of Draft*

A draft management plan was developed based on the field visits, review of literature and interviews of some stakeholders. The draft plan was circulated to the primary stakeholders for a first level feedback. Meetings were then held with the ACAPG, the SLNT and the Fishers of the area to get an initial feedback on the proposed plan.

1.3.5 *Second round of Stakeholder Dialogues*

Based on the responses received, the requested revisions were made and the second draft was circulated to a wider stakeholder group for more broad-based consultation which was organized as a workshop where the MP was presented as a powerpoint to a wide cross section of persons. The participants in this review included representatives from the following agencies:

1. Invest Saint Lucia / Crown Lands
2. Unique Crafters
3. Ministry responsible for Coastal Zone Management
4. Aupicon Agriculture and Charcoal Producers
5. Department of Forestry
6. Department of Fisheries
7. Savannes Fishers Group
8. ManKôté / Savannes Bay Seamoss Farmers Group
9. Saint Lucia National Trust

1.3.6 *Key Limitations of the Methodology*

Whilst every effort was made to get input from as many stakeholders as possible, this was not always realized. Effort was also made to present the MP in a simple and concise way as possible in order that all stakeholders would easily be able to follow. However, it was not possible to select a time and date when all stakeholders could be accommodated, and many of the charcoal producers and other users of the mangroves could not be enticed to attend the formal presentation of the management plan. It was therefore necessary to meet with this group separately and discuss some of the proposed components of the management plan with them and solicit their feedback.

Every effort was made to address and where relevant incorporate all feedback into the final draft of the plan.

Fig. 3 Exploring the Mangrove

2.0 BACKGROUND

2.1 GLOBAL IMPORTANCE OF MANGROVES

Mangroves can be considered one of the most important ecosystems on the planet. Mangroves provide a wide range of ecological services to countries including coastal protection, serving as nursery grounds to a variety of fish species, birds, reptiles and rodents. The mangroves also serve as silt traps removing undesirable levels of suspended sediment in river and other freshwater bodies before they empty their contents into coastal waters. Mangrove roots and the silt that builds up around them also capture floating debris present in the outflowing rivers and thus assist in keeping plastic, rubber, glass and metal products off the beaches, inshore waters and coral reefs.

2.1.1 *Coastal Defence*

As countries attempt to adapt and or mitigate the effects of climate change, the need to protect coastlines grows in importance. Fringing, riverine and basin mangroves are extremely important in the protection of land which borders large bodies of open water. CC brings with it hurricanes and accompanying storm surge, rising tides, increased wave energy and unpredictable changes in coastal water currents. The species of red and black mangrove are effective in absorbing the energy from waves and from barring the movement of sand and soil along the coastline. This in effect helps to protect coastal areas avoiding the removal of large quantities of material leading to erosion and loss of coastal properties.

Fig.4 The Role of the Mangrove in Protecting the Shoreline

2.1.2 *Spawning and Nursery Grounds*

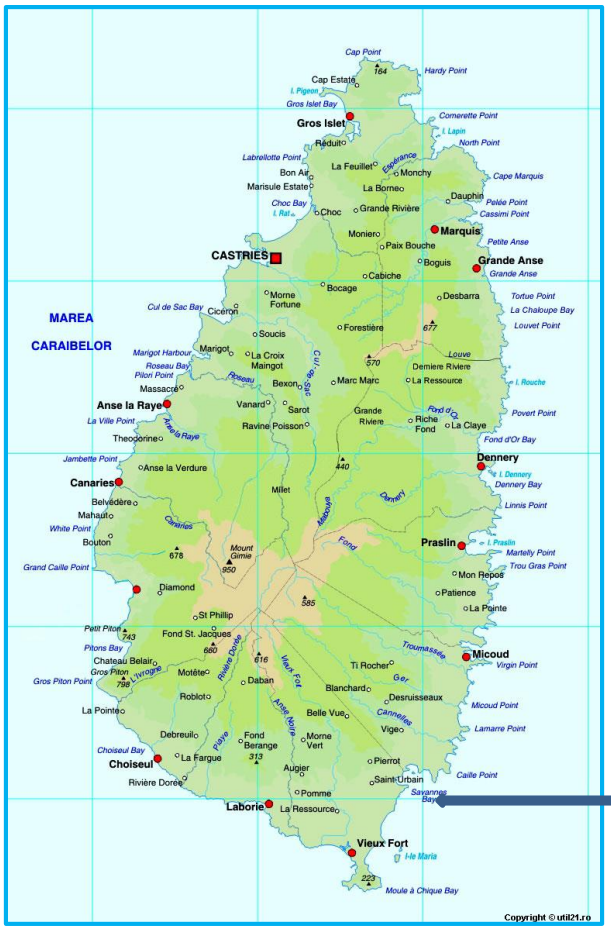
Along the intertidal zones, mangroves are important as shelter for the juveniles of many marine species including lobster, shrimp, crabs and both fresh and marine fish. These species may move within the mangrove according to the tides but always maintain close proximity to the area as they seek for nutrients, food, and protection from larger organisms.

Mangrove vegetation is also important in forestry and community development. It has been realized that mangroves may be used in the sustainable production of charcoal in many small communities, for eco-tourism, research and general recreation.

2.2 THE MA KÔTÉ MANGROVE

The Ma Kôté Mangrove is located on the southeast coast of the island, within the Point du Sable Bay of the town of Vieux Fort. The mangrove is also located immediately off the main Vieux-Fort – Micoud highway. It is also just about 10 minutes from the Hewanorra International Airport (HIA).

Ma Kôté Mangrove is the largest of 14 major mangrove wetlands in Saint Lucia with an area of 40 hectares, representing the largest contiguous tract of mangrove on the island and 20% of all mangrove cover on the island. It is a basin mangrove which is evident especially in the rainy season when most of the landscape becomes inundated and in some places almost impassable due to the mud that is formed. The area, with its dense mangrove cover, and intermittent fresh and brackish water pools and mudflats serves as a natural defence for the nearby beach and coral reefs, as its network of roots help capture sediment and other forms of solid matter originating from the island's interior and which are washed down towards the coastline via small streams and gullies that run along the Aupicon to BeanField section of the Vieux-Fort – Micoud highway. The mangrove is also a haven for several migratory birds, brackish water fish, crabs and other marine species.



Arrow shows location of mangrove

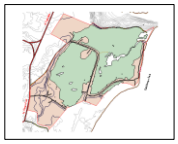


Figure : Location of the Ma Kôté Mangrove, Saint Lucia.

2.2.1 *Conservation Status*

Due to the important role that mangroves play with regards to fisheries, coastal defences and water quality management, the Department of Fisheries, in 1986, under its Fisheries Act 1984, declared most of St. Lucia's mangroves, including Ma Kôté Mangrove, a marine reserve. With this designation the entire landscape of Ma Kôté is protected by law. Under the Act, special measures must be put in place to preserve the integrity of the flora and fauna of the mangrove. The priority is to ensure that all wildlife in the areas are protected against unregulated exploitation that can contribute to a decline in biodiversity. However, the Act does make provision for the Minister responsible for fisheries to grant permission to a person or persons to undertake some level of use, if that is deemed necessary to safeguard the site.

In addition to enjoying special protection of its flora, fauna and non-biological resources, Ma Kôté Mangrove was also declared a Ramsar site, or wetland of international importance, in 2002. The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty for the conservation and sustainable use of wetlands. It is named after the city of Ramsar in Iran, where the Convention was signed in 1971. The convention establishes a framework where countries may identify areas containing natural waters, as sites of national and international importance. By declaring these sites as Ramsar sites, countries commit to:

- Work towards the wise use of the area;
- The effective management of the area; and
- Co-operate internationally on transboundary issues specifically with regards to shared wetland systems and shared species.

To date, the Government of Saint Lucia's commitment to the conservation of Ma Kôté Mangrove, despite its designation as a marine reserve and Ramsar site has been far from adequate. Despite its designation, the area has received limited inputs to support conservation and or management programmes. The area is owned by the Crown but is reliant on several national bodies for management. The mangrove is currently entrusted to Invest Saint Lucia, whilst the specific management of the area is being shared between the Departments of Forestry, and Fisheries – both in the Ministry of Agriculture, Fisheries, Physical Planning, Natural Resources and Co-operatives, and the Saint Lucia National Trust. In the absence of a lead Management Authority significant issues have recently arisen which are not being addressed by any agency. Of concern specifically is the status of organization of the ACAPG and as a consequence, the level of harvesting of mangrove forests for charcoal. Other issues include the continued pollution of the mangrove both as a result of illegal dumping of solid waste and seepage of grey and black water in the streams and other waterways that flow through the mangrove. Unregulated access into the mangrove by the public means that there is little control of other activities taking place in the area which can

lead to further unsustainable exploitation of resources and impact on income generation activities of the local communities. While many former ACAPG members continue to produce charcoal, there is little cohesion and therefore no agreement on controlling unauthorised access to the resource.

2.2.2 *Current Activities within the Mangrove*

Ma Kôté currently is not under any formal form of management. In the past, signage has been installed by the SLNT in an attempt to raise awareness in the public as to its presence and to provide basic information on species presence and the need for some level of conservation. Over the years the signs have aged and fallen apart. Recently, thanks to the support of the ECMMAN Project, and via the SLNT, and a recently formed group, the ECO-South Tours (EST), new signs have been installed at the entrance and within the mangrove, in order to continue the effort of public awareness and resource conservation.

The ECMMAN Project is a TNC (The Nature Conservancy) 4 year project (2013 – July 2017), funded by The German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). The project's goal is the strengthening and creation of new marine managed areas (MMAs) within 6 OECS countries, including St. Lucia.

Eco South Tours Inc. was formed by the Saint Lucia National Trust in 2011 to manage and oversee tours within the Pointe Sable Environmental Protection Area (PSEPA). Eco South Tours Inc. had its start in the Sustainable Livelihoods Sub Project of the OECS Protected Areas and Associated Livelihoods Project (OPAAL). It sprang from a specific recommendation made in the Socio-Economic Feasibility Study for the Pointe Sable Environmental Protection Area. The EST is currently designing a number of tours to be conducted in the Ma Kôté Mangrove. They have recently, once more under the ECMMAN project, invested significantly in the restoration of the Ma Kôté Interpretation centre (that was originally built under the OPAAL project) and have constructed new stables in order to support horseback riding tours through the mangrove. A number of hiking and riding trails have been built through the mangrove in 2017.

2.2.3 *Biodiversity*

One of the most important function of mangroves is their impact on the biodiversity of the area. The mangrove trees are specially designed to tolerate saline conditions. Their root systems enable the trapping of sediment and debris from inland water sources and the combination of vegetation and water makes ideal habitats for a wide range of wildlife.

