



Issue Briefs for the Caribbean  
*Lessons learned for building and sustaining effective marine protected areas*



## MONITORING TO IMPROVE MANAGEMENT EFFECTIVENESS

*You can conduct scientifically sound monitoring but if you don't apply results to improve and adapt management, you are wasting half of your gift*

### WHAT IS THE ISSUE?

Management effectiveness is the degree to which a protected area achieves its goals and objectives. Performance evaluation of marine protected area (MPA) management is critical for demonstrating and providing long-term positive impacts on biodiversity and the human communities that depend on these resources. Evaluating management effectiveness should ultimately lead to improved project planning, accountability and adaptive management, including the ability to change management as needed due to unanticipated impacts and/or changes outside the MPA boundaries. Monitoring the indicators that provide information on performance allows managers to *identify, document, justify and plan* changes to the MPA management scheme to improve effectiveness.

The assessment can only be accurate and useful if it includes the following important aspects:

- **Plan for a continuous assessment.** Include monitoring in your management plan so the management regime can be assessed. Evaluation of management effectiveness should not be a 'one-off' event.

- **Measure the minimum attributes that describe the condition of the MPA**, both its *natural and human dimensions*, and eventually the status of the main *ecosystem services* that it provides. Such attributes are measured through a series of indicators that are grouped into 3 main categories: **biophysical** (describe the ecological condition of species and habitats and its relation to the physical setting), **governance** (the management scheme and tools, including stakeholder participation) and **socioeconomic** (the usage patterns and social and economic impact of the MPA in the local community and the country at large).

■ **Get help.** You are not enough to cover all aspects of the work but you are not alone. Attract academic resources from local, regional and international institutions to conduct monitoring (researchers, college and university students and trained volunteer groups). Open opportunities for people in your community. Publicize your monitoring needs through relevant professional networks (CaMPAM List, Coral List, etc.) and you might get the assistance you need.

■ **Utilize technical and scientific expertise to apply appropriate monitoring methods.** Sampling and results analysis is a scientific undertaking and as such requires scientific expertise. In any case, build local MPA capacity to conduct the monitoring and analysis in-house by involving a trained core team of staff and volunteers (stakeholders and community members).

■ **Apply common sense (cost-benefit analysis).** There are several monitoring methods published therefore selection of an appropriate approach by MPA managers is the result of a combination of scientific rigor (for accuracy) and cost. Environmental indicators may vary in space and time so sampling design needs to properly cover that variability so generally, the higher the accuracy the higher the cost. Discuss with the people conducting the monitoring the costs and data accuracy and find the right balance for your MPA.

■ **Share responsibility.** Establish clear rules of engagement to ensure collected data (generally by several institutions) comes back to the MPA management authority.

■ **Apply results to management.** Use the assessment data to improve and adapt management. The information may justify, for example, the need to enlarge or re-zone the MPA for different uses, or to increase

awareness-raising and enforcement coverage, etc.

■ **Advertise your results.** Monitoring results are a good marketing product for MPAs. The dissemination of monitoring data and its application to improve management may show that the MPA is serious about achieving its management and conservation goals, and that management authorities are committed to improve ecosystems services and their associated benefits to communities. Use frequent, innovative and informative ways to communicate results to the general public and to regional and international audiences (videos, drama presentations, songs, brochures, flyers, radio programs, presentation at conferences, etc.)

This brief outlines some monitoring approaches commonly used in the Caribbean MPAs and provides advice on selecting the appropriate monitoring method and assessment approach. The information is presented according to what attribute to monitor, why it should be monitored, the information that should be assessed/collected, challenges to collecting the information, how to get the best results and some examples of MPAs currently assessing or monitoring. Specific methods to monitor biophysical, governance and socioeconomic indicators can be found in several publications provided at the end of the guidelines. The attributes for assessment outlined in these guidelines are by no means exhaustive but are provided as examples.

