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Best Management Practices for Marine Protected Areas of the Wider Caribbean Region

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EXECUTIVE SUMMARY

This report is the product of a three month internship at the United Nations Environment Programme (UNEP) Caribbean Environment Programme (CEP) Regional Co-ordinating Unit (CAR/RCU) in 2005. The Wider Caribbean Region (WCR) like other regions in the world has begun to establish Marine Protected Areas (MPAs) in an effort to protect and more sustainably use marine resources. The main focus of the internship was the compilation of this report on 'Best Management Practices' (BMPs) for MPAs of the WCR. This is important as most of the MPAs in the region are inadequately managed and therefore not benefiting the environment and its users as they should. The compilation of BMPs involved a number of steps including:

- Reviewing current literature on successful management practices being used in the WCR as well as other similar parts of the world
- Developing a questionnaire for MPAs of the WCR regarding their management practices
- Soliciting as many MPAs as possible to respond to the questionnaire

There were twenty-three responses to the questionnaire, representing over twenty eight MPAs from sixteen countries in the WCR. These responses and the literature were used to develop the '*Best Management Practices for Marine Protected Areas of the Wider Caribbean Region*' that are provided in this report. These cover a wide range of topics including:

- Participatory processes
- Zoning
- Human resources
- Finance
- Enforcement and compliance
- Monitoring, research and assessment
- Threatened and endangered species
- Habitat threats and solutions
- Reef enhancement activities
- Sustainable tourism
- Education, training and awareness
- Alternative livelihoods

Several recommendations were made regarding the need for further intensive studies on BMPs for the WCR, as well as improving on and further analyzing the information gathered in the questionnaire.

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Cover photograph: Tobago Cays Marine Park, St. Vincent and the Grenadines, showing the yacht anchorages among the cays and in the lagoon behind Horseshoe Reef which extends horizontally across the middle of the picture. In the background beyond Horseshoe Reef are Egg Reef, Worlds End Reef and Petit Tabac cay of ‘Pirates of the Caribbean’ fame.

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1 INTRODUCTION

The Wider Caribbean Region (WCR) comprises countries that are diverse in several ways including, their languages, heritage, culture, history, religion, size, environments and resources (Figure 1.1). While there are many differences there are also several similarities. Most of the population of the WCR is located around the coast and benefit from the marine environment in one way or another, whether directly or indirectly. Technology has increased our access and use of the marine environment, which has resulted in an ever-increasing threat to resources. Improper use puts pressures onto the resource and can lead to the damage or destruction of the marine environment. Signs of habitat destruction, fish stock depletion and general pollution can be seen throughout the region and need to be dealt with. Lessons can be learnt from each other's experiences, the failures and successes as well as experiences from other regions. The establishment of (Marine Protected Areas) MPAs represents an opportunity to manage marine resources in a sustainable way as well as influence the use of resources on land and it is important that this opportunity is fully utilized.



Figure 1.1 Map of the Wider Caribbean Region (Source: UNEP-CEP)

MPAs are areas of coastal land and water that are specifically designated to protect natural resources and ecosystems. MPAs create a framework for sustainable use and resource management that is designed to sustain the health of marine ecosystems (CORAL, 2003).

The IUCN defines a marine protected area as: “Any area of inter-tidal or sub-tidal terrain, together with its overlying water and associated flora, fauna, historical, or cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment” (Kelleher, 1999). MPAs are areas intended to manage marine organisms, their habitats and the human activities that occur in these habitats and there are many benefits to having them (see Box 1.1). There are several types of MPAs each being established with particular goals in mind. This may range from strict conservation, to sources of revenue generation and tourism. Whatever the reason, management of these areas often comes with having to tackle a number of biological and anthropogenic issues.

Box 1.1 Potential benefits of marine protected areas

Benefits may include:

- Shoreline protection
- Sediment retention and production
- Flood and storm protection
- Nutrient recycling and waste assimilation
- Water quality maintenance
- Maintenance of biological resilience
- Managing fish stocks including stopping and reversing fish population decline
- Maintaining representative samples of biodiversity and marine ecosystems in intact thereby keeping future options open
- Provision of spill-over and leakage organisms to adjacent areas
- Protection of critical habitats such as feeding, breeding and nursery grounds
- Providing sites for nature-based recreation
- Raising the profile of an area for tourism and expanding local economic options
- Providing reference sites for scientific research
- Providing opportunities for training and education about marine ecosystems and human interactions
- Providing support of cultural, heritage, aesthetic and spiritual values
- Provision of seafood products and material production
- Provision of medicinal treatments and products

Source: Kenchington, 2003

2 METHODS

Research for this document was conducted over two and a half months as part of an internship program at UNEP-Caribbean Environmental Program (CEP), Regional Coordinating Unit (CAR/RCU) and includes Internet sources, published books and a questionnaire sent to MPAs throughout the WCR. The questionnaire was sent out to MPA managers (and other potentially relevant personnel), to ascertain management practices that are currently being used in MPAs. There were twenty-three responses to the questionnaire (see Appendix 1) all of which contributed information for this document.

The information given here is not meant to be comprehensive but rather to act as a stepping-stone towards more in-depth research. Some of the major issues and options available to MPA management today will be discussed further to help provide a guide for management.

3 PARTICIPATORY PROCESSES

Stakeholders have an important role to play in the establishment and operation of an MPA and their level of involvement often can make the difference between MPAs that are able to achieve their goals and those that are not. “Stakeholders are people and groups whose interests, resources, power or authority result in them being likely to be substantially impacted by, management or the lack of it” (McConney et al, 2003). This may include residents, governmental agencies, Non-Governmental Organizations (NGO), researchers and private organizations (see Box 3.1). The process of stakeholder participation in management may come in many forms ranging from low to high participation. At its lowest level stakeholders are consulted but decisions are made solely by the management agency of the MPA, while participation at its highest level involves stakeholders being integrated, becoming a key part of the management of the MPA. In some cases it may be suitable to have low stakeholder participation, however in general MPA management should work towards having a high level of participation.

Box 3.1 Stakeholders involved in management of MPAs

Questionnaire response

National government, fisheries department and the local community were among the most often involved in MPA management based on questionnaire responses. Examples of other participants in management include :

St. Barth Marine Park, Guadeloupe – Yachtsmen.

Réserve naturelle du Grand Cul-de-Sac-Marin, Guadeloupe - Scientists of the University of the Antilles and French Guyana.

Reserva de la Biosfera Banco Chichorro, México - Academic institutions

Ocho Rios Marine Park, Jamaica - The Tourism Product Development Company and the Port Authority.

National Park Sistema Arrecifal Veracruzano, Mexico - Tourism service providers.

It is important that stakeholders are clearly recognized to ensure adequate participation and that the poorer groups are not marginalized in the decision-making process. However each individual member of a particular user group (e.g. fishers, SCUBA operators, hoteliers) does not directly have to be involved in the decision-making process but rather should have elected representatives of their interest groups who will allow the process to be less costly and more efficient. These individuals should be well informed and should seek to inform the people they represent as well as articulate their concerns. Stakeholder participation in management is a long-term process which is often very time consuming and expensive to establish and maintain.

Integration of this process into the everyday life of the MPA may take several years. Staff may not be fully aware or have the skills needed to facilitate the participatory process, so training and expert advice is very important. There needs to be a high commitment to the process and its initiatives in order to keep the interest of the stakeholders alive.

The process, once initiated should be a continuous one involving evaluation, review and feedback from stakeholders so that it may be adapted to the MPAs changing needs. Often when participation is not continuous stakeholders lose interest and faith in the process, making it harder to be successfully carried out. Benefits to stakeholders should be laid out as clearly as possible, to ensure that they remain motivated and interested in the process. Stakeholders should also be aware of the challenges that may arise and be encouraged to express any difficulties they

may be facing. Transparency is a key element in establishing trust between stakeholders and having a good relationship with management. The process should therefore be adaptable to the needs of the MPA and its stakeholders.

Box 3.2 Case study of participatory processes in the SMMA

Soufriere Marine Management Area (SMMA), St. Lucia

The SMMA evolved out of a process of consultation and negotiation carried out in the early 1990s to address escalating conflicts between users of the Soufriere coastal region in St. Lucia. The process, which was co-facilitated by a government agency (the Department of Fisheries), a local development NGO (the Soufriere Regional Development Foundation), and a neutral third party (the Caribbean Natural Resources Institute), took the form of a series of meetings with identified stakeholders, focusing on specific problems and needs. This 18-month process resulted in the negotiation of an agreement on management of the coastal area, including boundaries, a zoning plan, management measures, and an institutional arrangement that gave a voice to all the major stakeholder groups. While many of the technical aspects of the agreement were successful (e.g. implementation of a user fee system, improved monitoring and surveillance), local political and economic changes led to the collapse of the mechanism for maintaining consensus among stakeholders. They responded to the crisis with a participatory review that resulted in a clearer consensus on objectives and a more rational participatory management structure.

Source: Renard, 2001 (<http://www.canari.org>)

There are several participatory techniques ranging from formal meetings and discussions to questionnaire to semi-structured interviews. MPA management should be flexible in the use of these techniques and try to find the ones that are most appropriate for their situation, realizing that it may take some amount of experimentation to determine what works. The role of stakeholders should not stop at the decision making stage, but there should be participation in almost every aspect of MPA management including volunteering, monitoring, enforcing and evaluating.

Box 3.3 Benefits and costs of stakeholder participation

Benefits may include:

- Enhanced overall management effectiveness of MPA
- Lowered long term costs of MPA management
- Improved substance and legitimacy of decisions
- Improved compliance to regulation
- Enhanced enforcement capacity and increase compliance with MPA rules
- Fostering of trust between stakeholders leading to greater commitment to implement joint decisions
- Empowerment of stakeholders
- Enhanced and harnessed local knowledge and skills
- Regulations being more adapted to the local situation
- Management responsibilities being shared, lessening the burden of the MPA management agency
- A reduced likelihood of resource exploitation from outside interests
- Improved awareness of conservation issues
- Improved conflict management

Cost may include:

- Initial financial investment
- Possible expenditure (financial) to source outside expertise
- Diversion of substantial time and energy by staff and participants from other efforts
- Loss of time and money used train staff in skills such as facilitation
- Possible reduction of resources available to participants
- Greater expectation of participants that their contributions will be used
- A decrease in or shared power for management agency
- More detailed information being communicated to the participants
- Increase in decision-making time due to the collective managements
- Increased demands in other areas

Source: McConney (2003), Garaway (2003)

4 ZONING

Zoning is an important part of the management plan for most MPAs and should be approached with the participation of all users. MPAs are established for various reasons, often for multiple use, but could also be to protect endangered species, critical habitats, unique features, traditional rights, breeding and spawning sites, so it is important that management plans and zoning reflects this. Zoning is usually the best way of ensuring strict protection of a core zone, or zones, as part of a larger multiple-use area.