2.2.3.1 **Mangrove Tree Species**

The three main mangrove species occurring in the Ma Kôté Mangrove are *Avicennia germinans, Rhizophora mangle* and *Laguncularia racemosa*. The Rhizophora are better known as the pioneer species, are found primarily on the eastern part of the mangrove,

closest to the intertidal area. It is an evergreen tree, which grows to about 25 meters in height and 40 centimetres in diameter at breast height. A single seed germinates inside the conical fruit forming a long narrow first root (radicle), which is green except for the brown enlarged and pointed end up to 1.25 centimetres in diameter. It can grow up to 30 centimetres in length before it detaches from the mother tree and falls. The elaborate prop and aerial roots systems stabilize the trees and act as a first line of defence against wave action; in line with its position on the seaward edge of the system. The species normally grows in soft muddy soils along sheltered river banks and estuarine margins.

Interspersed amongst the red mangrove is the found the *Avicennia germinans* or the black mangrove. This species is widespread in Ma Kôté and represents the largest growing tree species. It is also found mainly close to the seaward section of the mangrove. It is tolerant of high saline conditions and the trees grow in isolated groups or woodland formations. Individual trees are fairly large and may grow up to 20-25 meters in height and 40 centimeters in diameter at breast height. The wood is used to make charcoal. The flower is reported to produce a high quality honey. The trees flower and fruit all year round and the seeds are viviparous in nature. This species regenerates quite well.

Also present at Ma Kôté is the grey mangrove, *Laguncularia racemosa*, and buttonwood *Conocarpus erecta*. Both species are fairly widely distributed within the mangrove and are important in soil stabilization, and charcoal production. Threats to the species include cutting down of adult plants, for charcoal production and habitat alterations due to either extreme droughts or rainfall that change the salinity within parts of the mangrove, leading to large scale dying off of the trees. High nutrient and heavy metal composition of soils and waste water most likely due to sewage discharges and wastes from farms, factories and nearby communities. There are other non- mangrove tree species that are also found in large numbers in Ma Kôté. These trees are also impacted by excessive cutting for charcoal and pollution leading to excessive nutrient and heavy metal contamination of soils and water.

Fig.10 Black and Red Mangrove trees in muddy swamp area, Ma Kôté 2016

2.2.3.2 **Ecosystem Degradation at Ma Kôté Mangrove**

An area of concern, related to the flora found within the mangrove, and which raisies the need for more targeted monitoring of biodiversity and research, is the occurrence of dieback in the mangrove in 2006. There was much speculation as to what may have contributed to the death of more than 12 hectares of mangrove trees. Possible contamination from run-off from the nearby hospital was considered the most plausible explanation.

"A ground truthing exercise was carried out in April, 2015 after Google imagery revealed the existence of major a canopy gap within the Ma Kôté Mangrove towards the northern zone of the mangrove system. According to a report written by the Chief Forestry Officer, Mr. Adams Toussaint, the canopy gap is estimated to be about 12 acres of mangrove forest cover. The report also speculated that 'toxic chemicals, petroleum hydrocarbons, change in hydrology, fluctuation in rainfall and climate pattern are four most pertinent and relevant possible causes of dieback within the Ma Kôté Mangrove. Of major concern was waste water which may contain toxic chemicals originating from nearby sources and an asphalt plant producing petroleum hydrocarbons located in the vicinity of the mangroves."

Source: Craig Henry, Programme Officer, SLNT.

2.2.3.3 **Birds Species**

Table 2.1: Local Species of Bird found in Ma Kôté Mangrove

Scientific name	**Common Name**
Bubulcus ibis	Cattle egret
Butorides virescens	Green Heron
Coereba flaveola	Bananaquit
Dendroica adelaidae	Adelaides Warbler
Elaenia martinica	Caribbean elaenia
Eulampis holosericeus	Green throated Carib
Icterus laudabilis	St. Lucia Oriole
Loxigilla noctis	Lesseer Antillean bullfinch
Orthorhyncus cristatus	Antillean crested hummingbird
Quiscalus lugubris	Carib grackle
Saltator albicoloris	Lesser Antillean saltator
Vireo altiloquus	Black whiskered Vireo

Table 2.2: Migratory Species of Bird found in Ma Kôté Mangrove

Scientific name	**Common Name**
Anas americana	American widgeon
Anas discors	Blue winged teal
Ardea alba	Greater egret
Ardea herodias	Greater blue heron
Arenaria interpres	Ruddy turnstones
Atitis macularia	Spotted sandpiper
Aythya affinis	Lesser scaup
Calidris alba	Sanderling
Calidris fuscicollis	White rumped sandpiper
Calidris himantopus	Stilt sandpiper
Calidris mauri	Western Sandpiper
Calidris melanotos	Pectoral Sandpiper
Calidris minutilla	Least Sandpiper
Calidris pusilla	Semipalmated sandpiper
Catoptrophorus semipalmatus	Willet
Ceryle alcyon	Belted kingfisher
Charadrius semipalmatus	Semipalmated Plover
Circus cyaneus	Northern Harrier
Dendrocygna autumnalis	Black bellied whistling duck
Egretta gularis	Western Reef Heron
Egretta thula	Snowy egret
Egretta tricolor	Tricolor heron
Falco columbarius	Merlin
Falco peregrinus	Peregrine Falcon
Fulica caribaea	Caribbean Coot
Limnodromus griseus	Short billed Dowitcher
Limosa haemastica	Hudsonian Godwit
Numenius phaeopus	Whimbrel
Pandion haliaetus	Osprey
Pluvialis squatarola	Black bellied plover
Porphyrula martinica	Purple gallinule
Porzana Carolina	Sora
Protonotoria citrea	Prothonotary Warbler
Seirus motacilla	Louisiana waterrthrush
Seirus noveboracensis	Northern waterthrush
Tringa flavipes	Lesser yellowlegs
Tringa melanolueca	Greater yellowlegs
Tringa solitaria	Solitary sandpiper

2.2.3.4 **Marine Species**

Centropomus undecimals
Oreochromis mossambicus
Oreochromis nilotica
Paguristes erythrops
Eleotris spp.
Dormitator maculatus
Cardisoma guanhuma
Bathygobius soporator
Sesarme spp.
Tarpon atlanticus
Mugil curema
Ucides cordatus
Uca mordax
Crassostrea rhizophorae
Penaeus (Farfantspentepenaeus) subtilis
Lebistes spp.
Callinectes danae
Lutjanus griseus
Eucinostomus jonsei
Erotelis smargdus
Caranx hippos
Gymnothorax funebris

Source: De Beauville-Scott, S. 2000

2.2.3.5 **Plants**

Sophora tomentosa
Sporobolus spp.
Cocos nucifera
Sesuvium portulacastrum
Frimbristylis spathacea
Spartina patens
Rhizophora mangle
Avicennia germinas
Laguncularia racemosa
Conocarpus erecta

Source: Portecop and Espinal (1985)

2.2.4 *Institutional Frameworks: Legal Instruments*

Ma Kôté is located on what is called "Crown Lands". Simply put, the mangrove is owned by the Government of Saint Lucia. However, the area is part of the Pointe Sables Environment Protected Area (PSEPA). The PSEPA is co-managed by the SLNT, in collaboration with a number of other agencies both Government and Non-Government. The Ma Kôté Mangrove, being a part of the PSEPA, is also partly under the management of the SLNT. Currently, management of the mangrove has been transferred from Crown Lands to Invest Saint Lucia, which therefore has the authority to lease the lands for various forms of investment if the management so desires. This means that ultimately control of Ma Kôté mangrove still resides with the Government of St. Lucia via its designated agency, Invest St. Lucia. However, ISL's role is not that of management of its sites. Therefore, the absence of a clear lead agency to direct the management and resource use of the mangrove is one of the key issues that must be addressed by this management plan (MP).

2.2.4.1 **Key Legislation and other Legal Instruments Relevant to Management of Forests.**

The main legal instruments governing mangrove use and management are the following:

- *The Fisheries Act of 1984, revised 31 December 2001*. This makes provision for the promotion and regulation of fishing and fisheries.
- *The Forest, Soil and Water Conservation Ordinance of 1946,* amended 1in 1956 and 1983. It stipulates the conditions for timber harvesting, makes provision for control of squatting and defines other offences.
- *The Wildlife Protection Act of 1980* places authority for wildlife legislation in the hands of the Minister of Agriculture, and makes provision for the conservation and management of wildlife, through the listing of species, the establishment of reserves, and the setting of fines for offences.
- *The Crown Lands Ordinance of 1946* establishes the position of Commissioner of Crown Lands and sets the conditions for the management of Crown Lands.
- *The Land Conservation and Improvement Act of 1992* establishes a Land Conservation Board and gives it a broad mandate with respect to the management of land and water resources.

The Government is also party to various international conventions which provide additional support to national policies governing natural resource management:

- ✓ The International Convention on the trade of Endangered Species; · The Convention on Desertification;
- ✓ The World Heritage Convention;
- ✓ The Convention on the Protection and Management of the Coastal and Marine; environment of the Caribbean, (Cartagena Convention).

The 2010 National Environmental Summary for Saint Lucia, produced by the UNEP summarised Saint Lucia's legislative environment as follows:

- Several laws are either weak and or inadequate to address management needs of various sites on the islands.
- In many instances there is little or no enforcement of current environmental legislation.
- International Obligations from MEAs are not translated adequately at the local level.
- There is no policy that requires agencies to pursue sustainable use and development of natural resources.
- Legislation adoption is weak and slow and some accompanying regulations are absent
- Lack of legislation to deal primarily with Climate change.
- Inadequate Solid waste management
- There is no comprehensive Fisheries Management Policy and Plan.
- Weak watershed management efforts;
- Poor freshwater resource management;
- There are many policies which are in draft and need to be given legal effect.
- Need for awareness building at all levels and sectors including at the political level.
- Awareness and sensitisation for greater ownership of the environmental assets of Saint Lucia by the population targeting resource use in all the sectors.

Table 2.3: Summary Description of the Legislation Relevant to Broad Ecosystem Based Management of Mangroves

Issue	Legislation
Inland and Coastal Water Quality	
Sewage and grey water	St Lucia ratified the Land Based Sources (LBS) of Pollution Protocol within the Cartagena Convention in 2008. Recreational water quality standards were developed in 2009 to facilitate the implementation of the LBS protocol.
	Water & Sewerage Acts 14 of 2005 and 13 of 2008. The 2008 Act defines its function as to provide for the management of water resources and to regulate the delivery of water supply services and sewerage services throughout Saint Lucia and for related matters. There is also a National Water & Sewerage Commission (NW&SC) to serve as the operational arm.
Solid Waste	Solid Waste Act # 8 (2004) and Regulations (2004). Litter Act 1993 which establishes a penalty for littering, however poor enforcement is an issue. A semi-autonomous Solid Waste Management Authority was established which has the mandate to provide an island wide collection system for household waste. Currently this is done twice weekly throughout St Lucia.