## Species populations conditions

<b>Why</b>	Most invertebrate and fish stocks have been overfished. Thus, the increase of species abundance is a primary objective of most coastal and marine areas in the Caribbean.
<b>What to assess (main attributes)</b>	Biomass or density (of both adults and juveniles) of fished, and some kind of assessment of the status of the stocks (breeding aggregations, reproductive output, abundance of recruits of key ecological and commercial species.)
<b>Challenges and opportunities</b>	<ul style="list-style-type: none"><li>▪ The species population range exceeds the managed area so analysis of data from other areas is necessary.</li><li>▪ Surveys at spawning sites and early juvenile nursery areas are more difficult.</li></ul>
<b>How to do it best</b>	<ul style="list-style-type: none"><li>▪ The fewer and more indicative of species status the better: Select a few species, particularly those that are fished.</li><li>▪ Involve key stakeholders and community members, wherever possible, in the assessment. Evaluation should be participatory.</li><li>▪ Coordinate with other areas to better assess transnational stocks.</li></ul>

Habitat quality	
Why	Habitat alteration is common in coastal and marine areas. The assessment of habitat condition within the MPA is a good indication of environmental quality.
What to assess (main attributes)	<p><u>Seagrass beds</u>: Seagrass shoot density, growth and productivity, fish density and richness, bottom sediment organic content.</p> <p><u>Mangroves</u>: Tree height and area, biomass of fallen leaves, mangrove canopy coverage, key associated fish and invertebrate species abundance.</p> <p><u>Coral reefs</u>: Live coral and algae cover disease/bleaching incidence; coral recent mortality; density of coral recruits, etc.</p> <p><u>Beaches</u>: Seasonal profile and erosion rate.</p>
Challenges and opportunities	<ul style="list-style-type: none"> <li>▪ Large MPAs with highly variable hydrological regimes (estuaries, coastal lagoons) require extensive and periodic sampling to cover both spatial and seasonal variability.</li> <li>▪ It is hard to distinguish natural from anthropogenic variation. Secure permanent resources to fund monitoring. It requires special logistics and training.</li> <li>▪ Build a combination of inter-sectorial and inter-disciplinary monitoring teams.</li> </ul>
How to do it best	<ul style="list-style-type: none"> <li>▪ Attract academic resources (nearby universities, research centers and NGOs) to conduct monitoring</li> <li>▪ Establish agreements so monitoring results are returned to the MPA</li> <li>▪ Agree with researchers on the best core indicators based on resource use, existing or predicted climate change and terrestrial influence, and available human and financial resources.</li> <li>▪ Utilize a recognized survey protocol, for results to be comparable with other areas.</li> <li>▪ Organize logistics and secure insurance if diving is required.</li> <li>▪ Establish relationship/communication with researchers across the region.</li> <li>▪ Share monitoring results and application to management (via CaMPAM, GCFI and Coral Lists and at conferences).</li> <li>▪ Involve and train key stakeholders and community members, wherever possible, in the assessment. Evaluation should be participatory.</li> </ul>

## Usage pattern

<b>Why</b>	<p>The assessment of both regulated and illegal usage of marine resources is critical to understand their impact on conservation measures in the short, mid and long term. This information allows determination of MPA threats, identification of resource user conflicts and impacts (benefits) of MPA management for communities.</p>
<b>What to assess (main attributes)</b>	<p>Fisheries and other extractive industries (species, annual and seasonal variation of production; seafood, handicraft and aquarium markets). Tourism operations (fishing; recreational fishing, kayaking and nature tourism activities)</p>
<b>Challenges and opportunities</b>	<ul style="list-style-type: none"><li>▪ Fisheries statistics are usually not accurate; landing points are dispersed; illegal foreign fishing may exist.</li><li>▪ Fisheries regulations and enforcement may be both weak and inexistent.</li><li>▪ Interview fatigue may be an issue. Other tools for gathering data may be needed – focus group meetings, mapping techniques</li></ul>
<b>How to do it best</b>	<ul style="list-style-type: none"><li>▪ Survey or key informant interview of fishers, dive operators, day charters, hoteliers and other resource users. Secondary data sources such as fisheries, farming and tourism studies may have information and maps showing resource use activities.</li><li>▪ Participatory mapping techniques using basic tools (flipchart paper, color coded stickers etc.) could be used to map use patterns. The information in these maps can be geo-referenced and GIS maps may be produced. Additionally, observations may be used to identify and verify use patterns.</li><li>▪ Provide feedback to the communities for verification of results through community validation meetings.</li><li>▪ Involve key stakeholders and community members, wherever possible, in the assessment.</li></ul>