The size of the MPA and the objectives chosen will determine whether an area can be managed as a single entity, or whether a system of zoning should be used, permitting different activities in specified parts or zones of the MPA. In most multiple use areas, there will be goals that cannot be applied uniformly to the whole MPA (Kelleher, 1999). Buffer zones are used to shield highly protected areas or core zones such as “no take” areas from high intensity and extractive activity. These zones usually allow for a wider range of uses to the core zones but acts to limit the potential negative impacts of activities in other zones. Buffering is important so that

incompatible uses are not put together and don't have negative impacts on each other. Buffering can also play a role in enforcement by keeping certain extractive activities away from core zones, making these zones easier to enforce. There is no one perfect way to arrange zones, as the best design or arrangement may depend on several factors such as purpose of the MPA, users involved, size and location.

Box 4.1 Stages in the preparation of a zoning plan

Ideally, the five stages in the preparation of a zoning plan are as follows:

1. **Initial information gathering and preparation:** The planning agency, perhaps with the assistance of consultants, should assemble and review information on the nature and use of the area; and develop materials for public participation and consultation.

2. **Public participation or consultation -prior to the preparation of a plan:**

The agency should seek public comment on the accuracy and adequacy of review materials and suggestions for content of the proposed zoning plan.

3. **Preparation of draft plan:** The agency should prepare a draft zoning plan and materials explaining the plan for the public or appropriate representatives. Specific objectives should be defined for each zone.

4. **Public participation or consultation – review of draft plan:** The agency should seek comment on the published draft plan and explanatory materials.

5. **Finalization of plan:** The Government or agency should adopt a revised plan, which takes account of comments and information received in response to the published draft plan.

Source: Kelleher, 1999

A zoning plan should define the boundaries of each area and what it is being used for. This document should be a legal document so that its rules are enforceable in a court of law. It is also important that the document is plainly written and clearly understood by the users of the MPA. Planners and managers should encourage public participation in formulation of such a plan so as to garner support, establish trust and increase understanding of the plan by the users. This process may take a very long time to be completed, but it is often worth it in the long term. Zoning has several benefits particularly where there is high competition for resources and varied interest groups.

These benefits include:

- Conflict resolution, where conflicting activities are separated
- Protection of critical habitats and ecosystems such as nursery and spawning grounds
- Protection of area with unique features or qualities
- Protection of damaged areas where rehabilitation can occur
- Provision of areas for certain human activities in a way that minimizes its negative impacts on the surrounding environment
- Protection of areas with significant historical or cultural value
- Preservation of undisturbed representative site

5 HUMAN RESOURCES

Human resources play an important role in the management and effectiveness of any MPA. Staff may have a number of arrangements including permanent, temporary, full-time and part-time employment. Whatever the case, it is important that the staff is able to work together as a team to achieve the objectives of the MPA management. Managers themselves must have good working relationship with staff and other stakeholders and the responsibilities of each staff member should be made as clear as possible. Generally the larger and more highly used the area the larger the staff needs to be. Training of staff including the manager is very important to increase the efficiency at which the MPA is run and both formal and informal training activities should be organized. Criteria should be established to evaluate staff performance on an annual basis and where possible this should include participation from stakeholders. Often there is not enough staff or expertise to carry out all the activities that are desirable within an MPA. The use of volunteers and the establishment of partnerships between the MPA management and individuals or organizations is therefore an important part of operating a successful MPA.

5.1 Volunteers

Volunteers enable MPA managers to increase their human resource capacity at little cost to the MPA. Activities which volunteers can be a part of are wide-ranging and related to both the skills that the volunteers bring and the skills or training the MPA management is able to provide. To ensure that the activities are being performed at a satisfactory level, MPA managers need to tailor the activities to the ability of the volunteer. The establishment of a volunteer program is a good way to increase the efficiency of MPA management and use of staff. Such programs would allow for a regular influx of volunteers to carry out activities.

Volunteers come with different backgrounds and reasons for volunteering which need to be taken into consideration. Local community members and MPA stakeholders in particular should be encouraged to volunteer in the MPA as this could help to form stronger bonds in the community. Foreign volunteers need to be aware of MPA regulations, local culture and practices and staff should help to make their integration as smooth as possible. Time may be needed to orient and train volunteers so they can carry out the necessary activities efficiently. While in other cases some volunteers may be able to educate and train staff.

Box 5.1 Sources of volunteers and potential activities

Volunteers may include:

- Local community members or stakeholders
- Foreign and local students,
- Researchers
- Tourists

Activities that volunteers may participate in include:

- Ecological and socioeconomic surveying
- Monitoring and assessment activities
- Research
- Organization of special events and fund raising
- Education and awareness activities
- Maintenance work around the MPA requiring physical labour e.g. beach clean ups

(Source: IUCN, 2004)

Box 5.2 Case study of Bonaire Marine Park volunteer program**The Bonaire Marine Park Volunteers (BONURA)**

One of the great successes of the Bonaire Marine Park has been the implementation of a volunteer program. This program offers residents and frequent visitors of Bonaire the opportunity to assist the Marine Park and its guest scientists in research. The volunteers are trained and tested in scientific survey protocols. Many of the volunteers are highly trained divers including several dive masters and instructors. Guest scientists on Bonaire are asked to make a presentation to the volunteer group and the volunteers are also available to these scientists to assist them while they are on island (Source: <http://www.bmp.org>)

5.2 Partnerships

MPA management should seek to and encourage partnerships with other organizations and institutions. These may be governmental and non-governmental, local, national and international. Partnerships should provide some benefit to MPA and should be consistent with long and short-term management objectives. Partnerships may provide technical support, training for staff, locals or volunteers, enhance fundraising capabilities and provide equipment. For example Reef Checks are widely carried out throughout the region and dive operators may agree to provide SCUBA equipment or use of their boats, hotels may provide accommodation for volunteers, and food establishments may provide the meals. In this way the MPA management is able to carry out essential activities at a highly minimized cost to them. Often partnerships will not be established unless both sides feel like they are benefiting from the relationship. MPA managers needs to make sure that benefits to their partners are not harmful to the management objectives and that they do not get coerced into destructive behaviour.

5.3 Emergency and safety

MPA management should have emergency and safety procedures outlined in their management plans. MPA staff and stakeholders should collaborate to work out who and what will be involved. Putting in place preventative measures will always be a better use of both financial and human resources than having to respond to a crisis after the fact. Measures should be put in place to minimize potential dangers to the environment and its users. There is no hard and fast management plan for emergency and safety as priorities vary depending on location, size, finances, staff capabilities and other such factors.

MPA management and stakeholders should come together and evaluate possible emergency situations and put in place the necessary procedures. For example an MPA which is located near an oil refinery or near a regular oil shipping route, should formulate a plan for dealing with potential oil spills based on their increased susceptibility. There are emergencies however that most MPAs in this region are susceptible to, such as storms or hurricanes and procedures need to be in place for these eventualities. One thing that is common to all MPAs is that there is water involved. Often in the WCR users of an MPA including some staff members can not swim, resulting in the risk of drowning. MPA management should encourage all its users to learn to swim and where possible should provide swimming lessons. This may also serve to increase the ties between the users and the MPA staff and the opportunity could also be used to educate persons on various aspects of the MPA and marine environment. Buildings and other structures should be designed in such a way as to minimize the potential impacts and environmental impact studies should be carried out for developments within the MPA. Lines of communication

(including contact information), personnel and equipment involved should be well known to MPA staff and documented. Although individuals may be given specific responsibilities, it is important that all the staff and other necessary personnel are well informed about procedures. Training of staff and occasional refresher activities of MPA safety and emergency procedures including evacuation should be done and where appropriate should include other users of the MPA whose services may be called upon.

Fire - MPA management should work along with their respective community fire departments to establish the best procedure for emergencies, as well as to ensure that all the necessary fire safety precautions take place. Some general rules however include:

- Banning smoking or burning of material near fuel storage areas.
- Having enough regularly serviced well-placed fire extinguishers.
- Having well placed containers with sand for small fires.

Flood, storms and hurricanes – MPA management should have procedures for dealing with flooding, storms and hurricanes this should include mitigation strategies, evacuation plans and plans for dealing with the consequences of such disasters (including damage by debris, pollution of water and habitat destruction). MPA management should encourage and solicit help from other users for reconstruction and rehabilitation efforts so as to speed up recovery. A system of procedures for different level of threats and the necessary procedures at each level can also be established to increase efficiency in emergencies.

Safety equipment and vessels - Safety equipment such as life jackets and first aid kits should always be present on MPA vessels going out to the sea. The vessels themselves should be well maintained and serviced by a qualified technician. Boats should have radios and particularly when going far out to sea should have drinking water and rations. Boats being used in the MPA should be encouraged to have safety equipment and be in good working order. (IUCN, 2004).

6 FINANCE

The level of management which can take place in a MPA, as well as its ability to play a major role in conservation and protection of that environment, is often directly related to its ability to bring in or generate revenue. Financing will play a role in almost every aspect of the MPA. MPA management should try not to rely too heavily on any one way to finance their budget, but rather use a combination of sources. This will help to reduce risks that may come from fluctuating economies and environmental disasters, which may cause funds received or generated to decrease. There are several ways in which MPA management may generate revenue and these will be discussed further below (see Box 6.1). MPA management should seek to explore every possible funding opportunity and aim to become self-financing.

Box 6.1 Potential sources of revenue in MPAs

Sources of revenue include:

- Government allocation (mandatory or discretionary)
- Donor funding
- Donations from philanthropic foundations, corporations and individuals
- Revenue-raising methods:
 - Protected area entrance fees
 - Recreation service fees, special events and special services
 - Accommodation, transportation and guiding
 - Parking
 - Equipment rental
 - Food sales (restaurant and store)
 - Merchandise sales (equipment, clothing, souvenirs)
 - Licenses, permits, and taxes
 - Licensing of intellectual property
 - Sale or rental of image rights (e.g. for taking photographs)
 - Private sector initiatives
 - Public investments
 - Trust funds

Source: Font, 2004

6.1 Government allocation

Governments often allocate funds to the establishment of an MPA and may choose to continue its support after its establishment. Government allocation however often is insufficient to carry out the management objectives and so other sources of funding would be needed. Allocation may be a fixed sum granted for a specific period of time or may be variable depending on the immediate need of the MPA, the budgetary constraints of the government or some other factors. Where appropriate, arrangements may be established for funds to be received from the government for fees collected from, for example, licensing of boats used in the MPA and environmental taxes.

6.2 User fees

User fees are fees paid to use the facilities of the MPA. These may come in a number of forms including entrance fees, mooring buoy fees and diving fees. There are usually fee differentials between domestic and foreign visitors, where foreigners are charged a higher rate for services. Rates could also be charged based on the quality of service being provided, for example high quality dive sites may require a higher diving fee and divers are usually willing to pay more money for a higher quality dive site.