	Two engineered landfill sites were developed under the OECS Solid Waste Initiative, where collected waste is disposed, however, no segregation of waste is conducted.
Agricultural pesticides and residues	Pesticides and Toxic Chemicals Control Act 15 2001 which provides a framework for regulation of pesticides and toxic chemicals mainly in the safe use and handling, but it provides no safeguards against excessive use and impacts on the marine environment.
Fisheries Management	
Fisheries	There is the Fisheries Act 1984 and Regulations of 1994. There is a Fisheries Management Plan and an interest in developing co management arrangements with communities.
Forests Management	
Illegal or unregulated deforestation	There is a Forest, Soil and Water Conservation Act, No. 11, Cap. 7.09 (1983) (St. Lucia); and Forests Act, Cap. 58, (1945). The Forestry Department has a number of Forestry Officers who work closely with farmers and other land owners to conserve forest lands or lands that border critical watershed.
Invasive species	Under the Fisheries and Forestry Acts invasive species management is partially addressed. In 2010, an invasive species management plan was developed which proposed a number of actions to address the control of the introduction and management of non-indigenous aquatic and terrestrial species. Included in the action plan is a public education and awareness component. There is also provision to seek funds to assist in the monitoring and removal of invasive species that threaten the biodiversity of the island.
Illegal solid waste dumping	As above. There is a Solid Waste Management Act and an Authority responsible for implementation of the Act. Unfortunately, collection services are not always as efficient as need be with many garbage bins often found to be overflowing in many parts of the island due to insufficient collection from contracted companies. Where illegal dumping occurs the Agency does not possess sufficient authority to prosecute offenders.
Wildlife / Biodiversity	
Over-exploitation (of crabs)	The Wildlife Protection Act 1980 allows for the conservation of wildlife including the designation of endangered species and wildlife reserves. A National Biodiversity Strategy and Action Plan were developed in 2005.
Co-Management of Natural resources	There are provisions in both the Fisheries and Forestry Acts for the development of co-management arrangements with local NGOs and community groups for the monitoring and management of natural resources (such as marine turtles) and vulnerable ecosystems (such as the SMMA).

2.2.5 *Institutional Frameworks : Organizations and Mandates*

There are a number of organizations that currently play or have the potential to play important roles in the management of the Ma Kôté mangrove. Any proposed management plan should therefore consider the involvement of the following organizations.

2.2.5.2 **Saint Lucia National Trust (SLNT)**

This is a membership organization established in 1975 under the Saint Lucia National Trust Act, Chapter 6.02 of the Revised Laws of Saint Lucia to conserve the natural and cultural heritage of Saint Lucia, and to promote values which lead to national pride and love of country. A number of sites are invested in the SLNT for conservation purposes. The Trust is expected to identify and implement sustainable use actions that ensure protection and management of Saint Lucia's natural resources.

2.2.5.3 **The Caribbean Public Health Agency CARPHA**

This is the new single regional public health agency for the Caribbean. It was legally established in July 2011 by an Inter-Governmental Agreement signed by Caribbean Community Member States and began operation in January 2013. The objectives of CARPHA are:

- to promote the physical and mental health and wellness of people within the Caribbean;
- to provide strategic direction, in analysing, defining and responding to public health priorities of the Caribbean Community;
- to promote and develop measures for the prevention of disease in the Caribbean;
- to support the Caribbean Community in preparing for and responding to public health emergencies and threats;
- to support solidarity in health, as one of the principal pillars of functional cooperation in the Caribbean Community; and
- to support the relevant objectives of the Caribbean Cooperation in Health (CCH).

2.2.5.4 **Invest Saint Lucia (ISL)**

This is the official Investment Promotion Agency of the Government of Saint Lucia. It is responsible for stimulating, facilitating and promoting investment opportunities for both foreign and local investors. ISL owns and manages seven (7) industrial estates and more than 2,500 acres of strategic lands, including the 40 hectares of Ma Kôté mangrove. ISL liaises with private landowners on behalf of investors who are interested in leasing or purchasing land for business enterprises.

2.2.5.5 **Department of Fisheries**

Promotes sustainable development of Saint Lucia's fisheries sector through participatory management and sustainable use of the fishery resources. Helps to manage marine ecosystems ensuring that they maintain their capacity to support the generation of local marine resources.

2.2.5.6 **Department of Forestry**

Seeks the preservation and sustainable use of forests and wildlife in order to safeguard benefits and ensure a healthy and productive nation.

2.2.5.7 **Environmental Health Division, Ministry of Health and Wellness**

Monitors environmental conditions and promotes sustainable Environmental Health Management Strategies.

2.2.5.8 **National Fishermen's Organization (NFO)**

Seeks to improve the quality of life for fisherfolk and develop a sustainable and profitable industry through networking, representation and capacity building and by adopting an ecosystem based management of fisheries resources.

2.2.5.9 **Ministry of Tourism, Information and Broadcasting**

Encourages the development of quality, authentic and distinctive tourism products that are based on principles of sustainability, equity and diversity and which will generate a high quality of life for all residents.

2.2.5.10 **St. Lucia Nature Heritage Tourism Programme (SLHTP)**

Perpetuates adventures that showcase the natural and cultural aspects of island. This is a collection that reflects genuine Saint Lucian experiences.

2.2.5.11 **Southern Tourism Development Corporation (STDC)**

A registered non-governmental, non-profit organization which co-ordinates the development and advancement of touristic activities in the south of St. Lucia. The STDC seeks to support tourism ventures that embrace cultures, sites and activities as well as the experiences and skills of local people. The STDC encourages local ownership and provides opportunities for small businesses e.g. small hotels and guesthouses.

2.2.5.12 **Physical Planning Section, Ministry of Economic Development, Housing, Urban Renewal, Transport and Civil Aviation.**

Effective integrated planning, coordination, implementation and monitoring of physical/ spatial, technological, economic, environmental and social development activities. Approval required for most public projects.

2.2.5.13 **Royal Saint Lucia Police Force (RSLPF)**

Works in collaboration with the public to reduce crime and secure a safer environment for the people of St. Lucia.

Table 2.4: Agencies and their Key Roles in the Management of Coastal Ecosystems

Organization	***Potential roles***		
	Environment	**Economic**	**Social**
SLNT			
CARPHA			
Invest SLU			
Dept. Fisheries			
Dept. Forestry			
Environmental Health			
National Fisherfolk Organization			
Ministry of Tourism			
SLHTA			
Ministry of Education			
STDC			
Physical Planning Section			
RSLPF			

2.2.6 *Current Economic Activities*

2.2.6.1 **Charcoal Production**

The mangrove has been targeted for built development in the past, particularly for large-scale resorts and golf course development. The most important resource use is charcoal production however, which remains a vital cottage industry undertaken by small-scale producers. Secondary use includes activities such as seasonal fishing, bird hunting, crab hunting, therapeutic bathing, and wood harvesting for construction.

Mangrove forests have favourable silvicultural characteristics which lend themselves to intensive forest management for wood products. Some of these characteristics are as follows:

- Rapid growth: mature stands under suitable conditions may yield over 270 m^3/ha within 30 years, equivalent to an MAI of 9-10 m^3/ha.
- Good regeneration potential: most mangrove species flower and fruit regularly and the propagules are dispersed by tides. Thus, mangrove stands can recover rapidly from natural or man-made disturbances, including intensive logging.
- Tendency to form homogeneous/even-aged stands: pure stands of Rhizophoras or Avicennias are not uncommon and even in mixed stands, the principal components are restricted to a handful of species.
- Diversity of forest products: a wide range of products are produced and as bioenergy plantations even the smaller thinings may be used as firewood.

Extracted from **FAO**. 1994. *Mangrove forest management guidelines*. FAO Forestry Paper No. 117. Rome.

Not surprisingly, the Ma koté mangrove has been and remains an important source of fuelwood in the south of Saint Lucia. Mangrove trees currently provide about 30% of the charcoal sold in the nearby town of Vieux Fort. Charcoal from the Ma Kôté mangrove is produced exclusively by a community group called the Aupicon Charcoal and Agriculture Producers Group (ACAPG). This group is comprised of both males and females and their primary source of subsistence is the sustainable harvesting of trees in the mangrove for charcoal production. Through dialogue with the ACAPG it is estimated that most (almost 90%) of the members rely on charcoal production from the mangrove for 100% of their livelihoods.

Fig.8 Charcoal Production at Ma Kôté Mangrove, 2015

2.2.6.2 **The Aupicon Charcoal and Agriculture Producers Group (ACAPG)**

The ACAPG is comprised of approximately 17 – 25 members who use mangrove trees to produce charcoal. Charcoal produced from the mangrove is sold primarily in the town of Vieux-Fort. Income from the sale of the charcoal represents almost 100% of the income generated by the members of the group. The ACAPG was formed in 1993 with the assistance of CANARI and the Department of Forestry and Department of Fisheries, both in the Ministry of Agriculture. The purpose of the establishment of the group was to enable co-management arrangement with a local community to manage exploitation of mangrove trees. This was in response to the severe deforestation due to unregulated and unmanaged cutting of mangrove trees, that was occurring in the 1980's and early 1990's, for charcoal production. It was realized that immediate action had to be taken in order to prevent a complete destruction of the Ma Kôté mangrove. Limited resources by the Forestry and Fisheries Departments at the time necessitated the employment of non-conventional measures in order to save the mangrove. The needs of the communities in the area for a source of income, and the realization that the mangrove could sustain some level of regulated harvest, led to the establishment of a co-management agreement between local community residents, the government and CANARI, who took the lead role in community engagement and drafting of the management agreement. Under this agreement, a specific approach to cutting trees within Ma Kôté mangrove and for charcoal production would be practiced. Anyone who wished to exploit the mangrove for charcoal production was expected to become a member of the ACAPG and abide strictly to the management agreement.

As part of the co-management arrangement, a monitoring programme was established in 1986, designed to estimate the rate of exploitation and trends in the status of the mangrove tree biomass. Currently, the ACAPG is required to undertake mangrove harvesting using a similar monitoring protocol that is approved by the Department of Forestry in Saint Lucia. Based on the original agreement, records of the amount of charcoal produced monthly had to be provided to the Department of Forestry by the ACAPG. More specifically, the ACAPG was required to maintain a record of the number of bags of charcoal produced by every group member each month.

As a result of discussions with CANARI during its formation, the following rules were agreed upon by ACAPG and other agents involved (CANARI, Departments of Fisheries and Forestry):

- ✓ No harvesting of young branches, determined by the harvesters by level of maturity and by others by stem size (less than 50 mm in diameter);
- ✓ No cutting of red mangrove trees that line the waterways;
- ✓ Preservation of large trees for seeds, shade, and shelter for birds;
- ✓ Careful stacking of stash to allow re-sprouting, or coppicing, of stumps;
- ✓ Cutting at a slant without splitting the stump, and cutting at sufficient height

above the ground to prevent rotting;
- ✓ Cutting only the wood needed for one pit at a time, in order to prevent loss of stockpiled wood from rain, flooding or pilferage.