## Economic benefits

### Why

Economic impact in local communities is critical to build management effectiveness and achieve overall MPA success.

### Advantages

Motivation and economic benefits of the MPA

- Material style of life
- Changes in household income
- Household occupational structure
- Community infrastructure and business development
- Change in livelihoods

### Challenges and opportunities

- Usually low degree of community organization for sustainable businesses.
- Require constant training and loans.
- Illegal activities interfere with legal businesses and users.
- Competition for services is regional/global, usually not considered by local users.
- Certain information, particularly about the existence of illegal occupations, is difficult to obtain using surveys. Need key informants to share their data and perspectives.
- It may be difficult to obtain secondary data at the community level as data is often reported in an aggregated form.
- Coastal sites have been surveyed excessively especially in the eastern Caribbean and interview fatigue may be an issue. Other tools for gathering data may be needed – focus group meetings, mapping techniques. Difficult to obtain secondary data at the community level as data is often reported in aggregated form – particularly so for health data.
- Surveys balanced/tested, which means a complementarily sensitivity analysis.
- Coastal sites have been surveyed excessively, available information is dispersed and little communication exists among key groups. Interview fatigue may also be an issue. Other tools for data acquisition may be needed – focus group meetings, mapping techniques.

### Examples of MPAs that exhibit this practice and can be used as learning center

- Data through MPA household/users surveys.
- Identify and involve key informants (community leaders) for complementary information and to increase public participation.
- Interviews with key stakeholders, secondary sources such as census statistics, country poverty assessments, health records, fisheries records, development plans etc., and by observations.
- Hold community validation meetings to secure feedback and verify results.
- Involve key stakeholders and community members, wherever possible, in the assessment.

## Social impact

<b>Attributes</b>	Social impact (benefits or damage) to local communities are to MPA effectiveness and long-term sustainability.
<b>Advantages</b>	<ul style="list-style-type: none"><li>▪ Quality of human health.</li><li>▪ Distribution of formal knowledge to community.</li><li>▪ Knowledge, awareness and support of MPA objectives by fishers and other stakeholders regarding benefits and risks of MPAs and other conservation measures.</li></ul>
<b>Challenges</b>	<ul style="list-style-type: none"><li>▪ Difficult to obtain secondary data at the community level as data is often reported in aggregated form – particularly so for health data.</li><li>▪ Surveys balanced/tested, which means a complementarily sensitivity analysis.</li><li>▪ Coastal sites have been surveyed excessively, available information is dispersed and little communication exists among key groups. Interview fatigue may also be an issue. Other tools for data acquisition may be needed – focus group meetings, mapping techniques.</li></ul>
<b>Examples of MPAs that exhibit this practice and can be used as learning center</b>	<ul style="list-style-type: none"><li>▪ This information can be collected through household surveys of MPA communities, key informant interviews with key stakeholders</li><li>▪ Provide feedback to the communities for verification of results through community validation meetings.</li><li>▪ Involve key stakeholders and community members, wherever possible, in the assessment. Evaluation should be participatory.</li></ul>