A differential fees system may not always be appropriate but is useful for several reasons including:

- Wanting to encourage locals to visit as part of conservation education and awareness programs

- Alleviating the burden on locals as they are often already paying taxes towards conservation
- Foreigners often being more willing to pay higher rates for services

The collection of fees can pose some difficulties and there may be a need to involve a number of collection agents such as tour operators. Enforceable regulations should be put in place and checks and balances should be done so as to ensure that fees are properly collected and handed over. MPA management need to have some way of verifying that fees were paid by users and this may involve the use of tickets, tags, stamps and other devices which can be checked. MPA management may choose to collect some fees directly, but this may not always be practical, for example where demand is high. MPA management should look to put in place the best fee collection option recognizing that at first they may need to try a number of methods in order to find the most suitable one. Whether the MPA uses tickets, waterproof bands, tags or some other form of receipt for payment of fees, these should clearly indicate the date to show its validity. Random checks may be needed to make sure that users are paying the required fees. The revenue collection system should be monitored and well enforced having penalties in place for non-compliance.

There needs to be stakeholder participation and consultation when establishing new fees or raising the rates for old ones as conflicts may arise. Stakeholders need to be aware of who is responsible for collecting fees, what the fees are being used for and why they were implemented. The implementation of user fees and the implementation of certain types of user fees may not be a viable option for all MPAs. Users may become disgruntled if they are being charged too many fees and the presence of many small user fees may discourage visitors. A smaller number of larger fees may be more appropriate in these cases. User fees can be particularly useful where there is a high demand for certain services within the MPA such as SCUBA diving, snorkelling and mooring buoy use. Fees may be used to manage or limit the number of users of a particular service, for example by having high fees for specific activities. This is particularly useful where there is a high potential for overexploitation and damage of the marine environment. Funds generated may directly go to the MPA or become consolidated and partly used to supplement funding for other MPAs that are unable to generate as much income. Whatever the arrangement is it should be clearly stated where the money generated should go.

Box 6.2 Case study of user fee systems in Saba and Bonaire marine parks

Saba, Netherlands Antilles

A fee per dive is charged rather than a yearly fee because of geography: there is no shores diving and divers have to use boats, giving an institutional contact through which the per-dive fee can be levied. The fees are collected by commercial operators who are required, under the terms of their permits, to turn over all fees collected (as well as diver/snorkeler statistics) to the management foundation on a monthly basis. Yacht mooring/anchorage fee was introduced. By 2003 the per-dive fee had been increased to \$3 and the proportion of income from user fees had increased to 70%. Other income comes from souvenir sales (32% in the late 1990s) and voluntary donations (17%).

Bonaire, Netherlands Antilles

Bonaire Marine Park operates a user fee system (also called an 'admission ticket') with the fee set at US \$10. Divers are provided with a dive tag to show that they have paid the fee which is valid for one year. The dive fee is collected on behalf of the Park by dive operators. Since all divers need to get their tanks from a dive operator, compliance is near 100% - although there is some recycling of tags, with old ones passed on to new arrivals by divers or operators. In general, though, the MPA has a good working relationship with the operators, who have to participate in an annual refresher course.

Source: Font, 2004

6.3 Licences

Licences are a means by which MPAs can charge an individual user or private firm fees to carry out specific activities, usually in a specific area for a specific period of time. These activities usually require a higher-level management for reasons such as:

- Potential to cause damage to environmental resources
- Demand for the activity
- Need to know and limit the numbers of users
- Need for certain criteria to be met by the licensee

Licences are different from user fees because they are purchased before the activity is carried out. Examples of activities that licenses may be needed for include fishing, boat launching, cruise ship visits, cutting mangroves, carrying out research and mariculture. Often certain operations need to be licensed by a government agency and depending on the management agreement MPAs may not receive revenue from this. Licenses can also act as an incentive for sustainable use of resources if it is able to establish property rights. This may be particularly useful in areas of the MPA that are difficult to enforce, where compliance and self-interest in resource conservation can be promoted.

6.4 Concessions

A concession is the leasing of an activity or a specific area to a private organization or individual (IUCN, 2004). The purpose of this is for the concessionaire to provide a service to the users of an MPA and these services may include the sale of food, beverages, souvenirs, accommodation and recreational equipment rental. This arrangement is beneficial to the MPA as there may be great demand for a particular service that the MPA management itself is incapable of providing. This may be for several reasons including not having the initial capital, expertise or staff to conduct the activity in a professional manner. Privately owned enterprises may also serve to attract more visitors to the MPA and increase its profile. Concessions can help provide employment for the local community and encourage local involvement.

The decision to grant concessions must be carefully considered and it should not negatively impact the community's own initiatives or the resources on which they depend. Market studies and business plans should be prepared before hand to determine the viability of activities, and potential impacts on the environment should be analyzed. Contracts should only be awarded and renewed if the resources are not being over exploited and if management objectives of the MPA are being met. An important but difficult aspect of concessions is determining the appropriate balance of earnings for the concessionaire and MPA. There are a number of arrangements by which the fees could be determined, ranging from taking a percentage of the concessionaires gross profits, to the number of people it serves, to fixed fee for a specific period or a combination of these. The contract with the concessionaire should also clearly outline fee collection mechanisms, pricing of the fee and other financial and legal details. MPA management should assure that best practices are used to reduce resource damage including assuring that products sold are not contradictory to MPA conservation efforts (e.g. the sale of coral jewellery). MPA management should assure that they ultimately have full control over the concession so as to ensure that there is not overexploitation of resources.

6.5 Special events, sales and appeals

MPA management can put on special events periodically to raise funds and increase environmental awareness. These events may include family fun days with special attractions, competitions and other public events. Sales from food, drinks, clothing and other such items can potentially earn revenue for MPAs. MPA managers need to be creative in the promotion of these events and the sale of items, involving the community as much as possible. The planning and promotion of special events can be quite time consuming and may require various expertise. MPA managers should seek to enlist volunteers to work on the day of the event as well as aid in the planning and preparation process. Corporate and private sponsors can be approached where appropriate to help reduce “production” costs to the MPA, help promotion and provide technical expertise.

These special events should always be in keeping with the conservation objectives of the MPA. Revenue could also be generated from “publicity fees” where organizations that use the MPA as locations for ads, posters, film and other such events are charged.

6.6 Voluntary donor assistance

Donations can be an important source of funding for an MPA and can provide an opportunity for others to contribute to the MPA and its conservation efforts without having to necessarily participate in other activities. Some MPAs have very wealthy visitors who are willing to pay much more for the use of resources and these visitors should be encouraged to donate to the MPA. Trust funds or “Friends of” organizations may be established specifically to receive donations and keep in contact with donors. These organizations can be set up to send information such as conservation efforts that are being carried as well as general MPA information and updates, keeping them abreast of the activities their donations have helped with and any current needs the MPA may have. Private companies may also be approached to donate funds or sponsor specific activities as this may help them increase their environmental awareness profile and solidarity with the community. Businesses such as hotels, travel agents and tour operators may also be approached to help solicit donations from their customers on behalf of the MPA. Donors may also play an important secondary role as potentially influential lobbyist for conservation of the particular area they are interested in, thereby helping the MPA management to achieve some of its objectives.

6.7 Cost efficiency

An important part of the financing of a MPA is the wise spending of funds. Expenditure that is not essential should be eliminated so that money can be given to those areas that have the greatest need. Cost and benefits of the MPA should be shared with stakeholders, by for example, allowing them to play a direct role in the management of particular activities. These activities may be more efficiently managed if the stakeholders gain direct benefit from it. For example, SCUBA diving operators could be asked to maintain mooring buoys and report incidences of damage of the reef as their livelihood depends on it. Volunteers can be used wherever appropriate to help cut cost of paid labour. Where volunteers may be unavailable some individuals may also be willing to work at a reduced wage and MPA management should try to explore such opportunities. In some cases it may be necessary for an MPA to pay high costs initially to save money in the long term (e.g. installation of low flush toilets and solar water heaters).

Box 6.3 Case study of revenue generation strategies in Saba Marine Park

Saba Marine Park

Saba Marine Park was established in 1987 by the government of Saba, in the Netherlands Antilles, with grants totalling \$270,000 from the island government, the Dutch Development Corporation, and private foundations. Management of the park is delegated to an NGO, the Saba Conservation Foundation, which was created to manage the park and has authority to carry out all management activities, including land acquisition to expand the protected area and the creation and maintenance of trails. The Foundation has a three-pronged revenue-generation strategy emphasizing user fees, souvenir sales and voluntary donations. The strategy also focuses on keeping operating expenses low by using volunteer services wherever possible, soliciting in kind goods and services, and requesting grants for special projects, such as research and monitoring. The island government continued to subsidize operating expenses for three years beyond the start-up period while the revenue streams were being developed. Donations are generated through the Friends of the Saba Marine Park. Souvenir items at Saba bring in significant income and the park is investigating the possibility of corporate sponsorship, allowing businesses to use the park's logo and name for an annual fee.

Source: Font (2004)

7 ENFORCEMENT AND COMPLIANCE

It is often difficult for MPA management around the region to enforce the regulations they have in place. The ability to enforce regulations and encourage compliance plays an important role in the ability of the MPA management to achieve its objectives. There are several approaches towards enforcement and compliance that can be taken, however the appropriateness of each will depend on the local situation and is influenced by local knowledge, culture, management style and funds available, among other things. There are always going to be people who do not comply with the regulations of the MPA and it is important that these people do not cause people who do comply to be disadvantaged or have decreased returns. Weak enforcement undermines co-management and participatory processes by increasing the uncertainty of resource sustainability (McConney *et al*, 2003). In any case it is vital that codes of behaviour in management plans are supported by legislation and adequate human and technical resources to achieve effective enforcement (Kelleher, 1999). While surveillance and enforcement is often carried out by park rangers, other agencies such as local or state police, fisheries officers or related government agencies may also be involved.

Box 7.1 Agencies involved in MPA enforcement

Questionnaire results

Most MPAs that responded to the questionnaire had park rangers who were responsible for enforcement while local police were involved in less than half of the MPAs. Others involved in Enforcement include:

Exuma Cays Land and Sea Park, Bahamas - Fisheries Officers and Royal Bahamas Defence Force Bahamas.

Réserve Naturelle du Grand Cul-de-Sac-Marin, Guadeloupe – Fisheries department.

St Barth Marine Park, Guadeloupe - State police force.

Reserva de la Biosfera Banco Chinchorro, México - The federal law office of Mexico.