Despite the above agreement recent observations of the group by the consultant suggests the following:

- ✓ while many former ACAPG members continue to produce charcoal, there is little cohesion and therefore no agreement on controlling unauthorised access to the resource;
- ✓ a significant component of current extraction is the cutting of white mangrove trees for construction poles. This is conducted by former ACAPG members as well as unauthorised harvesters but the extraction is unregulated and, in the absence of monitoring, its sustainability cannot be determined;
- ✓ the use of approved cutting methods that maximise coppicing (i.e. regeneration of stems from stumps for future harvests) has been abandoned by many harvesters with the result that regeneration is compromised;
- ✓ the mangrove was used as a dump for solid waste for many years but this was controlled to a large degree when the ACAPG was functioning. Dumping has since resumed despite the fact that the municipal dump is on the opposite side of the road from the mangrove entrance;

2.2.6.3 **Eco-Tourism**

In an effort to increase income generation amongst persons living in the nearby areas of the Ma Kôté mangrove, the SLNT and the ACAPG, together with interested persons from communities in Vieux-Fort, Micoud, Laborie and their environs, formed a special organization, Eco-South Tours, whose purpose is to develop eco-tourism within the Ma Kôté Mangrove and other sites in the Point Sables Environment Protection Area (PSEPA) in order to diversify income generating opportunities in the south of the island. With the assistance from the Nature Conservancy, under the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) funded ECMMAN Project, Eco-South Tours (EST) has undertaken the establishment of trails in the mangrove for walking, horseback riding, and bicycling. New stables have been built to improve the horseback riding services being offered, bicycles have been purchased and promotional brochures and mangrove conservation awareness materials have been recently produced (2017). An Interpretation Centre, complete with kitchen and washrooms facilities has been refurbished and a mangrove nursery has been constructed.

Whilst some limited tourism (mainly horseback riding offered by a few members of the ACAPG who are co-owners of the Savannes Stables) has been ongoing in the mangrove for

several years, it is anticipated that a significant increase in this activity will commence in the second half of 2017.

'Fig.9 Efforts MaKôté Mangrove Interpretation Centre

2.2.7 *Key Management Challenges Associated with Ma Kôté Mangrove*

1. Absence of a Designated Management Authority

The Ma Kôté Mangrove is owned by the Crown, but management authority has been transferred to Invest Saint Lucia, whose mandate is to lease land for development but, as a component of the Pointe Sables Environment Protection Area (PSEPA), it technically should be under the full management of the SLNT whose mandate is defined under the Saint Lucia National Trust Act, Chapter 6.02 of the Revised Laws of Saint Lucia. The Act requires the SLNT to conserve the natural and cultural heritage of Saint Lucia, and to promote values which lead to national pride and love of country.

The Pointe Sable Environmental Protection Area (PSEPA) is a coastal strip in the south of Saint Lucia which extends from Moule-a-Chique to Pointe de Caille, just north of Savannes Bay. This 1,038 hectare site was designated an environmental protection area under the Physical Planning and Development Act of 2001 in August 2007.

Description of the Boundary of the Pointe Sable Environmental Protection Area

The Gazette Notice, dated August 27, 2007, states that the Pointe Sable Environmental Protection Area (PSEPA) is "…located from Pointe De Caille to Moule A Chique including Savannes and Pointe Sable in the quarter of Vieux Fort …". The Gazette Notice provides the detailed land description as a series of Block and Parcel numbers. The designated area consists of a narrow coastal strip (the Queen's Chain1), the Savannes Bay Mangroves and ManKôté Mangroves, and adjacent cays (Scorpion Island and the Maria Islands).

However, no formal designation of the management of the ManKôté Mangrove to the SLNT has occurred. The absence of a designated management authority also means that the co-management agreement developed by CANARI with the ACAPG does not define exactly with whom the agreement exist.

2. Insufficient Public Awareness, Understanding and Appreciation of Mangrove Eco-systems

Despite significant investments in public awareness on mangroves that have been undertaken by CANARI in the 1980's and 1990s, SLNT and the Ministry of Agriculture through its Departments of Forestry and Fisheries since the 1970's till current, with support of multiple national, regional and international agencies such as the OAS, OECS, OPAAL, ECMMAN, FAO, USAID, ECMMAN, GEF SGP and many others, there still seems to be an insufficient appreciation by the general public, specifically in the south of the island, on the important contributions made by mangroves to human wellbeing. The rationale has been drawn from the public responses to questions on coastal development investments in Ma Kôté Mangrove that have been posed by radio and television reporters. Whilst many persons have indicated concern, these have been persons who work in conservation or are associated with conservation organizations. Public awareness activities over the years whilst being successful in the short term, must be sustained in order to reach multiple generations. Unfortunately, since much of the awareness activities have been concentrated with funding support from external funding sources very often awareness activities has been sporadic. Long term initiatives must be developed in order that a wider cross section of the public is repeatedly informed and reminded of the roles of mangroves in saving livelihoods.

3. Inadequate engagement of the public with resources of the Ma Kôté Mangrove. More visits need to be planned to the site.

Only a small percentage on the St. Lucian public has visited Ma Kôté Mangrove.

During the Mangrove Awareness week, several school students were given the opportunity to visit Ma Kôté. On enquiring from the students, more than 90% (about 1 out of 10 persons) were visiting the area for the first time, even though they were all residents from either

Vieux-Fort or its close environs. Those who had visited had passed through the area in order to picnic on the beach. Unless there is some specific reason to visit the area, (some form of entertainment, or tours, or research activities), it seems plausible that residents will not undertake a visit to the area.

4. Inadequate monitoring and data collection.

Baseline information is occasionally collected at the mangrove, however, this is often based on funding and technical input from regional and international organizations and projects. must be generated in order to assess success Considering that the site is one declared to be of international importance. There currently is no long term research goals or projects and so data management is sporadic and methodologies used are not always standardized, limiting capacity for replication or comparison of data. Data is also housed with different agencies and not always easily obtained. A more organized approach to data collection and management, for effective planning and problem solving is necessary.

5. Insufficient legal framework and law enforcement to support effective management of mangrove.

Most ecologically significant landscape contain multiple landowners, often of different types. Less obvious, given the oversimplified image of property ownership in current societal discourse, property owned by one party is also subject to interlinking property rights held by others. The most obvious of these rights are embodied in nuisance laws, which generally prohibit landowners from substantially and unreasonably interfering with the use and enjoyment of property by their neighbours or the public. Thus, neighbours and the public have rights requiring that the property of others not be used in a way that substantially and unreasonably interferes with their interests. An important general lesson is that property rights have never been absolute.

Ma Kôté Mangrove is under the management of Invest Saint Lucia. Technically, as such, the Government Departments of Forestry and Fisheries are the agencies best positioned to guide the management of the natural resources of the area as it is comprised of forests, freshwater sources, hosts fish and other marine species for some time of the year, is an important refuge for migratory birds and other wildlife, and plays an important function in the protection of marine ecosystems and vulnerable species such as sea grass beds, coral reefs, and marine turtles.

There is expected to be an overlap in interests of several Government Ministries and other agencies in the management of the mangrove. At the same time, the level of involvement in management will be dictated by existing legislation for each ministry. A popular form of ecosystem management is shared management amongst multiple agencies, or co-management agreements between State and private enterprises. Another form is the

community-based management arrangements such as exists between the ACAPG and the State. In summary, the legal context of forest management is multi-layered and complex, beginning with a variety of types of owners (private, corporate, and governmental, all having different incentives), proceeding to include a variety of interlinking rights and duties among them, and then including many types of regulation (water, air, land use, wildlife) implemented by a variety of government bodies. A management plan for Ma Kôté needs to ensure that there is sufficient legislation in place to enable a range of management structures to be possible, and which can respond to changing social, economic, political and climatic conditions.

Of even greater concern is the seemingly complete absence of enforcement of laws that do exist. Currently, there are very specific laws that address several of the activities that currently threaten the mangrove, including, but not limited to the following:

I. Pollution: Dumping of solid and liquid wastes in waterways and protected areas;
II. Harvesting of resources in protected areas without permits;
III. Unregulated and approved use of pesticides and toxic substances
IV. Unregulated disposal of sewage;
V. Construction of buildings without approval from the Ministry responsible for Physical Planning;
VI. Us eof crown lands without a permit;
VII. Cutting of trees in marine reserves;
VIII. Planting of crops in protected areas, including marine reserves;
IX. Introduction on non-native species into Saint Lucia.

Despite these laws several infractions of the above take place without any actions taking place by Police and or other designated authorities. And even when actions do occur the penalties are inadequate and do not serve as deterrents to others. In some cases the poor enforcement of the law is due to insufficient capacity by the police and other relevant organizations. In other cases, reasons for poor law enforcement stem from a lack of interest by law enforcers and the public, fear of reprisal and or ignorance of the law, even by the law enforcers.

6. No Sustainable Financing Mechanisms in place to support the management of the mangrove.

Management of protected areas cost money. Despite its intrinsic value and the importance of forests, marine and coastal biodiversity to human well-being and sustainable development, there is often a lack of sufficient financial resources reserved to support environmental projects. Most countries in the Caribbean for example are almost completely

dependent on donor funds to sustain their ecosystems. The steady flow of sufficient financial resources is however extremely important to conduct monitoring, education, research, rehabilitation and development activities. Habitat restoration and species conservation whilst being aided by volunteers in many countries still require a minimum amount of investment. There is no question that achievement of long-term conservation goals is very dependent on sustained economic investments.

Ma Kôté Mangrove has benefitted tremendously in the past 20 and more years from various projects most of which have been financed from foreign investment. The mangrove has also suffered from neglect during the periods when project funds are scarce. The management plan must identify mechanisms to secure long term income generation that is not completely dependent on project funds. There is an urgent need to identify sufficient, sustainable, stable, secure financial resources to cover the costs of ecosystem management. Possible sustainable financial options include investments via ecological compensation, donations, PES (payment for ecosystem services), green philanthropy and sponsoring, user fees, purchase of "green shares". Any management strategy for protected areas must take into consideration one or more methods that will secure investment for the long term.

2.2.8 *Key Conservation Threats Associated with Ma Kôté Mangrove*

Unfortunately, despite some efforts towards the conservation of the mangrove, Ma Kôté still faces many challenges, prompting the urgent need for a more structured and focussed effort at management and conservation. Whilst excessive and unsustainable exploitation of mangrove species for charcoal may no longer be of major concern (due to the endeavours of the Forestry Department and the ACAPG), pollution of aquatic and terrestrial sites due to the illegal dumping of garbage, agrochemicals, and sewage; vulnerabilities to coastal development and CC persist. This is often evident in high levels of turbidity in flowing streams, the deposition of plastic debris by streams throughout the mangrove, and public announcements by the Government of its willingness to consider investment proposals for income generation and job creation.