## Governance Tools

<p><b>Attributes</b></p>	<p>Bad MPA governance can be detrimental to success and the social acceptance of such MPAs as coastal management tools. Governance must reduce conflicts without compromising MPA objectives.</p>
<p><b>Advantages</b></p>	<ul style="list-style-type: none"> <li>▪ Formal and informal forms of resource ownership and use.</li> <li>▪ User rights and associated laws that support them.</li> <li>▪ The functionality of the management authority and how it interacts with other bodies.</li> <li>▪ The implementation of the management plan</li> <li>▪ Level of resource conflict.</li> <li>▪ Stakeholder participation and satisfaction in management</li> </ul>
<p><b>Challenges</b></p>	<ul style="list-style-type: none"> <li>▪ Rules and rights are defined by formal institutions at different geographic and jurisdictional levels, including some beyond the reach of MPA managers (provincial or state, national, and international).</li> <li>▪ Inter-institutional arrangements are needed to define and enforce regulations within the MPA and the influential area.</li> <li>▪ Management bodies must be held accountable.</li> <li>▪ A management plan may exist but this does not mean that it is a good one or that it is actually being followed or is recognized by resource users.</li> <li>▪ It may be difficult to separate conflicts associated with the MPA from others that exist in the community</li> <li>▪ Some stakeholders have unrealistic and unreasonable expectations of participation. Low levels of satisfaction may be the result of these expectations. Participation does not necessarily mean satisfaction.</li> </ul>
<p><b>Examples of MPAs that exhibit this practice and can be used as learning center</b></p>	<ul style="list-style-type: none"> <li>▪ Involve in the assessment representatives of the main stakeholder groups.</li> <li>▪ Information can be collected through household surveys of MPA communities, and interviews with key informants of different stakeholders groups.</li> <li>▪ Secondary sources of data – management plan, meeting minutes, legislation etc.</li> <li>▪ Provide feedback to the communities for verification of results through community validation meetings.</li> </ul>

Examples of MPAs where monitoring programs have been implemented for some years. The information is not exhaustive and additional data can be obtained in their websites (click on parks names).

Marine Protected Area	Aspects that have been monitored
<a href="#">Seaflower Biosphere Reserve</a> , and <a href="#">Corales del Rosario y San Bernardo National Park</a> (Colombia)	Coral reef health, and conch and fish fisheries.
<a href="#">Banco Chinchorro</a> and <a href="#">Sian Kaan</a> Biosphere Reserves, and <a href="#">Arrecifes de Xcalak National Park</a> in Mexico	MBRS monitoring protocol has been used to monitor stony corals, sponges, gorgonian and algae cover. Tourist visitation and fisheries have been also monitored.
<a href="#">Negril National Park</a> (also at <a href="http://www.nepa.gov.jm/nmpzp/interim-zoning-plan.pdf">www.nepa.gov.jm/nmpzp/interim-zoning-plan.pdf</a> ) in Jamaica	Socioeconomic monitoring (SocMon).
<a href="#">Soufriere Marine Management Area (St. Lucia)</a> and <a href="#">Tobago Cays Marine Park</a> (St. Vincent and the Grenadines)	Water quality, sedimentation rates, coral growth and mortality (Reef Check Protocol) fisheries landings in Soufriere; resource usage patterns and other socioeconomic attributes (using SocMon protocol).
<a href="#">Hol Chan and 'Glovers Reef Marine Reserves</a> (Belize)	Socioeconomic monitoring (using SocMon), sea turtle, fisheries, spawning aggregations, etc. Recommendations for best practices have been published (see Recommended Best Practices of the Cayes of Belize).
<a href="#">La Caleta Marine Park</a> (Dominican Republic)	Reef health using Reef Check protocol
<a href="#">Monumento Natural Cayos Cochinos</a> (Honduras)	Fisheries, sea turtle, coral reef health (Reef Check protocol), socioeconomic aspects.
<a href="#">St. Martin Natural Reserve, St. Barthelemy Natural Reserve and Guadeloupe National Park</a> (French Caribbean)	Sea turtles, fishes, marine mammals, coral reef health, and other biophysical attributes are monitored with a common protocol, reported, data exchanged and applied to adapt management. The marine mammal monitoring in St. Martin and St Bart includes Anguilla, Saba, Sint Maarten and St Eustatius, with the participation of local MPA managers.