Measures that can be taken by MPA management can be categorized as being “passive” or “active”. Passive measures involve encouraging compliance through means such as education, public participation in decision-making, promoting a sense of ownership and community self

interest in resources. It is influenced by the local situation including the culture, knowledge and relationship with management. Active measures rely on having surveillance and enforcement personnel who aid in punishing those who break the rules. MPA management should try to strike the appropriate balance between active and passive measures, by encouraging compliance while having sufficient enforcement agents to catch and help prosecute those who disobey laws.

The sharing of resources in an open access situation where there is high competition can often lead to overexploitation. It is important that such a situation is avoided through encouraging self-interest in conservation of resources and backing it up with suitable penalties for non-compliance. Legislation should be put in place in such a way that the penalties fit the crime and deter offenders. For example when a cruise ship damages a section of a coral reef, they could be made to pay not only for restoration of the reef, but for the potential lost benefits that the reef provided to its users. Penalties should be such that there is not an overall benefit to the offenders. Some countries currently have very stiff penalties for some offences, for example in the Cayman islands, poaching is considered a serious offence and offenders may be fined as much as CI\$500,000, one year of jail and their boats and equipment can be confiscated (www.divecayman.com). Fines can be put in place for individuals and organization that pollute and destroy the reef and its environs, including seagrass and mangrove areas.

The inclusion and active participation of stakeholders in the establishment of regulation increases the likelihood of compliance by bringing legitimacy and transparency to them. Compliance is often more likely when the users are the ones that helped to create the regulations, as they will have a deeper understanding and appreciation of them. Regulations that are not absolutely necessary to the goals of the MPA should not be established, as this would decrease the benefits to users. Social attitudes and reverence for the environment can also play a role in attitudes towards regulations.

For example where there is high respect and positive attitudes towards the environment even in cases of little enforcement, users may still show a high level of compliance. Education and capacity building are important elements of compliance and enforcement. Users that understand the need for, and the importance and benefits of, certain regulation will be more likely to comply and encourage other users to comply. Factors influencing compliance include:

- Benefits from non-compliance
- Deterrents, penalties and sanctions
- Actual outcomes of enforcement
- Perceived legitimacy of regulations
- Practicality of the regulations
- Norms and morals of the individual
- Level of participation in management

(McConney *et al*, 2003)

While all stakeholders may contribute toward compliance, it is often only the government that can deal with enforcement in a definitive manner as ultimately they have the power to put MPA regulations into law, prosecute offenders and enforce environmental legislation. This makes it absolutely necessary for MPA management to work with their governments in establishing environmental laws.

Enforcement of regulations by the peers of users may be beneficial in some situations such as where the enforcement agent is respected. In some places, good results have been achieved with enforcement by other active or former resource users as community wardens or becoming full enforcement officers. Benefits of this type of arrangement may include being familiar with undesirable practices and offenders, ability to apply social sanctions and having an appreciation for the consequences of irresponsible resource use. This however may not always be practical due to fear of victimization, likely disrespect or intimidation, corruption and inability to be (or be seen as) neutral. In such situations management retains full responsibility, but there may be some form of informal integration into monitoring, control and surveillance (McConney et al, 2003). Enforcement personnel should be carefully selected, well trained and informed of the rules and should help to inform users. Training of these persons is very important, they should be approachable and be able to strike a balance between not making the users feel like they are being harassed and being vigilant of offenders. Management style should be flexible and adaptable with the ability to act on unforeseen conflicts and issues that may arise, particularly those issues which are not clearly dealt with in legislation (e.g. new fishing techniques) (Kelleher, 1999).

8 MONITORING, RESEARCH AND ASSESSMENT

8.1 Monitoring

Monitoring of various parameters in an MPA is important for better decision-making. It allows for trends to be documented over time and gives an idea of whether management objectives are being achieved. Programs may start off modestly and expand as interest and resources (human and financial) increase. Volunteers and partnerships with relevant institutions such as universities and environmental groups are very useful for establishment and continuation of monitoring programs and should be encouraged. The needs of the MPA should be prioritized so that programs suit resources, personnel and funds available. MPA management will have different priority areas based on their local situation and monitoring programs should be specific to this. Expert advice should be sought to help design the program and provide training to those responsible for overseeing and participating in it, particularly for more technical aspects (e.g. sampling techniques). The aims of monitoring, research and assessment should be directed towards aiding to increase knowledge for more informed decision and policy making at the local and national level.

Staff, volunteers and other participants in the program should be sufficiently trained so that information collected is accurate and useful. Objectives must be defined including the questions that need to be answered both for the long term and short term and timescales should be set. Monitoring and research programs may need to be conducted outside the physical boundaries of the MPA in order to be useful and show a complete picture. MPA management should not hesitate to do this where necessary, but should in general be mindful of getting caught up in collecting lots of useless information.

Monitoring and assessment programs may be internationally (e.g. Reef check), regionally (e.g. Mesoamerican Barrier Reef System Synoptic Monitoring Program, MBRS SMP), nationally or locally coordinated. Whatever the case, information should be shared with the community and other stakeholders on a regular basis allowing them to see the benefits of the MPA as well as the challenges it faces. Information may be shared in either formal or informal settings and programs should be adaptable and flexible to the changing needs and priorities of the MPA. For example

new programs may need to be established after disasters such as hurricanes occur, where environmental and socio-economic changes may arise. Also as information is gathered and more is learnt about the environment, programs may need to be adjusted to better fit the aims. Baseline data should be collected including any traditional knowledge that users may have of the area. Parameters to be monitored may include biological, physical and human aspects. These may all go towards determining if management objectives are being met.

Monitoring and assessment programs may include the following:

- Water quality
- Level of pollution
- Fish abundance and diversity
- GIS mapping
- Number of users for particular activities
- Level of compliance
- Socioeconomic status of community and stakeholders
- Management effectiveness

Box 8.1 Sea turtle monitoring program in St. Eustatius Marine Park

St. Eustatius Marine Park, Netherlands Antilles

In August 2001, the St. Eustatius government provided Zeelandia beach with protected status to prevent further anthropogenic erosion of the sand and afford protection for nesting sea turtles. In conjunction with this, the St. Eustatius Marine Park in affiliation with the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) established its Sea Turtle Protection and Monitoring Program in 2002. During 2002, three species of turtles were observed nesting on Zeelandia: green, hawksbill and loggerhead. The overall goal of the first year of the Sea Turtle Protection and monitoring program is to promote the long term survival of the endangered sea turtle populations by:

- Safeguarding critical habitat on St. Eustatius
- Providing important information to scientists and MPA managers in the wider Caribbean
- Directly involving the local community in the program, in order to promote a better understanding of the importance of long-term conservation

The objectives of the monitoring program are to:

- Tag all turtles which nest (try to nest) on Zeelandia
- Relocate nests in erosion zones
- Monitor hatchling emergence to ensure safe arrival to sea

Source: http://www.statiapark.org/tw/tw_index.htm, STENAPA Foundation - St. Eustatius National Parks

8.2 Research

A research strategy should be prepared and plans made towards needs and priorities of the MPA. Establish partnerships with scientific institutions and encourage research in the MPA that meets the MPAs management objectives. Research topics can be made available to potential researchers or students who ask to work in the MPA and it could also be sent to universities and other in the scientific community who may then become interested.

A code of conduct should be developed outlining the regulations under which research is to be conducted and the expectations the MPA management may have, including aspects of sharing information. It is not unusual for researchers to conduct research in an MPA and not share their

finding with its management or community, so strategies should be put in place so that this does not occur. Establish partnerships with research institutions for joint authorship of publications, ownership of specimen and develop of research plan with roles and responsibilities of individuals (IUCN, 2004). To help build capacity as well as aid researchers, staff should work closely with researchers so that they can learn from each other.

Box 8.2 Case study of local involvement in research and monitoring programs

Glover's Reef Marine Reserve, Belize

During research investigations on the Nassau grouper and its spawning aggregations, fishermen have been hired to assist with the fish tagging. Similarly shark researchers have hired experienced local boatmen and fishermen to assist with the capture of sharks for tagging. A subsequent fish tagging study designed to assess whether or not the Marine Reserve was effectively protecting finfish resources has also involved fishermen who have been requested to return the tags. Fishermen were an invaluable asset to the project as they helped to design and build the fish traps for the study, and shared their knowledge of the Atoll's fish populations with the researchers.

Source: Garaway (2003)

An up-to-date inventory of research work in the MPA should be kept, preferably backed up and stored electronically. Where possible, employ a research or scientific officer on staff so that the MPA can conduct its own research as well as facilitate others more effectively. Where possible, try to provide basic research facilities, such as field labs, simple accommodation, assisting with transport, guides, and translators. These facilities may help encourage research in the MPA as well as provide revenue.

8.3 Assessment

MPA management should have periodic assessment of its operations and management. Often managers are unable to review the effects of the decisions they make and how their management affects the stakeholders and the environment that they are trying to protect. Formal reviews which include inputs from stakeholders and other external sources will allow managers to take stock of both the positive and negative aspects of their management, as well as allow stakeholders to be part of the feedback mechanism. It will help to bring forward management successes and failures allowing for management objectives to be more efficiently achieved, as managers are better able to learn from their failures and successes. Managers and staff need to be able to take criticism and use it constructively to better adapt to the needs of the MPA and allowing them to improve over time. The evaluation may also serve to build support for new and old regulation, setting more realistic timelines for conservation activities. Evaluation of specific activities such as monitoring, education programs and revenue generating activities are also important to help increase efficiency.

Strategies should be designed within these programs to help evaluate their progress and usefulness to the MPA. From these evaluations active steps should be taken to make the necessary changes.

9 THREATENED AND ENDANGERED SPECIES

Threatened and endangered species are among the organisms most susceptible to the negative impacts of human activity and MPA management need to pay special attention to them. Firstly species found within the MPA that are nationally, regionally or internationally threatened or endangered should be inventoried. The status of these species can be checked against IUCN Red List (refer to <http://www.redlist.org>). If present, a plan should be made specifically to protect

these species including monitoring programs and research. Public awareness and understanding of these species should be raised and where appropriate, public participation in their protection should be encouraged. Managers and staff of MPA management should become familiar with these species, participate in their monitoring and obtain the necessary training to improve conservation. Expert advice should be sought in the establishment of conservation efforts and MPA management should seek to get international help where appropriate. Explore links and partnerships with international and local groups who may be willing to assist with conservation efforts or who have established programs in other areas. Sustainable tourism such as ecotourism could be used to generate awareness and understanding and serve to educate both tourist and locals particularly those who exploit these organisms. MPA management should also try to help initiate or establish legislation that will aid in the conservation of these species and encourage their governments to become part of international agreements such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) if they have not already done so (refer to <http://www.cites.org>).