1. Pollution: Agrochemical, Sewage, Industrial Wastes

Mangroves act as sinks for pollutants such as sewage, toxic minerals, urban runoff, pesticides, and herbicides. These pollutants have negative effects on mangrove trees and associated ecosystems. The effects are often long lasting. If pollutants are repeatedly deposited into mangrove areas, ultimately they will reach levels that will lead to permanent damage or death of the mangrove. In recent years, the biggest regional threats to mangroves in the Caribbean, other than coastal development, is pollution from runoff of fertilizers and pesticides, and improper disposal of industrial wastes.

The Ma Kôté mangrove is located in a moderately busy commercial and residential area. As a result, the marine reserve is often impacted by wastes originating from waste waters from

the surrounding urbanized areas. Most of the grey water coming from nearby factories and homes is deposited in open drains which empty into the mangrove. In addition to wastes from nearby communities, a significant potential source of pollution is the nearby solid waste facility. Due to the proximity of the solid waste facility to Ma Kôté and the absence of lining at the site, the potential threat of leachate contamination exists.

The Vieux-Fort Solid Waste Management Facility is located at St. Urban in the quarter of Vieux-Fort, adjacent to the National Sporting Stadium along the Vieux-Fort Highway. The site covers some 7.4 hectares (18.97 acres) and is located in a former sand gravel pit. The site was an open dump from 1995. From 1998 to present, improvements in the operations of the site have been achieved. The site has been upgraded to a waste management facility and low-tech landfill site. However, despite these and other improvements in operations, the site does not have a leachate collection and management system. Due to the real threat of leaching at the site, an environmental monitoring programme has been instituted to monitor potential negative impacts on the environment, specifically monitoring leachate migration and surface water quality.

Source: Saint Lucia Solid Waste Management Authority Website. 2013.

The possibility of leaching at the site is of even greater concern realizing the presence of biomedical wastes in the materials deposited in the landfill. The findings of the Sewage Needs Assessment Study allow for conclusions to be made on the existing situation and recommendations to be formulated for improving sewage management and obtaining conformity to the LBS Protocol. Some of the main conclusions emanating from the Assessment include: i) The problem of untreated sewage from the St. Judes Hospital entering the environment is a serious concern and can pose threats to human health and the environment; ii) The sewage treatment plant at Hewanorra International Airport (HIA) serving the Airport, the industries of the Hewanorra Free Zone and National Stadium is inadequately maintained and operated.

In 2015- 16, due to its concern about the level of pollution in the PSEPA, the SLNT, with funding support from the ECMMAN project, contracted CARPHA to undertake an assessment of pollution in a number of sites within the PSEPA. Two of these sites were located in the immediate vicinity of Ma Kôté Mangrove. Sampling took place five times over a thirty day period from November – December of 2015, in order to provide an understanding of the pollutants present in the surface waters entering the surrounding sensitive marine environments in the selected areas. Nine parameters were analysed in total, four of which were listed in the LBS Protocol appendices - E.coli, Enterococci, total nitrogen and phosphates. These were selected to give an indication of pollution input from greywater, agricultural and blackwater sources. E.coli and Enterococci are indicators of faecal pollution from warm blooded organisms. E.coli present in surface water is indicative of recent pollution because it does not survive for extended periods of time in such environments. On the other hand the more resilient Enterococci survives for longer periods of time in surface

and coastal water. These organisms are a bit more resistant to harsh environments therefore they indicate the presence of long term faecal pollution.

The nutrients that are total nitrogen and phosphates are compounds which indicate pollution from agricultural activity. Other parameters analysed were heavy metals (cadmium, copper, iron and lead) and turbidity. The bacterial counts in the surface water samples, for enterococci bacteria, far exceeded the recommended limits under the LBS protocol. The data obtained from the study shows levels of both nitrogen and phosphates above the recommended limits in the surface water samples that were analysed.

2. Coastal Development

Ma Kôté is ideally located for coastal development. The mangrove sites of a large expanse of flat land, along a major highway, minutes away from the main international airport. The mangrove is also located close to coral reefs, sandy beaches, calm and shallow bays. Not surprisingly the mangrove has become a prime target for proposed development in the hospitality industry. The lands are also crown property vested in ISL. As a result, there has been, and continues to be, considerable pressure from Government to develop this area under the hospitality sector. To date, several proposals from foreign investors have been entertained. The pressure in recent years has escalated with the increasing unemployment rate especially in the south of the island. The threat of transformation of the mangrove for hotel construction is thus quite high.

3. Deforestation

i) charcoal production: Whilst this was a serious issue in the mangrove in the 1980's and 90's , it has become significantly less so due to the most part, to the formation of the ACAPG and the management agreement formed in the early 1990 between this group, CANARI and the Departments of Forestry and Fisheries, in the Ministry of Agriculture. Currently, members of the ACAPG participate in regulated harvesting of trees in the mangrove, employing a system of allocation of demarcated plots to family groups for use for a specific period of time. Once a plot has been harvested (limited to a specified number of trees per acre) the family will move to another plot that has been surveyed and approved for cutting. There is a limit to how much each family is permitted to harvest monthly.

More specifically, each charcoal producer uses one cutting area per season (two seasons per year, before and after the rains), and rotates cutting areas, returning to a cut over area after about two years. They cut selectively in strips of 10-20 metres, zigzagging to access clusters of suitable stems. All group members are aware of each other's cutting area in a given season; this helps avoid conflicts. Related individuals often cut in adjacent areas to facilitate exchange of help. Cut stems are placed in rectangular pits dug in the forest floor, about 4- 6m long, partially covered with grass or leaves and then with soil, and fired for three days.

ii) construction: Cutting of mangrove trees also often occurs in order to produce stakes or props that are used in construction. Even amongst the charcoal producers, this activity often occurs to augment the income from the sale of charcoal. Charcoal producers either cut the wood themselves and sell to the public, or give permission to persons outside the group, to come into the mangrove and cut the trees themselves. Either way, in the absence of guidance from the Department of Forestry, the risk of damage to the ecology of the mangrove is high.

4. Solid waste caused by illegal dumping into waterways and within the mangrove

The prevalence of plastic bottles and other debris continues to be a significant problem within the mangrove. In the recent past, about 2 – 3 years ago, the bulk of the waste had its origins from materials being illegally and deliberately dumped into the mangrove from trucks. Construction waste was also often deposited by truckers who chose to use the mangrove as a dump site rather than the nearby Vieux-Fort Solid Waste Management Facility. The presence of plastic, paper, rubber and metal waste in the mangrove, during the rainy season especially pose severe pollution threats as rising waters facilitate the movement and spread of solid matter throughout the mangrove, into waterways and eventually out to sea where they eventually end up either on the beach adjacent to the mangrove and on nearby coral reefs. Solid wastes also contribute to blockage of waterways contributing to flooding within the mangroves and interference with the normal ecosystem functions of the mangroves. Solid wastes also sometimes leach harmful materials into the surrounding ecosystem of the mangrove, once more threatening natural functions and wildlife. In the more recent past, the illegal dumping of solid wastes has been reported (by members of the ACAPG) to have declined somewhat, and most of the waste turning up in the mangrove is more often than not carried there by waters the small streams and overflowing drains that dump their water in the dry ravines that feed the water courses of the mangrove.

5. Unregulated harvesting of resources – crabs

This threat is a recently emerging one. The hunting of crabs in the Ma Kôté Mangrove is a popular recreational activity that has slowly been growing. It is undertaken by young men who live and or work in the nearby areas of Ma Kôté Mangrove. The threat to the mangrove is two-fold. First, there is the slow depletion of the resource itself, as more and more persons participate in “crabbing” with no regulations of when and how much they harvest. The number of crabs seen in the mangrove is reported by the ACAPG to be getting smaller and smaller. Similarly the sizes of the crabs seen are also reported to be in decline. The second issue is related to the popular method of harvesting. The use of traps is no longer then main form of harvest. Rather, the digging of large holes at the base of the mangrove trees in order to open up existing crab holes and thus trap the crabs, is currently the main form of harvest in the mangrove, as it is in several other areas around the island. This method however not only ensures that the chance of escape by the crabs is next to zero, it also leads to severe

damage to the roots of the mangrove tree, and also dislodges the tree from the ground, increasing the risk of the tree falling over. Trees also die when roots are destroyed during digging or rot, as water accumulates and remains in the holes dug by poachers. Extended harvests of crabs is thus not only illegal (based on the Wildlife Ordinance), but also leads to toppling of trees throughout the mangrove.

6. Climate change / variability impacts

Mangrove forests, due to their close proximity to coastal and inland waters, are easily affected by heavy rainfall, storms and hurricanes. Rising sea levels and flooding rivers invariably will lead to flooded forests and changes to ecosystem dynamics. Floods also mean increasing loss of habitat for mangrove wildlife, increased erosion, increased incidents of salt intrusion and the deposition of debris, agrochemicals and other toxins from inland sources. Increasing temperatures also affect the growth of mangrove forests and the fauna that live within them. Breeding patterns can become altered, affecting the important ecosystem functions and services of the mangrove.

7. Invasive Alien Species

In this regard, the species of greatest concern is the leucaena. During the 1970s and early 1980s, *Leucaena leucocephala* was known as the 'miracle tree' because of its worldwide success as a long-lived and highly nutritious forage tree, and its great variety of other uses. As well as forage, leucaena can provide firewood, timber, human food, green manure, shade and erosion control. In an attempt to reduce the pressure on mangrove trees for charcoal and props, the Forestry Department introduced the species to Saint Lucia and commenced planting the species in various parts of the island but specifically in the south and along the outskirts of Ma Kôté Mangrove . The intention was that farmers would use the tree for forage for livestock and for timber and rely less on the mangrove species. To some extent this was successful. However, the tree has become naturalized to the extent that it has grown faster than several other naturally occurring species and has replaced several species in several parts of the island. Whilst farmers use the leucaena for crops and livestock, they continue to use the mangrove trees during the dry season. The leucena is thus not harvested sufficiently and has become a nuisance in some parts of the mangrove.

3. 0 MANAGEMENT PLAN

3.1 GOAL AND OVERALL OBJECTIVE OF THE MA KÔTÉ MANGROVE MANAGEMENT PLAN

Goal: To protect the natural landscape and biodiversity of the mangrove whilst preserving and enhancing the ecological, social and economic services provided by the area.

Objective 1: To identify the important social, cultural, health and economic contributions of the Ma Kôté Mangrove to the people of Vieux-Fort and environs.

Objective 2: To define a set of management and conservation targets, actions and indicators that will preserve the capacity of the mangrove to provide benefits to human populations in the long term.