## WHAT LESSONS MAY APPLY TO MY MARINE PROTECTED AREA?

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■ **Learn.** If you are not convinced that monitoring results can help improve your management regime and achieve MPA objectives, you won't make any use of it. Get help to select and implement the appropriate method.

■ **Look actively for required monitoring resources.** Market your MPAs, post your monitoring needs in relevant professional networks (CaMPAM List, Coral List, GCFI.net and others). Many college and university students can assist with monitoring if you provide content for their research work, and some resources. Ask collaborators to assist you with writing and submitting project proposals to government and private funding agencies.

■ **Request information from monitoring personnel.** Define rules of engagement of the collaborative monitoring projects. Request the delivery of results in a reasonable timeframe and a format that can be understood by non-scientists, or transform the data into community outreach materials.

■ **Participate in monitoring and assessment.** Even if monitoring is conducted by a partner institution, MPA personnel should be involved in all stages: survey design, data gathering, results analysis and reporting.

■ **Continuity is difficult so be prepared to replace your collaborators.** Monitoring MPAs is an expensive endeavor that occurs over time. If partners stop conducting mentoring, you should be able to provide continuation by measuring at least a few biophysical and socioeconomic indicators with your own resources and the help of local community groups.

■ **Share assessment information and apply results to improve management.** Share information widely by posting the information in the MPA or relevant web site. This also presents a marketing tool for managers to justify changes in the management scheme.

## WHERE TO EXPAND YOUR KNOWLEDGE AND GET MORE INFORMATION?

- **Appeldoorn, R.S. and K. C. Lindeman. 2003.** [“A Caribbean-Wide Survey of Marine Reserves: Spatial Coverage and Attributes of Effectiveness.”](#) Gulf and Caribbean Res. 14(2)139-154.
- **Bunce, L., P. Townsley, R. Pomeroy and R. Pollnac. 2000.** [“Socioeconomic manual for coral reef management.”](#) Australian Institute of Marine Science.
- **Corrales, L. 2005.** [“Manual for the rapid evaluation of the management effectiveness in marine protected areas of Mesoamerica.”](#) MBRS Technical Document 7, 54 pp.
- **Gombos, M., A. Arrivillaga, D. Wusinich-Mendez, R. Glazer, S., Frew, G. Bustamante, E. Doyle, A. Vanzella-Khoury, A. Acosta, and B. Causey. 2011.** [“A management capacity assessment of selected coral reef marine protected areas in the Caribbean”.](#) Commissioned by the National Oceanic and Atmospheric Administration (NOAA) Coral Reef Conservation Program (CRCP), the Gulf and Caribbean Fisheries Institute (GCFI) and by the UNEP-CEP Caribbean Marine Protected Areas Management Network and Forum (CaMPAM). 269 pp.
- **Germano, B.P., S.A. Cesar and G. Ricci. 2007.** [“Enhancing Management Effectiveness of Marine Protected Areas: A Guidebook for Monitoring and Evaluation.”](#) Marine Laboratory, Institute of Tropical Ecology, Leyte State University, Visca, Baybay, Leyte 6521-A, Philippines.
- **Hocking, M., Stolton, S. and Dudley, N. (2000).** [“Evaluating Effectiveness: A Framework for Assessing the Management of Protected Areas Best Practice Protected Area Guidelines”](#) Series, 6. IUCN, Gland, Switzerland and Cambridge, UK.x + 121pp.
- **Homer, F. 2004.** [“Management effectiveness of Caribbean MPAs: design, appropriateness and delivery \(the case of Anguilla\)”.](#)
- **Loper, C., R. Pomeroy, V. Hoon, P. McConney, M. Pena, A. Sanders, G. Sriskanthan, S. Vergara, M. Pido, R. Vave, c. Vieux and I. Wanyonyi. 2008.** [“Socioeconomic conditions along the worlds tropical coasts: 2008.”](#) National Oceanic and Atmospheric Administration (NOAA), Global Coral Reef Monitoring Network (GCRMN) and Conservation International (CI). 56pp.
- **McConney, P. and M. Pena. 2012.** [“Capacity for \(Co\)Management of Marine Protected Areas in the Caribbean.”](#) Coastal Management, 40:3, 268-278.
- **Marshall, P., H. Schuttenberg. 2006.** [“A Reef Manager's Guide to Coral Bleaching.”](#) Great Barrier Reef Marine Park Authority.
- **MBRS Project. 2004.** [“Manual for the Rapid Evaluation of Management Effectiveness in Marine Protected Areas of Mesoamerica.”](#) MBRS Technical Document No. 17. The protocol was developed after the recommendations of the workshop on monitoring and evaluation of the National Systems of PA of Mexico, Belize, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama. IUCN, WCPA and NOAA.
- **Pena, M. 2006.** [“Report on Management Effectiveness at the Tobago Cays Marine Park \(TCMP\), St.Vincent and the Grenadines.”](#) CERMES Regional Project on Enhancing Management Effectiveness at Three Marine Protected Areas in St. Vincent and the