Box 9.1 Case study of Bonaire sea turtle conservation

Sea Turtle Club Bonaire (STCB)

The STCB is a non-profit organization set up to help prevent the extinction of Bonaire sea turtles and preserve their natural habitats through research and public awareness programs. The programs include public slide presentations, regular local media updates and the distribution of educational materials. Caring for the environment which supports sea turtles (coral reefs, sea grass beds and sandy beaches) is as a concern as the turtles themselves. Research consists of underwater surveys, beach patrols, and biological monitoring of nesting activities and resident populations in Bonaire coastal waters. Gathering data from the 'Sighting Network' in which all divers or snorkelers are encouraged to participate is of special importance.

Source: www.bonairenet.com

10 HABITAT THREATS AND SOLUTIONS

There are a variety of common practices that are destructive to the marine environment and managers should be aware of those that affect their MPA. These threats may be land-based or marine-based, but measures should be put in place to reduce or remove them. An integrated coastal zone management approach is often needed, where all the players involved in development, management and use of the coast, including the relevant administration bodies, come together to make more holistic, sustainable decisions. In the formulation of regulation, regulators also need to have leeway for stopping new practices that may be used in the MPA.

10.1 Anchor damage

Anchor damage including damage from their chains is a common threat to many habitats, especially reefs. They can easily damage or destroy corals and other organisms that make up the reef. Boats of all sizes cause this type of damage, but bigger boats can be most destructive as the anchors are also larger. Anchor damage is often tackled by putting in place mooring buoys. Mooring buoys, placed where boats can easily tie up to them without damaging the reef, can prevent anchor damage. Mooring buoys should be installed in the most environmentally friendly way possible. It is important that the right types of buoys are put in place based on the current users and potential future needs of the MPA. Also the number of mooring buoys in place should increase as the number of users increase. Maintenance of buoys is vital and this should be done

on a regular basis. Regular users could be approached to help maintain these buoys. Mooring buoys may also serve as a source of income by charging a rental fee to users. There should be clear and well known rules for use of mooring buoys and these may include colour codes to identify different purposes such as range or size of boat and use of area (e.g. scuba diving groups, yachts, fishers, water taxi). Banning anchoring in coral reefs, encouraging anchoring in sandy areas, putting fines in place for damage and educating users to the damage that can occur to coral reef by anchors are some of the other ways of dealing with anchor damage.



Figure 10.1 Dive boat on mooring in Bonaire Marine Park
Source: Kali De Meyer

Box 10.1 MPA strategies that help reduce physical reef damage

Questionnaire results

Almost all the respondents of the questionnaire (approx. 91%) had indicated that they had mooring buoys and fines or penalties (approx. 86%) in place to deal with physical reef damage. Other strategies included:

Reserva de la Biosfera Banco Chichorro - Environmental education and distribution of administrative guidelines such as printed materials, distributed to users and service providers, training for users.

National Park Sistema Arrecifal Veracruzano -The buoy-anchoring project is currently underway, PROFEPA in coordination with park personnel implements fines for damage to the corals. Participatory processes.

Saba Marine Park - Education and awareness mainly, Zoning and closures, Specific anchoring areas. Only guided dives and active patrols .

Virgin Islands National Park/Virgin Islands Coral Reef National Monument - Boat exclusion areas.

10.2 Destructive recreational activity

SCUBA diving, snorkelling, motorized sports and other such recreational activities may cause severe damage to a reef, particularly where there is high usage and a large amount of water-based activities in the MPA. While single isolated incidents may not be fatal to corals, if these incidences occur on a regular basis it increases the threat to the reef and its ability to recover from events. MPA management should encourage education and increase awareness of its users to the potential negative effects of their actions. Penalties for reckless or destructive behaviours

should also be in place. Activities such as SCUBA diving where persons come in close contact to the reef may especially be threatening where there are large numbers of users. Operators of recreational activities have an important role to play in making sure that they take the necessary precautionary measures including warning users against certain types of and educating them on the appropriate MPA regulation. MPA management should establish operating procedure or guidelines under which each activity is expected to function. Operators can also make observations and make management aware of any areas that have been damaged as well as report destructive users. It may be necessary in some instances to prohibit or limit specific activities in the MPA to safeguard against damage (e.g. only guided dives are allowed in Saba Marine Park and Bonaire SCUBA operators' conduct briefing before dives).

10.3 Over-exploitation of marine resources

Over-fishing, over-harvesting of marine products (e.g. shells) and the use of destructive gear or practices such as dynamiting is a very common problem. These practices may cause physical damage to the reef in the form of habitat destruction as well as put stress on corals by overexploiting key fish species, reducing the functioning of this ecosystem. Where there is overexploitation of fisheries alternative livelihoods should be encouraged and destructive practices such as the use of cyanide should have legislation in place to ban it. Juveniles need special protection from over fishing and any other activities that will decrease their ability to survive and contribute to this ecosystem. MPA management can put minimum size limits in place such as an appropriate minimum mesh size for fish traps, minimum size limits on invertebrates (e.g. conch) and ban the catching of spawning adults such as lobster. Zoning and seasonal closures of fishing in particular areas or for specific organisms, protection of spawning sites and protection of threatened and endangered species are a few of the ways in which MPA management can help conserve reefs. Stakeholder participation is particularly important in helping to reduce conflicts and finding suitable ways of trying to keep ecosystems in tact.

10.4 Pollution

Pollution may come from many sources including: agricultural run-off containing pesticides and fertilizers, urban runoff factory outfalls, untreated sewage and wastewater, ballast water from ships, solid waste dumped on the coastline or generated in the MPA and so on. Each pollutant and its source will come with its own set of challenges and effects on the MPA. The effects of pollution may include ecosystem change and destruction; reduce water quality for recreational activities, decreased tourism and loss of income, reduced fisheries and contamination and disease.

Pollution may be acute (one-time event) or chronic where it occurs over a period of time. Often acute pollution is easier to recover from than chronic. Pollution may come from inside the MPA or outside. Pollution from an outside source is particularly difficult to deal with and it will often require collaboration with other groups and government agencies to combat. An integrated approach needs to be taken where legislation, penalties, enforcement agencies all need to be in place. Programs should be established to monitor pollution levels and acceptable standards for particular substances should be established. Encourage international certification of hotels (e.g. Green Globe) and beach areas (e.g. Blue Flag) as well as other environmentally sound practices for all of the MPA and users. Activities, which aim to reducing waste, reuse and recycle materials, should be established and promoted.



Figure 10.1 Bequia (Grenadines) bench made from cement and broken glass
Source: Melanie Burrows

MPAs should explore potential uses for waste material such as plastics which can be recycled, Glass bottles which can be crushed and used to make concrete structures (see figure 3), paper which could be shredded and used in chicken coupes and marine debris (e.g. seaweed) could be used for fertilizer. The extent to which MPAs can carry out such activities will vary from place to place depending on factors such as local facilities available, costs involved and viability.

Stakeholders should be involved in reducing pollution and MPA management should actively seek support from local and international governments to help tackle pollution issues. MPA management should support and initiate programs outside the MPA to help combat sources of pollution such as reforestation activities, beach clean-ups and underwater cleanups.



Figure 10.3 Sian Ka'an Biosphere Reserve (SKBR), Mexico beach clean-up
Source: SKBR

Box 10.2 Case study of beach cleaning program in St. Eustatius Marine Park

St. Eustatius Marine Park

The Atlantic coast provides a nesting beach for four species of endangered turtles, and islanders have been involved in monthly beach cleaning exercises to prevent entrapment of hatchling in particular. Removal of plastics, materials (rope, clothing, etc) and other land - and sea based debris takes place on a weekend afternoon. Cleanups are advertised via schools and local radio, and on community notice boards. Transport to the beach, and removal of debris to the landfill site, is arranged by the marine park, with assistance from school and church groups and dive operators. Results of clean-ups are published in the local newspaper

Source: Garaway(2003)

Box 10.3 Strategies to help reduce pollution

Questionnaire results

National Park Sistema Arrecifal Veracruzano, Mexico - Procuraduría Federal de Protección al Ambiente (PROFEPA) applies the fines, local/national plan against Oil Spills. The Management for the park includes a programme on environmental education at the secondary and preparatory levels and there are ongoing talks and courses for students at all levels and park users.

Gladden Spit & Silk Cayes Marine Reserve and Laughing Bird Caye National Park, Belize - The parks are 13 and 20 miles off-shore and the main pollutants that reach the reef come from nearby Guatemala and Honduras. They have helped to found a tri-national organization to deal with this among other issues.

Réserve naturelle du Grand Cul-de-Sac-Marin, Guadeloupe - An agreement with various partners (farmers, manufacturers, local communities etc.) to reduce watershed pollution called the Contract of River has been established.

Ocho Rios Marine Park, Jamaica - Deforestation is a major problem in this area and so a Watershed Reforestation Projects have been established.

11 REEF ENHANCEMENT ACTIVITIES

Coral reefs are one of the most biologically diverse ecosystems on the planet and they play several important roles ranging from a habitat for fisheries to physical protection against erosion to a tourist attraction. However, all around the world coral reef are being damaged, degraded and showing signs of stress from pollution, eutrophication, physical damage from boats, divers and other human activity, along with having to combat natural occurrences such as sea level rise and hurricanes. This is a major problem in many MPAs in the region and one that needs to be combated in a holistic way involving several players (e.g. local community, government, industry and other organizations).

11.1 Remove harmful impacts

The first line of attack a manager should take is to put in place activities and regulation that will remove or significantly reduce as much as possible the negative sources of impact to the MPA and particularly the reef. While managers will be faced with several constraints (funding, getting legislation passed, enforcement and compliance), it will be well worth the effort in the long run. It is a more practical use of resources if these impacts are eliminated or reduced so that other rehabilitation efforts are more effective. Education is an important part of reducing impacts, as often many MPA users are simply unaware of the impacts of their actions. Encouraging responsible behaviour such as good fishing practices and diver awareness may help reduce the everyday damages to the reef.

Rehabilitation of coral reefs is a long process and managers should be aware and let stakeholders know that it may take decades for results to be seen. Also there is never any guarantee that rehabilitation efforts will be successful, as some reefs may never be able to fully recover from damages. The cost and benefits of different methods should be carefully analyzed along with the goals that are trying to be reached.

The purpose and goal of the rehabilitation effort should be clearly stated before any method is decided upon, as this will influence the approach taken (such as location and scale of activities). Restoration activities should begin as soon as possible as delays may significantly increase costs and recovery time and decrease the likelihood of full recovery after damage as well as the functionality of the reef.