To achieve this, the following are expected to be important components of the management plan:

- Planned public consultations;
- Prioritized list of mangrove needs of the communities;
- Public education programs;
- Ecological tourism utilizing living and non-living resources of the mangrove areas;
- Recommendations for legislation and policy revisions to reduce threats and enable sustainable use of mangrove resources and community participation in management;
- Law enforcement strategy;
- An ecosystems monitoring plan (includes monitoring of living and non-living resources);
- An ecosystems restoration plan; including reforestation of degraded canals and flood plains, and removal of pollutants;
- Research plan and protocols to identify sustainable levels of exploitation;
- Sustainable mariculture (seamoss cultivation);
- Zonation of mangrove (tourism, charcoal production, education and research, bio-systems restoration);
- Restoration of mangrove forest hydrology;
- Managed charcoal production;
- Regulated harvesting of crabs;
- Site-specific mangrove forest management programme;
- Protection of freshwater inflow to mangrove estuaries.

3.2 THE MANAGEMENT PLAN

Component 1: Management and Governance Frameworks

The following seeks to address ***Management Challenge#1, Conservation Threat # 2***

Objective 1A: To identify and have designated an agency as the Lead Management Authority for the Ma Kôté Mangrove.

Based on dialogue with ISL undertake one or more of the following strategies:

Strategy 1A.1: Formally seek the transfer of management of the Ma Kôté Mangrove from ISL to the SLNT.

Strategy 1A.2: Request a 99 year lease from Invest SLU of the Ma Kôté Mangrove to the SLNT.

Strategy 1A.3: Establishment of co-management arrangements between Invest Saint Lucia, SLNT, Departments of Fisheries and Forestry for the management of the Ma Kôté Mangrove.

Objective 1B: To develop a platform whereby stakeholders and interested groups can work together to i) agree on a system of Governance to manage the use of resources in Ma Kôté , ii) define long and short term conservation and sustainable development targets, and iii) drsft a business plan. In so doing, stakeholders play an active role to protect the biodiversity and mangrove habitats from human- related threats including over harvesting, deforestation and pollution, climate change and IAS.

Strategy 1B.1: Designate the PSEPA Management Team as the management authority for the Ma Kôté Mangrove.

Activities:

1.1 The PSEPA MT to extend invitations to the following institutions to identify one person to sit on the Ma Kôté Mangrove Stakeholder Committee:

1. Invest Saint Lucia / Crown Lands
2. Southern Tourism Development Foundation
3. Unique Crafters
4. Ministry responsible for Physical Planning
5. Ministry responsible for Coastal Zone Management
6. Sustainable Development Division of the Government
7. Aupicon Agriculture and Charcoal Producers
8. Department of Forestry
9. Water Resources Management Authority

10. Department of Fisheries
11. Savannes Fishers Group
12. ManKôté / Savannes Bay Seamoss Farmers Group
13. Saint Lucia National Trust
14. Ministry of Health
15. Ministry of Education / District Education officer
16. Saint Lucia Hotel and Tourism Authority
17. Solid Waste Management Authority
18. Member from the Student Council (Vieux-Fort)
19. Coconut Bay Hotel
20. Goodwill Fishermen's Cooperative
21. National Conservation Authority
22. Royal Saint Lucia Police Force

1.2 Hold first meeting to propose and reach consensus on a Governance Structure for the management of the Ma Kôté Mangrove.

1.3 Elect additional members to add to the PSEPA MT to serve as the Board of Management.

1.4 Agree to a system of rules and regulations pertaining to participation, attendance and functions of the Board.

Indicators

1. # of persons attending the first Stakeholder Committee meeting.
2. Document stipulating 99 year lease of Ma Kôté Mangrove to SLNT.
3. Structure of the Ma Kôté Mangrove Management Board.
4. Memorandum of Understanding (MOU) between Agency (ies) that comprise the Management Authority and Invest Saint Lucia.

Component 2: Awareness and Education

The following seeks to address ***Management Challenge #2***

Objective 2: Increase communication and sharing of information on mangroves in general, and Ma Kôté Mangrove specifically, with members of the public.

Strategy 2: Increase public appreciation of environmental and economic importance of mangrove forests.

Public awareness and education have unanimous support as a technique for changing attitudes and building support for mangrove management. The role of public education in mangrove ecosystem management is to promote awareness, understanding, and new attitudes within the public (adults and children) regarding values and appropriate uses for these coastal resources. The mechanisms to be used and the messages to be transmitted must be carefully thought out as the target groups are quite varied both in social, cultural, economic and educational backgrounds. The public is also expected to play very diverse roles with regards to use of and impact on the mangrove resources. Thus, a broad-based approach to education is necessary, since people must make decisions at many levels in order for new or strengthened mangrove management policies to take effect. At the national level, building community awareness and sensitivity to mangroves would need to be a priority in order to garner maximum support for proposed mangrove policies and regulations. It is recommended that all media be used to transmit information, such as television, radio, internet, music, sports, to promote visits to the mangrove. Politicians and the business community must also be targeted and given special attention as they can play a pivotal role in determining access by the public, and use of resources within the Ma Kôté mangrove. In order to maximize use of limited funds, it is also recommended that national events such as carnival and jazz, as well as school sports and science fairs be used to launch information on the mangrove and maintain an interest in scientific research on mangrove ecosystems. Other avenues for education and attention raising are via technical seminars, hosting of weekend events at the mangrove, supporting kayaking and estuary fishing competitions, essay writing and poetry. At the local level, education efforts-such as talks by technical experts, oral histories of the role of a mangrove ecosystem in community life, school programs, mangrove tours, distribution of materials on local resources, small projects, and specific interventions in key decisions-can raise consciousness and prepare a community to give serious consideration to management proposals.

By making the community an active participant in decisions related to Ma Kôté , multiple stakeholders may be brought together who benefit from and who may be contributing to threats to the mangrove, to participate in the planning process, to become local watchdogs, defenders of the mangrove resources and promote local vigilance and reporting of mangrove destruction.

In this capacity the role of the public relations / communications officer will be very important. Keeping the public informed and interested in the status and ongoing functions of the Ma Kôté Mangrove will be especially important. To do this effectively there must be a permanent presence that can distribute general information, generate local educational materials and learning experiences, and reach all of the different audiences who ultimately will determine whether mangrove management succeeds. Once general awareness is built, follow-up is necessary to focus on the issues and concerns of specific interest groups.

Activities

2.1 Through stakeholder consultations develop or revise an Education and Communications plan for the mangrove similar to that shown in the draft below.

2.2 Implement the plan through public awareness on radio, television and the internet.

2.3 Increase information and education on mangroves in schools.

2.4 Produce and distribute information materials on mangrove functions, conservation and good management.

2.5 Develop mangrove awareness programmes and events in keeping with other public activities.

Indicators:

1. # stakeholders participate in the development of the E&C plan.
2. # of radio, television and internet programmes developed and broadcasted.
3. # of persons reached via media programmes.
4. # of different types of information materials produced.
5. # of each type of material produced and distributed.

Draft Awareness and Education Strategy

Issue: Why? Communicate / What ? Message to audience	**Code**
Ignorance of what mangrove forests are and there role in coastal defence, sediment trapping, climate control, biodiversity conservation, fisheries conservation. / provide detailed information on each of these.	A
Effect of agro-chemicals on mangroves/ dos and don'ts on using agrochemicals near or in mangrove ecosystems	B
Pollution from sewage, litter, solid waste / Effect of litter on mangroves. Do not litter. Dumping is illegal.	C
Environmental role{s} of mangroves/Protect mangrove/ Support mangrove conservation	D
Lack of knowledge on mangrove contribution to livelihoods / Economic and social role of mangrove.	E
Garner support for income generating initiatives /Help support mangrove community livelihoods, participate in the mangrove tours.	F
Threats to marine reserves / How to protect Ma Kôté Mangrove .	G
Deforestation: Do not cut mangrove trees/It is illegal to cut trees in the marine reserve/mangrove	H
Presence of Invasive species / Impact of introduction of non-native species	I

Issue: Why? Communicate / What ? Message to audience	**Code**
Ma Kôté Mangrove Riding Club / Please join and enjoy riding in the mangrove	J
Opening of the Mangrove Boardwalk / Advertise the boardwalk tour	K
Unrestricted access to the mangrove: Ma Kôté Mangrove opening times and fees	L
Effect of coastal development of mangroves / Demonstrate the effects	M
Sustainable development impacts / description of sustainable coastal development	N
Effect of mangrove decline on coral reefs and fisheries / description of impacts	O
Effect of harvesting of crabs on mangroves/ Describe impacts. Propose sustainable harvesting methods	P
Lack of knowledge of the impact of CC on mangrove structure and function / Describe impacts	Q

Communication can take many forms, including:

- Word of mouth
- Memos
- Lectures
- Social media (Whats app, websites, facebook, Instagram, twitter)
- News stories in both print and broadcast media (television and radio)
- Press releases and press conferences
- Posters, brochures, and fliers, promotional items, popular art / dance /music
- Outreach /presentations to community groups, fishers, farmers, youth groups, business houses, tourism organizations
- Special events and open houses, exhibition
- Workshops , seminars

Who? Target Group	**Code**	**How to? Delivery Method**
General public	ADEFGHJKL	Posters, brochures, events, promotional items, broadcast on social media
Government Agencies/Managers	BCMOPI	Workshops, seminars
Charcoal Producers	DGHI	Posters, Events, broadcast media
Farmers	BCDGHIP	Events, posters, workshops, outreach
Horse owners	CDGI	Posters, fliers, word of mouth, outreach
Savannes Fisherfolk	ABCDGOQ	Posters, events, exhibition
Aupicon Community	ACGHIMNOPQ	Outreach, exhibition, broadcast on social media, popular art
PSEPA Users	ACDEFJKNO	Posters, exhibitions, fliers, brochures
Truckers	CDG	Word of mouth, press releases
Students	A-Q	Posters, lectures, social media, exhibitions, popular art

Who? Target Group	**Code**	**How to? Delivery Method**
Vieux-Fort Residents	A-Q	Press releases, broadcast media, popular art
Tour operators	CDEFGKL	Press conference, brochures, fliers, exhibitions
Business houses	AEJKLMN	Press conference, brochures, fliers, exhibitions

Component 3: Research and Development

The following seeks to address ***Management Challenge #4***

Objective 3: To establish baselines and monitor changes in biological and biophysical processes taking place within the Ma Kôté Mangrove. Utilize data for management planning.

Strategy 3 Conduct scientific monitoring of mangrove ecosystems and processes and ensure the availability of current and accurate data.

It is recommended that visits of scientists interested in mangrove ecosystems be encouraged in order to increase the capacity and affordability of scientific research at Ma Kôté mangrove. Invitations should be extended to the Sir Arthur Lewis Community College (SALCC) and the Vieux-Fort Post-Secondary Comprehensive School. Extension of invitations to the various campuses of the UWI and other regional universities is also recommended. International research institutions should also be encouraged to collaborate on research projects in order to stimulate learning and experimentation with mangrove species and systems.