11.2 Increase surfaces for coral establishment

Once the negative impacts have been removed or reduced there are several “active” approaches that can be taken by an MPA. Coral recruitment is an important part of the survival of a reef and can be significantly decreased on damaged reefs, as suitable surfaces may not be available for larval settlement. Surfaces can be increased by introducing artificial surfaces such as wrecks, designed structures (e.g. reef balls) or other man-made structures. On the other hand natural structures already present can be cleaned of algae or other inhibiting organisms to encourage coral recruitment. It is important that any artificial surface introduced is structurally sound, well secured to the seabed (so that it does not move around during heavy wave action), put in the right location and does not leach potentially harmful substances into the marine environment. It is important that expert scientific advice is available and an environmental impact assessment (EIA) is conducted so as to minimize potential negative impacts, particularly when introducing artificial surfaces. While scientific advice may initially be expensive it often serves to save funds in the long term for example by taking the necessary mitigative action before the start of the project rather than corrective action after, which is often more expensive and has more negative impacts.

11.3 Coral transplanting

Coral transplanting is another way of enhancing and rehabilitating damaged reef. It involves the relocation of coral fragments or colonies from a healthy reef in a non-destructive way to a damaged reef. This approach can be expensive as well as labour intensive. It is important to carefully pick the right species to transplant, as some species tend to have a lower potential for survival under certain circumstances. Environmental conditions such as wave action and potential for human disturbance also have to be taken into consideration as transplanted corals can be easily damaged or dislodge. The transplantation of corals on newly introduced artificial surfaces may help to improve the speed of development of that reef system by bypassing the recruitment stage which tends to have a slower growth rate and lower survivorship. Transplanting is also very good way of potentially saving corals that would have otherwise been destroyed in dredging or other underwater activities (IUCN, 2004).

Reef enhancement can be an expensive and time consuming process and MPA management should encourage all the stakeholders of the MPA to support activities and express their concerns in an effort to reduce potential conflicts. Where possible, partnerships can be established to help in funding, implementation, monitoring, carrying out of research and obtaining scientific expertise. Activities could also be put into place to help educate the public, bring awareness and solicit volunteers.

12 SUSTAINABLE TOURISM

Sustainable tourism shows respect for the people, environment, local culture and local economy of the tourist destination. Tourism is a very important part of the economies of most of the region and can bring in much needed revenue to developing states. Most of the population around the region can be considered coastal, and the marine environment is often one of the biggest aspects of our tourism product. The establishment of an MPA is an excellent way of raising the profile of an area for marine tourism and enhancing conservation efforts. Tourism can play a very important role in the life of an MPA, through its ability primarily to generate revenue, but it is important that managers do not lose site of other objectives of the MPA such as conservation and protection of the marine environment. The success of tourism in an MPA is tied into the ability of the MPA to provide certain amenities and high on the list of amenities is a healthy environment. Through their attractive environments, well-managed MPAs can potentially generate enough revenue to finance and sustain their operations. There is also the potential for socio-economic benefits to the local communities through the provision of goods and services to the sector and the increased in environmental awareness. For example the Punta Cana Resort and Club, in the Dominican Republic, has organized a cooperative for local women to enable them to market their handicraft at nearby hotels (Sweeting, 2003). Tourism may also be a source of volunteers and play a part in establishing new partnerships for research, funding, education and capacity building. The ability of a protected area to manage tourism depends on several factors including:

- Definition of clear management strategies
- Scale of demand for visits to the site
- Staff and resources available for management of tourism
- Legal and political environment covering wildlife protection in the countries in which they are located. (Font, 2004)

Governments often promote tourism to the detriment of the environment or without putting much emphasis on good environmental practices. Mass tourism has put severe strain on many countries resources and has contributed significantly to environmental degradation. A priority for MPA managers should be to find ways to work with the tourism sector and reduce the impacts on and the potential costs to the site. Preferably this should be done before exploring the potential of using tourism to generate revenues for management. MPA management should ensure that they are equipped to control and manage tourism so that there is always a balance with conservation goals. MPA management need to keep in mind that any adverse impacts of tourism are a cost to the MPA. The potential for tourism depends on several factors including:

- Location
- Accessibility market demand
- Proximity to popular tourism destinations
- Publicity
- Infrastructure (accommodation, transportation, guides etc.)

Marketing should be based on the above factors, for example some tourists would prefer to go to places where there is a mass tourism type situation, while others would prefer to be away from that. MPAs should be marketed based on what they can sustainably offer and in both situations there may be the possibility to generate significant revenues. Certain activities within the MPA

may be able to accommodate more people than others before negative impacts occur and management should be mindful of this when making decisions (see Carrying capacity). MPA management should encourage those who benefit most from tourism such as hotels and tour operators to aid in conservation efforts.

Box 12.1 Good practices by the tourism related organizations

Contribution to biodiversity and nature conservation

For each booking on "Discover Jamaica Naturally" programs, the Hotel Mocking Bird Hill on Jamaica donates "per guest" sponsorships to a local conservation project.

Costa Rica Expeditions provide free transport to researchers and National Park Service employees and their equipment.

Water use management and wastewater management

Sandals Negril Beach Resort and Spa in Jamaica uses low-flush toilets and urinals which use only 5.7 litres of water per flush, aerators and low-flow devices on faucets, water saving showerheads with a maximum flow of 9.5 liters per minute, and ground-care water-saving techniques to reduce water loss from evaporation. In the three years from 1998-2000 total water consumption per night was reduced 28.6 percent.

The Le Sport Resort in St. Lucia treats wastewater in three interconnecting lagoons that filter wastewater with aquatic plants and mesh. The filtered water is then disinfected further with ultra violet rays and used for irrigation on the resort's grounds. In its first year of operations, the new treatment method saved about 3.8 million litres of water and thousands of dollars.

Source: Sweeting (2003)

12.1 Carrying capacity

Carrying capacity refers to the maximum number of persons an ecosystem can support before it begins to experience negative impacts. Determining how much stress an ecosystem can take and coming up with a figure as to how many people will cause that threshold to be reached, can be very difficult, as not only does visitor behaviour vary, but the environment's resilience may vary temporally and spatially. Studying the carrying capacity of every activity that occurs in the MPA may be a wasteful way to spend resources as carrying capacity may change over time. However some sort of estimate should be made to determine levels at which the ecosystem will be damaged and levels at which the visitors experience will diminish. In some instances the signs that the system has exceeded its carrying capacity are very clear and managers need to take action to aid the systems' recovery. MPA management may face strong opposition when putting limits on visitors and it is important that there is constant dialogue and sharing of information with stakeholders in order to get support for decisions.

This is important for several reasons including:

- Keeping the tourism product at a satisfactory level
- Preventing conflicts between locals and visitors and among stakeholders
- Maintaining cultural values and social norms

Some areas may already be exceeding their carrying capacity and these effects may be clearly seen. Where this is occurring strategies must be put in place to curve impacts such as limiting numbers of users at any one time.

13 EDUCATION, TRAINING AND AWARENESS

13.1 Education

Education, training and awareness are key components of the life of an MPA. The importance of education can be seen throughout this book and almost every activity can be used as an opportunity to educate users of the MPA. MPAs should seek to design educational programs that are able to reach a wide cross section of users ranging from the poorer groups to the influential and powerful groups. School lectures, special presentation, community meetings, informal discussions, posters, brochures and so on, are often used to help educate users. Activities carried out as part of an educational program, should be targeted towards a specific audience (e.g. children or adults, fishers, hoteliers, dive operators etc). The intentional involvement of stakeholders and other users into activities such as monitoring, research and reef enhancement can also be part of educational programs, where these users should be encouraged to share what they have learned with others, in a formal or informal setting. After-school clubs or activities (e.g. ranger club, environmental club) are a good way to help educate children outside of a school setting.

Box 13.1 Examples of education, training and awareness strategies of MPAs

Questionnaire results

Saba Marine Park - Snorkel and ranger club.

St. Barth Marine Park - Regular information to the mass media.

Réserve naturelle du Grand Cul de Sac Marin - Exposition, participation in local demonstrations.

Negril Marine Park- Junior ranger school program, flyers, posters, and a regular newsletter. Staff encouraged and allowed to go to workshops and exchange programs funded by other agencies.

St.Eustatius Marine Park - Snorkel Club and Junior Rangers STENAPA

Montego Bay Marine Park- The Trust has established a film unit (Deja Blue), which produces educational documentaries and short-stories for local/national publication.

13.2 Visitor centre

Visitor centres are useful for educating visitors and other users of the MPA and making them more aware of the activities that take place in the MPA. Visitor centres should provide relevant information to the visitors about the regulations, management, importance and role of the MPA, the importance of marine conservation and give the visitor a sense of how they can play a role in conservation. The visitor centre should be in a location that is easily visible and accessible to visitors. Hotels and tour groups that use the MPA could also play a role in directing or encouraging visitors to spend some time learning about the MPA. MPA management could put on competitions within the community, which can help contribute to the material, that can be found in the centre and also help bring awareness and educating individuals or groups about the MPA. Information in the centre should be well kept and periodically updated so as to provide new information to regular visitors, keep up with changes that may occur in the environment and MPA and keep the presentations interesting and fresh. It is generally better to have a small well-planned and laid out centre to large poorly organized centre, as visitors may be turned-off poor quality work and it will reflect badly on the MPA (IUCN, 2004).

13.3 Training

Training of users to help themselves and others carry out specific activities can help build the capacity of the MPA. MPA management should seek to be part of local, national, regional and international training programs where management and stakeholders can be trained and train others to carry out certain activities. Training could be oriented towards a myriad of aims, from providing potential alternative livelihoods for users and community members to increasing the ability of stakeholders, to increasing the capacity of users to assist in other activities carried out in the MPA. There is a wide range of training and awareness programs that occur regionally and MPA management should seek to participate in them and learn from others experiences.

Box 13.1 Training and awareness in Jaragua National Park Questionnaire result

Jaragua National Park, Dominican Republic - Some of the youths from the community have been involved in monitoring hawksbill marine turtles and in training as tourist guides in the coastal zones. This has increased local awareness of the importance of the marine area of the Park and has generated enthusiasm and interest among the youth.



Figure 13.2 Hol Chan Marine Reserve (HCMR) SCUBA diving training
Source: HCMR

Box 13.2 Case Study of training in sampling methods in the MBRS

Training in sampling methods for the monitoring of marine pollution

As part of the Synoptic Monitoring Program (SMP) of the Mesoamerican Barrier Reef Systems (MBRS) Project, training courses were held in the sampling methods for monitoring of marine pollution in the MBRS region. These courses were carried out, in May of 2004, in the MBRS member countries, Mexico, Belize, Guatemala and Honduras.

Aspects covered in this course included sampling protocols for pollutants in water, sediments and organisms, the preservation of the samples for subsequent analysis and the shipment of samples to certified laboratories. The monitored pollutants include pesticides of agricultural origin concentration in sediments and animals, biological indicators of stress, water quality indicators, and the presence of coliformbacteria.

Source: <http://www.mbrs.org.bz/english/news.htm>

Box 13.4 Case study of UNEP-CEP ‘Training of Trainers’ programme

UNEP-CEP ‘Training of Trainers’ programme for MPA managers

To address this issue of lack of capacity, UNEP-CAR/RCU launched a “Training of Trainers” programme for MPA managers, through which managers are not only trained in all aspects of MPA management but also on adult education techniques to conduct local and tailored training activities in their respective MPAs. This approach includes regional two week courses, followed by local training activities which the trained managers are committed to undertake upon completing the regional courses. The specific subject areas covered by the training manual are as follows:

- Training and Communication Skills
- The Nature of the Marine Environment
- Uses and Threats to the Marine Environment and its Resources
- Marine Protected Areas Overview
- Participatory Planning
- Marine Protected Area Planning
- Marine Protected Area Management
- Research and Monitoring

Source: M. Miller UNEP – CEP

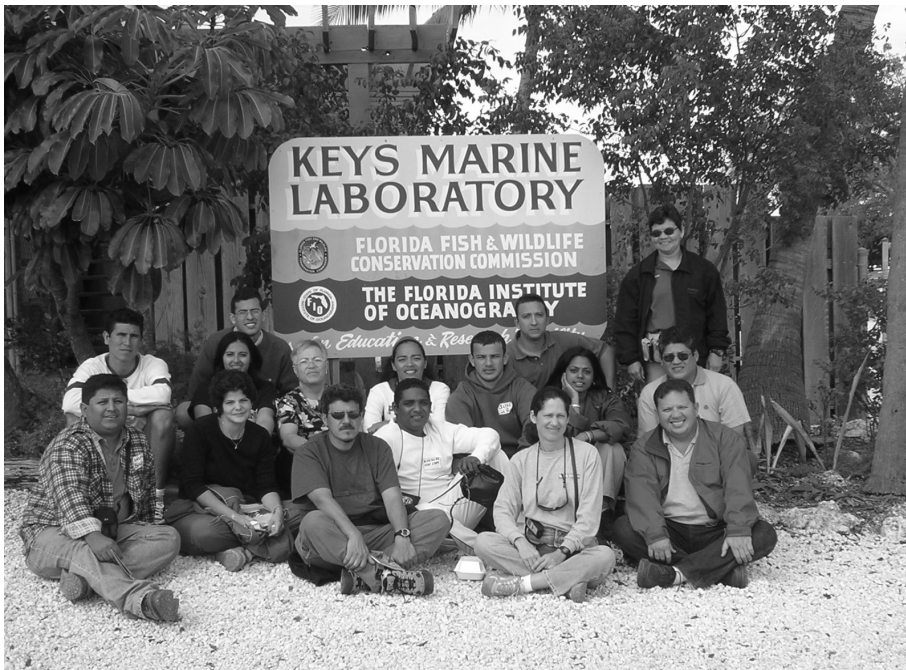


Figure 13.3 UNEP-CEP ‘Training of Trainers’ in MPA management, graduate class of 2004

Source: Kelvin Guerrero

14 ALTERNATIVE LIVELIHOODS

MPA management should encourage alternative livelihood for users whose means of living depend on unsustainable practices or overexploitation of the marine environment. Whether this is a full-time or a part-time change in livelihood, the aim remains the same; to reduce or eliminate practices that may damage or overexploit the marine environment while providing income. It is

important that these opportunities are not only attractive but are also sustainable. MPA management can encourage fishers to start up a sustainable mariculture (i.e. farming of marine organisms such as sea weed) business with the aim of reducing fishing pressure while supplying an income to the fisher. In MPAs that see many visitors per year, fishers could be encouraged to become tour guides (e.g. boat tours and fishing trips) or start new enterprises (e.g. producing handicrafts or providing holiday accommodation). In other cases they could become MPA wardens and aid in enforcement. These alternatives may help to increase the socioeconomic status of the area and its stakeholders while contributing to the environmental health of the MPA. Alternative livelihoods are particularly successful as a means of reducing environmental harm when it is dependant on a healthy environment. Stakeholders in these ventures will be encouraged and find it necessary to do all they can to not damage the environment and may even participate in activities which enhance its health. From this there is a myriad of possibilities from increased compliance and self-enforcement to perhaps even social changes in attitudes toward the environment (more positive attitude towards the environment). Alternative livelihoods should be suited to the local situation and capabilities.

Box 14.1 Case study of eco-tourism training for fishers in the MBRS

The Mesoamerican Barrier Reef Systems (MBRS) Project

The MBRS contracted the Green Reef Environmental Institute and the Toledo Institute for Development and Environment (TIDE) to conduct eco-tourism training courses for communities of the MBRS trans-boundary areas during the summer of 2004. The primary purpose of this regional training effort was to provide fishers of the MBRS region with new skills in alternative livelihoods in order to reduce economic pressure on the fisheries resources of the region. Training courses were offered in a variety of eco-tourism related skills, including natural history tour guiding, kayaking, snorkelling, sports diving and fly-fishing.

Source: <http://www.mbrs.org/bz/english/news.htm>

Box 14.2 Alternative livelihoods encouraged in MPAs

Questionnaire responses

Gladden Spit & Silk Cayes Marine Reserve and Laughing Bird Caye National Park - Dive master, fly-fishing, community monitoring.

Jaragua National Park - Local micro companies and construction workers.

Réserve naturelle du Grand Cul-de-Sac-Marin - Tourism and eco-tourism activities.

Ocho Rios Marine Park - Fishermen living near the beach are encouraged to become wardens, non-motorized sports operators (e.g. kayaking etc) and coral restoration or coral farmers. Many of the fishermen live inland in a village and beekeeping (export honey), crafts, nature trails and bird watching are currently being looked at as alternatives.

15 CONCLUSIONS

Our marine habitats are sacred and need to be sustainably used so that future generations may benefit from them also. More and more they are being destroyed and while there are hundreds of MPAs throughout the region, very few are currently being adequately managed. There are many challenges that MPA managers will face, from being under-funded, to having to tackle the social concerns and attitudes of stakeholders. The level of management needs to be increased if our ecosystems are to thrive. As our populations grow and our technologies improve, threats to marine habitats are increasing. MPAs provide an excellent opportunity for education and conservation of marine ecosystems. There is no one perfect formula for management of an MPA

as each MPA is unique and will require a different combination of strategies for success. Managers need to be willing to share their experiences and learn from the experiences of others adapting strategies to their own situations. There is a great need throughout the region for MPA management to form stronger ties with each other and with the relevant governmental and non-governmental agencies. An integrated approach is vital to the success of an MPA and there needs to be broad education and awareness of how ecosystems work and their responses to anthropogenic activity.

16 REFERENCES AND USEFUL RESOURCES

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- Garaway, C. and Esteban, N. 2003. Increasing MPA effectiveness through working with local communities. Guidelines for the Caribbean. MRAG Ltd, London, U.K 45pp.
- Geoghegan, T., Smith, A.H., and Thacker, K. 2001. Characterization of Caribbean marine protected areas: An analysis of ecological organizational and socioeconomic factors. CANARI Technical Report No. 287 available online at www.canari.org
- Hoff, R. 2001. Oil Spills In Coral Reefs: Planning and Response. NOAA.77pp
- IUCN. 2004. Managing Marine Protected Areas: Toolkit for the Western Indian Ocean. IUCN Eastern African Regional Programme, Nairobi, Kenya, xii + 172pp available online at www.wiomsa.org/mpatoolkit.htm
- Kelleher, G. 1999. Guidelines for Marine Protected Areas. IUCN, Gland, Switzerland and Cambridge, U.K xxiv +107pp. available online at www.iucn.org
- Kenchington, R. , Ward, T. and Hegerl, E. 2003. The benefits of Marine Protected Areas. Commonwealth of Australia Commonwealth Department of Environment and Heritage. 20pp.
- McConney, P., Pomeroy, R. and Mahon, R. 2003. Guidelines for coastal resource co-management in the Caribbean: Communicating the concepts and conditions that favour success. Caribbean Co-management Guidelines Project. Caribbean Conservation Association, Barbados. 56pp.
- Solares, I. and Alvarez, O. 2003. Socioeconomic Assessment in Punta Allen: A tool for the management of a Coastal Community. Sian Kaan Biosphere Reserve, Mexico. UNEP/ICRAN-CONANP/SKBR. 102pp.
- Sweeting, J. and Sweeting, A. 2003. A Practical Guide to Good Practice: Managing Environmental and Social Issues in the Accommodation Sector.

16.1 Organizational Websites

Caribbean Natural Resources Institute - www.canari.org
Centre for Resource Management and Environmental Studies (CERMES) - <http://cermes.cavehill.uwi.edu>
Coastal Resources Centre - www.crc.uri.edu
Conservation Finance Alliance - www.conservationfinance.org
Dive Cayman - www.divecayman.ky
Conservation International - www.conservation.org
International Coral Reef Action Network - www.icran.org
International Marinelife Alliance - www.marine.org
Marine Protected Areas of The United States - www.mpa.gov
Mesoamerican Barrier Reef Systems Project - www.mbrs.org.bz
MPA News - <http://depts.washington.edu/mpanews>
NOAA Coastal Services Center - www.csc.noaa.gov
Ocean Life Institute - www.whoi.edu/institutes/oli/index.htm
Small Island Developing States Network - www.sidsnet.org
UNEP, Caribbean Environment Programme (CEP) - www.cep.unep.org
UNEP, Division of Technology, Industry and Economics [DTIE] - www.unepie.org
United Nations Educational Scientific and Cultural Organization - www.unesco.org
World Conservation Union - www.iucn.org

16.2 MPA websites

Bahamas National Trust - www.bahamasnationaltrust.com
Belize National Parks - www.ambergriscaje.com/pages/town/parkintro.html
Bonaire Marine Park - www.bmp.org
Friends of the sea -Ocho Rios Marine Park - www.Friendsoftheseaja.org
Hol Chan Marine Reserve - www.holchanbelize.org
Jaragua National Park - www.geocities.com/grupojaragua
Montego Bay Marine Park - www.mbmp.org/
Reserva de la Biosfera Banco Chinchorro - www.conanp.gob.mx
Réserve naturelle du Grand Cul de Sac Marin - www.guadeloupe-parcnational.com
Saba National Marine Park - www.sabapark.org
Soufriere Marine Management Association - www.smma.org.lc
St. Barth Marine Park - www.reserve-naturelle-stbarthelemy.com
St. Eustatius Marine Park - www.statiapark.org

17 APPENDICES

17.1 Appendix 1: Best management practices for MPA within the WCR questionnaire

Best Management Practices for Marine Protected Areas within the Wider Caribbean Region

Instructions : Please put an “X” in the appropriate space and give details where necessary. Answer all of the following questions to the best of your knowledge. Thank you.

1. What is the name of your MPA and when was it officially established?
2. What country is it in? Name of island, if appropriate.