Research should also be encouraged by officers from the Forestry and Fisheries Departments, in order to promote the concepts of sustainable use. Identification of more efficient plant nurseries and more environmentally friendly charcoal production systems are needed. Research to identify and test new mariculture and fishing techniques should also be a priority.

Activities:

3.1 Conduct a data gap and needs assessment and develop a priority research list.

3.2 Based on the results from 3.1, develop a research and ecosystems monitoring plan inclusive of which organization or group will conduct or implement the research and monitoring plan. Research plan must be aligned with that proposed in the PSEPA Management Plan.

3.3 Train volunteers and students to monitor ecosystem structure and functions. Research methodologies must be in based on established international data collection protocols.

3.4 Train and facilitate the members of the Aupicon community to monitor biotic and abiotic features within the mangrove.

3.5 Promote Advanced Level, school-based monitoring programmes.

3.6 Implement summer school programmes.

3.7 Develop cooperative arrangements with CARPHA and WASCO (for water quality testing).

3.8 Develop and support research and freshwater quality monitoring projects.

3.9 Establish baselines for various parameters and through routine updates.

3.10 Establish a research and monitoring working group specifically for the Ma Kôté mangrove and which will seek funding assistance for its operation and sustenance.

3.11 Develop research targets in collaboration with local and regional research organizations.

3.12 Facilitate sustainable biodiversity exploitation through consideration of zoning of the mangrove to enable multiple uses (example: tourism, charcoal production, education and research, bio-systems restoration).

3.13 Promote protection of flora and fauna in mangrove forests through research and monitoring programmes with local, regional and international institutions.

3.14 Establish research plots within the mangrove for long term monitoring of plant growth and response to manipulated environmental conditions.

3.15 Construct a small research wing as an extension of the Interpretation Centre. Students can observe first-hand the growing of various seedlings and see the influence of various climatic variables on growth and development of the mangrove species. Simple water and soil quality analyses can be conducted in this wing.

Indicators:

1. # of volunteers and students trained to monitor ecosystems;
2. # of community members trained to monitor living and non-living resources in the mangrove;
3. # of advanced level monitoring programmes implemented;
4. # of summer school programmes established and # of students participating in the summer school programmes;
5. # of cooperative agreements established. Description of the cooperative agreements;
6. # of research and freshwater quality monitoring projects;
7. # of resource baselines established;

8. Name and description of research and monitoring organization;
9. # of research and monitoring programmes established with local, regional and international institutions;
10. Map of various zones established;
11. Description and # of research targets;
12. # of research plots established;
13. Description and photo of the new extension added to Interpretation centre.

Component 4: Conservation of Biological Functions: Threat Reduction

The following address ***Conservation Threats # 1 - 7***

Objective 4: Ensure the conservation of Fauna and Flora within the mangrove and their habitats through the reduction of key threats, primarily pollution, coastal development and deforestation.

Strategy 4: Reduction of key sources of pollution. Determine the conservation status of living organisms in the mangrove. Implement actions to protect forests and wildlife and to aid in the reduction of environmental threats. Undertake mangrove rehabilitation and restoration. Promote sustainable use programmes.

The first approach to mangrove resources conservation should be to determine comprehensively the biological and ecological status of the species found in the Ma Kôté mangrove. It would be wise to commission studies that lead to the determination of forest cover, mangrove species composition, abundance of birds, reptiles, amphibia and insects, presence of invasive species. Secondly, an assessment of the mangrove's capacity to perform certain ecological functions including:

- Inshore and intertidal nursery
- Shoreline protection
- Food source and shelter
- Nutrient sink (leaching of agro-chemicals and bio-chemicals from nearby farms, restaurants, factories and homes, landfills, illegally dumped solid and liquid wastes)
- Sediment sink (trapping suspended solids) extracted from rivers and small water bodies that flow through the mangrove to the nearby ocean.
- Pollution/solid waste sink (unfortunately, several mangroves, including Ma Kôté, have taken on the role of solid waste reservoirs, where bulk wastes especially are dumped amongst the buttonwood and white mangrove trees. Marine debris is often also lodged amongst the fringing red and black mangrove prop roots).

Activities:

4.1 Conduct preliminary studies to determine the current status of the mangrove ecosystems.

4.2 Determine the levels of pollution threats and identify actions needed to immediately mitigate these threats.

4.3 Determine human carrying capacity within the mangrove to guide the decision making with regards to public access in order to reduce adverse impact on biodiversity through human interactions with the various ecosystems present.

4.4 Identify and reserve significant tracts of mangrove areas for forest and wildlife conservation purposes.

4.5 Strengthen institutional capacities to monitor, protect and rehabilitate mangrove forests and wildlife.

4.6 Create information posters and brochures on Ma Kôté mangrove systems and biodiversity such as “Birds of Ma Kôté Mangrove”, “Mangrove Trees of Ma Kôté, “Fresh and Marine Fish of Ma Kôté ”

4.7 Build resilience to CC: replant mangrove trees in deforested areas.

4.8 Rehabilitate and restore degraded mangrove soils and freshwater ecosystems.

4.9 Identify key pollution hotspots for freshwater and take action to reduce levels of contamination and or mitigate impacts. Seek assistance from relevant institutions in managing freshwater threats.

4.10 Create wildlife conservation corridors to avoid species fragmentation.

4.11 Lobby for increased enforcement of laws which protect mangrove forests from undesirable coastal development and other environmental threats.

4.12 Organize series of school talks to promote community involvement in conservation activities.

4.13 Develop a Conservation Action Calendar, defining activities to be organized on special calendar days such as Earth day, World Oceans Day, World Water Day, Biodiversity.

4.14 Enable sustainable livelihoods. Promote seamoss cultivation, charcoal production, and eco-tourism.

4.15 In collaboration with the Forest and Fisheries Departments, other research institutions, conduct a socio-economic study on the crab harvests / fishery in the mangrove and establish a protocol for the harvesting of the species. Based on the results of research, propose management programme. Define harvest seasons, set harvest quotas, identify harvest techniques to be used. Consider recommending size limits, and restricted access via the issuing of permits.

Fig. 11 Red Mangrove seedlings

Fig. 12 Charcoal Production in Ma Kôté .

Fig. 13 Raising awareness, Ma Kôté Mangrove Nov. 2016

Indicators:

1. # studies undertaken to assess status of mangrove;
2. Description of pollution levels and mitigation actions;

3. Maximum # of persons approved to be within the mangrove at one time;
4. Calculated carrying capacity for the mangrove;
5. Size of area reserved within Ma Kôté as wildlife reserve / conservation;
6. # of institutions strengthened to monitor and rehabilitate mangrove forests and wildlife;
7. # of different types of information posters and brochures produced;
8. # of each type of poster and brochure produced;
9. # of mangroves trees replanted;
10. # of degraded sites rehabilitated;
11. # of pollution hotspots identified, assessed and restored;
12. # of wildlife conservation corridors created;
13. # of laws/legislation enacted to prevent transformation of mangroves for coastal development;
14. # of school talks successfully delivered at various schools;
15. # of different types of livelihood programmes developed;
16. Harvest season stipulated, size of harvest quota, list of approved harvest techniques.

Component 5: Legal Framework

The following address ***Management Challenge # 5***

Objective 5: Ensure that the proposed management framework for Ma Kôté Mangrove falls within the legal frameworks that exist.

Strategy 5: Review existing legislation and national policies to determine any gaps and inadequacies in the legislation and other legal instruments which are necessary for the management of mangrove forests.

In order to adequately manage the Ma Kôté Mangrove it is necessary to ensure that all the legal instruments are in place to enable management authorities to implement the necessary conservation actions, and to enforce any regulations that are proposed to ensure compliance by the public. It is currently recommended, for example, that some level of regulation of resource exploitation be in place, as well as control of access to particular vulnerable areas within the mangrove. In order to be able to achieve these controls, management agencies must be able to reference some form of legislation as well as have the national support to enforce the controls. Currently, a number of laws and policies are proposed but the capacities to enforce these are weak. For example, Ma Kôté is a marine reserve, declared so in 1986. In 2002 it was also declared a RAMSAR site. Both these actions imply some level of legal protection for the site. However, recent considerations by the Government to consider

leasing the area for large scale tourism suggest a disparity between legal status and enforcement, thus limiting Ma Kôté mangrove benefiting adequately from these protective measures.

Saint Lucia has many policies but a significant number remain unimplemented because of limited capacity- human, institutional and financial. Many of the policies are fragmented and so there is a need for greater synergies to be established, both in the actual polices and implementation among the agencies. Greater institutional cooperation and coordination is needed. As a marine reserve, for example, management of the mangrove falls under the control of the Department of Fisheries. However, it is also part of the network of forests on the island, and a Ramsar site. Management of forests and implementation of the Ramsar Convention are generally the responsibility of the Department of Forestry. The locations of these 2 departments have not always fallen under the same Government Ministry and so have sometimes relied on different Ministers of Government to oversee the implementation of their various legislations.

Activities

5.1 Conduct a review of existing relevant legislation in Saint Lucia and identify gaps and inadequacies.

5.2 Draft recommendations for legislative revisions.

5.3 Identify institutional gaps and weaknesses that affect capacity to manage implementation of laws and regulations.

5.4 It is noted that often lack of enforcement of laws is often the cause for poor management of protected sites. Therefore conduct an assessment of enforcement capacity of management agencies and determine actions necessary to improve capacities.

5.4 Prepare and submit findings to relevant agencies on appropriate legislative and institutional revisions necessary for effective implementation.

Indicators:

1. # of legislative gaps identified;
2. # of and description of recommended legislative revisions;
3. # of institutional gaps and weaknesses identified;
4. Copy of the Cabinet memo.

Component 6: Sustainable Financing

The following address ***Management Challenge #6***

Objective 6: Identify income generating initiatives to support the financing of conservation and management programmes as defined in this management plan.

Strategy 6: Identify and pilot test income generating initiatives with capacity to finance conservation activities within the Ma Kôté mangrove.

Coastal management activities are mainly funded by national government budgets and donor contributions from projects or development assistance which often have limitations in both their magnitude and scope. Public sector budgets are often inadequate and donor-funded projects are usually short-term and tied to particular government or donor priorities.