Contact Information

3. Name:
Title:
Work Address:
E-mail:
Telephone:
Fax:
Website Address:
MPA Manager Name :
Email address:

Revenue

4. How does your MPA generate revenue and is it sufficient? Give details.
 User fees Private donations Government allocation
 NGO funding Special events, appeals Concessions (souvenirs)
Other _____

Resource Monitoring and Assessment

5. What kind of Monitoring and Assessment activities do you have?
 GIS mapping Surveying Reef check
 Water quality assessment Socioeconomic assessment
 Management evaluation Carrying capacity assessment
Other _____

Reef Enhancement Activities

6. What kinds of reef enhancement activities does your MPA have?

Reef balls Coral transplanting Fish attracting devices
 Artificial Reefs Other_____

7. How do you combat or reduce physical reef damage?

Mooring buoys Penalties and fines Other_____

Participatory Processes

8. Who is involved in managing your MPA?

National government Fisheries department International NGO
 Local NGO Local community Private enterprise
Other_____

9. What is the level of involvement of stakeholders in decision-making?

Management agency makes all the decision
 Management agency interacts often but makes all decision
 Management agency and stakeholder work closely and share decisions
 Management agency lets formally organized users make decisions
 Citizen and community reps. have most control
Other_____

Enforcement

10. How are regulations of the MPA enforced?

Park rangers Self enforcement Local police Other_____

11. Are compliance and or enforcement a problem?

Coastal Development and Zonation

12. Does your MPA have well defined zones? What was your zoning strategy?

13. What activities are carried out to mitigate against or prevent pollution of the MPA from land-based or marine sources of marine pollution?

Beach clean ups Public education Pollution fines
 Emergency response plans Other_____

Alternative Livelihood for Fisher Community

14. What are the alternative livelihoods for fishers within your MPA?

Guide MPA ranger Mari culture farming Other_____

Education, Training and Awareness

15. What educational, training and awareness activities do you have in place?

Visitor center School lectures Capacity building
 SCUBA diver and snorkeler briefing MPA staff workshops
 Volunteer training Community out reach Radio/ T.V program
Other_____

Other Information

16. What other successful management practices contribute to your MPA's sustainable development and what problems has it solved or mitigated?

17. Do you know of any other MPA in your country?

17.2 Appendix 2: Summary of questionnaire results

Topic	Summary
Finance/Revenue	Non-Governmental organisations and the charging of user fees was the most popular means of generating revenue within the MPA.
Resource Monitoring & Assessment	Reef check was the most popular monitoring and assessment activity carried out, but more than half of the MPAs also carried out management evaluation and socioeconomic surveys.
Reef Enhancement Activities	Many MPAs had no reef enhancement activities in place, but artificial reefs were most often used where there were activities in place. Almost all the MPAs surveyed had mooring buoys, penalties and fines in place to help combat physical reef damage. Education was often suggested as a means of combating damage.
Participatory Processes	National governments were the most often group involved in management of the MPA. The fisheries department and local community are also involved in more than half of the MPAs surveyed. In most of the MPAs management and stakeholders work closely together and share in the decision making.
Enforcement	Regulations are most often enforced by the Park Rangers. Compliance and enforcement is more often than not a problem.
Coastal Development & Zonation	More than half of the MPAs are zoned. Beach cleanups and public education are the most popular activities used to mitigate against or prevent pollution of the MPA.
Alternative Livelihood for Fisher Community	While several MPA did not actively promote alternative livelihoods, those that did promote it encouraged fishers to become MPA rangers, guides and other tourism related activities.
Education, Training & Awareness	Most MPAs had school lecture programs to help promote education training and awareness. Community outreach, volunteer training and staff workshops were also used by more than half of the MPAs.

17.3 Appendix 3: Contact information for MPAs that responded to the questionnaire

Country	Name of MPA	Name and title of contact	Telephone, fax, email and mailing address
Anguilla	Dog Island Marine Park Prickly Pear/Seal Island Marine Park Sandy Island Marine Park Little Bay and Island Marine Park Harbour/Shoal Bay Marine Park	Othlyn Vanterpool (Manager) James Gumbs (Marine Biologist- Fisheries dept.)	Othlyn.Vanterpool@gov.ai Tel# (264) 497 2871 Fax# (264) 497 8567 James.Gumbs@gov.ai Address: Department of Fisheries, Crocus Bay, Anguilla, B.W.I.
Bahamas	Exuma Cays Land and Sea Park	Ray Darville (Warden) Lynn Gape (Director of Education & Communications) Christopher Hamilton (Executive Director) Eric Carey (Director of Parks & Science)	exumapark@aol.com Tel# (242) 393 1317 Fax# (242) 393 4978 nlgape@batelnet.bs
Barbados	Folkestone Marine Park	John Nicholls (Manager)	folkestonemarine@yahoo.com folkestonemarine@caribsurf.com jnicholls02@yahoo.com Tel# (246) 422-2871/2314 Fax# (246) 432-2793 Address: Folkestone Marine Park, Church Point, St. James
Belize	Coordinator of Marine Reserves (National Response)	Isaias Majil (Coordinator of Marine Reserves)	isaiasmajil@yahoo.com Tel# (501) 2244552 Fax# (501) 2232983 Address: Princess Margaret Drive, Belize City
Belize	Gladden Spit & Silk Cayes Marine Reserve Laughing Bird Caye National Park	Dwight Neal (Manager) Will Jones (Development Director)	dineal@hotmail.com Tel# (501) 523 3377 Fax# (501) 523 3395 folbc@btl.net Address: Point Placencia, Stann Creek District
Belize	Glover Reef Marine Reserve	Armador Pot (Manager) Jon Clamp (Glovers Reef Marine Research Station Manager)	wcslover@starband.net Tel# (501) 522 2153 Address: P.O.Box 272, Dangriga Town Belize
Belize	Hol Chan Marine Reserve	Miguel Alamilla (Manager)	mikeobze@yahoo.com Tel# (501) 226 2247 Fax# (501) 226 2420 hcmr@btl.net Address: Caribeña Street, P.O. Box 69, San Pedro Town, Belize

Country	Name of MPA	Name and title of contact	Telephone, fax, email and mailing address
Dominican Republic	Jaragua National Park	Yolanda León (PhD) Subsecretaría de Areas Protegidas y Biodiversidad	ymleon@yahoo.com Tel# (809) 802 7273 dnp@codetel.net.do Address: Grupo Jaragua, El VERgel 33, El Vergel, Santo Domingo
Guadeloupe	Réserve Naturelle des îlets de Petite Terre	René Dumont (Manager) Office National des Forêts	rene.dumont@onf.fr Tel# 05 90 74 35 61 Fax#05 90 91 52 17 Address: ONF Jardin d'Essais 97139 Les Abymes
Guadeloupe	Réserve naturelle du Grand Cul de Sac Marin	Yves Brugière (Director National park of Guadeloupe) Delloue Xavier (Curator)	www.guadeloupeparcnational.com Tel# 0590 26 10 58 Fax# 0590 26 10 58 png.gcsm@espacesnaturels.fr Address: Parc national de la Guadeloupe 43 rue Jean Jaures 97122 Baie Mahault
Guadeloupe	Réserve Naturelle de Saint Barthélemy	Franciane Le Quellec (Curator)	resnatbarth@wanadoo.fr Tel# 0590 278818 Fax# 0590 278818
Saint Barthélemy	St. Barth Marine Park	Association Grenat NGO Grenat	www.reserve-naturelle-stbarthelemy.com Address: BP 683 – Gustavia, 97099 Saint Barthélemy cédex
Honduras (Bay Island)	Cayos Cochinos Archipelago Marine Natural Monument	Adrian Oviedo (Manager & Biologist)	aeoviedo@caribe.hn Tel# (504) 4434075 Fax# (504) 4434076 http://fundcayos.org Address: Colonia El Narnajal Avenida Victor Hugo, Casa 1145.
Jamaica (Montego Bay)	Montego Bay Marine Park	Brian Zane (Acting Director) TBD (Manager)	mbmp@n5.com.jm Tel# (876) 952 5619 Fax# (876) 940 0659 Address: Pier One Complex, Montego Bay, St. James, Jamaica
Jamaica (Negril)	Negril Marine Park	Carl Hanson (Manager)	coralreef@cwjamaica.com Tel# (876) 957 3736 Fax# (876) 957 3115 Address : Norman Manley Blvd. P.O. Box 2599 Negril, Westmoreland
Jamaica (Ocho Rios)	Ocho Rios Marine Park	Alex Lanigan (Manager) Executive Director Friends of the Sea	wildlani@yahoo.com Tel# (876) 974 4428 Fax# (876) 974 7811 friendsofthesea@yahoo.com Address: 5 Pineapple Place, Ocho Rios, St. Ann. Jamaica
Mexico	Reserva de la Biosfera Banco Chinchorro	María del Carmen García Rivas (Director)	mcgarcia@conanp.gob.mx Tel#(983) 285-46-23 Address: Av. Insurgentes 445, Chetumal, Quintana Roo, México. CP77039

Country	Name of MPA	Name and title of contact	Telephone, fax, email and mailing address
Mexico	Parque Nacional Sistema Arrecifal Veracruzano	Elvira Carvajal Hinojosa (MPA Manager) Machado Arias (MVZ)	ecarvaja@conanp.gob.mx Tel.# 01 (229) 9307834 Fax # 01 (229) 1002345 sarreciv@conanp.gob.mx www.conanp.gob.mx. Address: Grijalva No. 78. Esq. Colón. Fracc. Reforma. C.P. 91919
Netherlands Antilles Bonaire	Bonaire Marine Park	Ramon de Leon (Manager)	marinepark@stinapa.org Tel# (599) 717 3814 Fax# (599) 717 7318 Address: P.O. Box 368 Kralendijk, Bonaire N.A.
Netherlands Antilles Saba	Saba Marine Park	David Kooistra (Manager)	smp@unspoiltqueen.com Tel# (599) 416 3295 Fax# (599) 416 3435 www.sabapark.org Address: P.O. Box 18 The Bottom, Saba Netherlands Antilles
Netherlands Antilles St. Eustatius	St Eustatius National Parks	Nicole Esteban (Manager) Kath Selkirk (Administrator)	semp@goldenrocknet.com Tel# (599) 318 2884 Fax# (599) 318 2884 Address: STENAPA, Gallows Bay, St Eustatius, N.A.
St. Lucia	Soufriere Marine Management Area	Kai Wulf (Manager) Julian Mathieu (Administrator)	kai@smma.org.lc Tel# (758) 459 5500/5904 Fax# (758) 459 7799 mathieu@smma.org.lc smma@candw.lc www.smma.org.lc Address: 3 Bay Street Soufriere
St. Vincent and the Grenadines	Tobago Cays Marine Park	Vibert Dublin (Manager)	tcmp@caribsurf.com Tel# (784) 485 8191 Fax# (784) 485 192 Address: Clifton Union Island
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