In order to achieve long term coastal management goals, sustainable sources of funding need to be identified that not only help initiate activities but also help maintain and promote further investment. Some funding options for coastal management interventions include

1. Donations/ philanthropic contributions – websites can be set up to facilitate donations from local and overseas sources, from business but also private individuals;
2. User and entrance fees (for participation in mangrove tours, use of the boardwalk, and entrance into the mangrove);
3. Events hosting (use of the Interpretation centre for public and private events such as receptions, exhibitions, shows);
4. Private sector partnerships (consider partnerships between Digicel, Flow, LUCELEC, Heineken Brewery, Sandals Hotel);
5. Market-based mechanisms (such as payment for environmental services through the purchase of green spaces within the mangrove and user charges);
6. Creation of green bonds (to enable persons to sponsor the management and conservation of green space within the mangrove annually. Areas of 0.25 – 1.0 acres can be offered for public or private sponsorship ranging from EC$150 - $1000 per year) ;
7. Research grants and fees for research programmes;
8. Locally raised funds.

The Ma Kôté Management Board will seek to find innovative and sustainable funding mechanisms to ensure long term financing for Ma Kôté Mangrove ecosystem conservation and management.

Activities

6.1 Conduct research on suitable sustainable financing mechanisms for Ma Kôté Mangrove.

6.2 Implement at least 3 financing options (consider those proposed above).

6.3 Develop research programmes and advertise to attract foreign research students and researchers.

6.4 Train community persons in tour guiding, eco-tourism management and ecosystem data collection.

6.5 Collect data on different species and micro-ecosystems within the Ma Kôté Mangrove in order to build the foundation for information sharing during mangrove tours.

6.6 Construct a network of boardwalks throughout the mangrove to enable better tours and appreciation of the area.

6.7 Engage professional event planners to assist community groups maximize the use of the Ma Kôté Interpretation Centre, and Savannes Stables (for both local and tourist events).

6.8 Establish a network of self-guided trails and bird watching tours and significantly increase communications with the various Tour Operators around the island as well as Trip Advisor and similar agencies.

6.9 Utilizing socio-economic assessments of the Vieux-Fort, Micoud, Laborie and surrounding communities, determine an entrance fee system that will make repeat visits to the mangrove affordable but still provide some income to facilitate maintenance of mangrove trails, buildings and facilities, including the employment of guides and security officers.

6.10 Promote ecological tourism in mangrove areas.

6.11 Organize familiarization / orientation tours through the mangrove for potential investors in order to raise interests.

6.12 Promote the mangrove for events including receptions, parties, exhibitions.

Indicators:

1. # of sustainable financing mechanisms in place
2. # of eco-tourism projects developed
3. # of community-based monitoring plans
4. # of community persons trained in tour guiding, eco-tourism management and data collection

5. Data collected on species and ecosystems
6. Length of boardwalk constructed within the mangrove
7. # of events taking place at the Ma Kôté Interpretation Centre
8. # of self-guided trails and tours within the mangrove
9. Entrance fee

Component 7: Social Benefits

Objective 7: Increase recreational enjoyment of the Ma Kôté mangrove by the Saint Lucian public and visitors.

Strategy 7: Develop and promote recreational activities at Ma Kôté Mangrove.

The Mangrove must be a place that serves as a site for recreation as well as education. This will permit repeat visits by tourists and Saint Lucians alike. However, this will only be achieved if the mangrove provides the peaceful and safe environment for visitors, is regularly updated so that there is an element of change and difference that will make repeat visits attractive.

Activities

7.1 Establish walking trails and bird watching towers;

7.2 Upgrade the Mangrove Interpretation Centre to serve also as an Entertainment and Recreational Centre;

7.3 Develop user-friendly / affordable fee structures that will enable residents to frequent the mangrove with their families;

7.4 Develop special weekly, week end and holiday activities for the public;

7.5 Develop self-guided walking trails and boardwalks in the mangrove;

7.6 Establish a 12 month Calendar of Events for the Ma Kôté Mangrove which will include specially designed activities to coincide with national holidays, world environmental days and which will be attractive to a wide cross-section of the Saint Lucian society;

7.7 Develop a special working agreement with a media house on the island. This media house will receive exclusive rights to publish certain events taking place at the Mangrove. In return, Ma Kôté mangrove will enjoy a certain level of free advertisements. The intention is to create a win-win situation for both parties.

Indicators:

1. # walking trails and bird watching towers built
2. Fee structures described
3. List and # of special activities developed to attract local visitors
4. # of self-guided trails and boardwalks
5. 12-month Calendar of Events
6. # of media reports on mangrove

4.0 WORKPLAN AND BUDGET

	Jan- March	April-June	July-Sept	Oct - Dec
2017	Q1	Q2	Q3	Q4
2018	Q5	Q6	Q7	Q8

Strategy	Key Outputs	Key Outcomes	Timeline
1. Establishment of a Ma Kôté Mangrove Management Board and define a framework for effective Governance for mangroves in Saint Lucia.	2 Stakeholder meetings	Ma Kôté Management Board established	Q1 - 2
	3 Management Board meetings assisted by Technical experts	Draft Governance Framework for management of the mangroves	Q1 - 3
	Cabinet Memo	Governance framework legally endorsed	Q4 - 6
2. Increase public appreciation of environmental and economic importance of mangrove forests.	Information on mangroves on radio and TV	Public receives information on mangroves via documentaries and talk shows.	Q3 – 4; Q6,8 2019 -21
	Information materials developed (posters and via social media clips)	Public has greater exposure to information on mangroves.	Q4, 2019
3. Conduct scientific monitoring of mangrove ecosystems and processes and ensure the availability of current and accurate data.	Conduct gap and needs analysis	Research priorities identified	Q3 – 4; 6 - 8
	Train students, volunteers to conduct research	Significantly more and focussed mangrove research ongoing at Ma Kôté . More information available on the ecosystem. Increase in the number persons trained to collect field data.	Q 3 - 6
	Involve universities in research programme		Q2 – 8; 2019 - 21
	Implement research		
4. Protect forests and wildlife and reduce environmental threats. Undertake mangrove rehabilitation and restoration.	Threat assessment and actions identified to reduce threat.	Threats reduced and managed.	Q2 - 3
	Site restoration and rehabilitation	Size of deforested and polluted sites significantly reduced.	Q3 – 6; 2019, 2021
	Conservation information materials produced.	Public participation in threat management increased.	Q 3 - 8

Strategy	Key Outputs	Key Outcomes	Timeline
	Use of community engagements to achieve voluntary compliance by resource users to regulations	Halt of illegal deforestation, & over-harvesting. Halt of pollution.	Q4 –8
	Creation of conservation corridors	Special wildlife reserves defined within the Ma Kôté Mangrove	Q 6
5. Review existing legal and policy instruments and reduce gaps and inadequacies	Recommendations: Legislative and policy revisions.	Improved legal instruments and policies that enable the transfer of management authority to the SLNT or similar agency.	2019
6. Identify at least 2 sustainable finance (SFIs) initiatives and test them. Min. of 2 SFIs identified and tested.	Community residents trained as tour guides	Management Board advertises the Mangrove for local and foreign investment. Some SFI can immediately be implemented such as entrance fees, sale of tours, sponsorship and donations, research grants, etc.	Q 5 – 8; 2019 - 20
	Self- guided trails in place		
	Functioning boardwalk		
	Bicycle tours operational		
	Interpretation Centre used for private events		
	Horseback riding		
7. Develop and promote recreational activities at Ma Kôté Mangrove.	Interpretation Centre and Savannes stables improved; Several tours developed. 12 month calendar.	Significant increase in local and foreign visitors to the mangrove as a consequence of the attractive tours and facilities.	Q4 -8 2019 – 21

4.1 TIMELINE PER COMPONENT

Component	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	2019	2020	2021
1Management Board & Governance Frameworks											
2Awareness & Education											
3Research & Development											
4Biodiversity Conservation											
5Legal Frame: revised											
6Sustainable Financing											
7Social Benefits											

5.0 PROPOSED BUDGET

Strategy	Activities	Details	Total Costs $US
1	10 stakeholders meetings	$500 per meeting	$ 5, 000
	Salary for Mangrove Manager	$2000 x 24 mnths	$ 48,000
	Salary for technical support	$1500 x 24 mnths	$ 36,000
	Sub-total		$ 84,000
2	Radio and Television productions	air time@ 4000/yr	$ 20,000
	Education programmes in schools	2,000 @ 5 yrs	$ 10,000
	Informational materials	1000 posters	$ 3,000
	Billboards	3 @ 2,000	$ 6,000
	Sub-total		$ 39,000
3	Data gap & needs/Research Priority	consultant-1 day	$ 1,500
	Train community	3 days @$1000	$ 3,000
	Train students	3 days@ $1000	$ 1,500
	Train volunteers	3 days@$500	$ 1,500
	Support 6 school programmes	@ 2000	$ 2,000
	Support work of Research & Monitoring Unit, dev research plots	@5000 /yr (water analysis, equipment)	$ 25,000
	Sub-total		$ 44,500
4	Informational materials and brochures	Brochures, posters, web pages, radio, TV broadcasts	$ 25,000
	Replanting of mangrove ~ 4000 plants	4,000	$ 4,000
	Restore polluted sites /solid waste	10 truckloads@ $200	$ 2,000
	Mitigate pollution hotspots	Clean up@1000/yr	$ 5,000
	Activities in support of World Wetland, World Ocean, Earth Day and others	@ 1000 for 6 events per year (5 yrs)	$30,000
	Sub-total		$ 66,000
5	Legislative review/ (much has already been done)	5,000	$ 5,000
	Sub-total		$ 5,000
6	Tour guide (Masters) training. The trained will train others	4 days @ $500 for meals/snacks	$ 2,000
	Consultation on sustainable financing mechanisms	consultant	$ 2,000
	Construct part of the board walk	volunteer labour	$ 15,000

Strategy	Activities	Details	Total Costs $US
	Signage for self-guided walking trails	10 @ $150	$ 1,500
	Support community-based data collections for eco-tours	60 days per year @ $50 for 5 years	$ 15,000
	Socio-economic assessments of communities near to Ma Kôté	5 communities @ $1000	$ 5,000
	Sub-total		$ 40,500
7	Walking trails and bird watching towers	pay labour	$ 10,000
	Support Calendar of Events	12 @ 100 x 5yrs	$ 6,000
	Upgrade Interpretation Centre	Maintenance for first 2 years	$ 5,000
	Sub-total		$ 21,000
	Final		**$300,000**

6.0 CONCLUSION

This Management Plan is designed to assist its users and managers to maximize benefits to all stakeholders, at the national, regional and international levels. Whilst this management plan attempts to address all situations likely to adversely impact the Ma Kôté mangrove, and it attempts to build on all opportunities for biodiversity conservation and developments, one is cautioned that this document cannot or should not be considered a "Quick Fix" to all the problems likely to be faced within the mangrove ecosystem. It is an ambitious plan with multiple targets and is based on a number of assumptions, including the support from Government and Non-Government agencies. These agencies are expected to contribute technical and other resources to mangrove conservation. The plan takes an EBM (ecosystem-based management) approach, addressing issues of ecosystem Governance, legislation, communications, biodiversity protection, community-based interventions, research, and social and economic benefits.

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