Grenadines, Jamaica and Belize. Report No. 5, 59 pp.

■ **Pomeroy, R.S. J.E. Parks and L.M. Watson. 2004** [“How your MPA is doing. A guidebook of natural and social indicators for evaluating marine protected areas management effectiveness.”](#) IUCN, Gland, Switzerland and Cambridge, UK, xvi + 216pp.

■ **Roach, D. 2007.** [“Report on Management Effectiveness at the Negril Marine Park \(NMP\), Jamaica.”](#) CERMES Regional Project on Enhancing Management Effectiveness at Three Marine Protected Areas in St. Vincent and the Grenadines, Jamaica and Belize Report No. 7. 68pp.

■ **Roach, D and C. Garcia. 2007.** [“Report on Management Effectiveness at the Sapodilla Cayes Marine Reserve \(SCMR\), Belize.”](#) CERMES Regional Project on Enhancing Management Effectiveness at Three Marine Protected Areas in St. Vincent and the Grenadines, Jamaica and Belize Report No. 10. 52pp.

■ **Rogers, C., G. Garris R. Brober, Z, Hillis and M.A. Franke. 1994.** [“Coral Reef Monitoring Manual for the Caribbean and Western Atlantic National Park Service, U.S. Virgin Islands National Parks.”](#)

■ **Saterson, K, R. Margoluis, and N. Salafsky (eds.). 1999.** [“Measuring Conservation Impact. An interdisciplinary approach to project monitoring and evaluation.”](#) Proceedings from a BSP symposium held at the joint annual meetings of the Ecological Society of America and the Society for Conservation Biology in Providence, Rhode Island, August 1996.

■ **Solares-Leal, I. and O. Álvarez-Gil.** [“Socioeconomic assessment of Punta Allen. A tool for the management of a coastal community, Sian Kaan Biosphere Reserve,](#)

[Mexico.”](#) UNEP-CAR/RCU's Sub-Programme "Conservation and Sustainable Use of Major Ecosystems in the Wider Caribbean" of the Regional Programme on Specially Protected Areas and Wildlife (SPA) and established in the project MT/1010-01-03: "International Coral Reef Action Network (ICRAN)"

■ **Wongbusarakum, S. and C. Loper. 2011.** [“Indicators to assess community-level social vulnerability to climate change: An addendum to SocMon and SEM-Pasifika regional socioeconomic monitoring guidelines.”](#)

■ **Garaway, C. and M. Esteban. 2003.** [“Increasing MPA effectiveness through working with local communities.”](#) Guidelines for the Caribbean. MRAG Ltd., London, UK, 45pp.

#### Important websites:

- [US NOAA MPA Center](#)
- [Reef Check Monitoring Protocol](#)
- [Healthy Reef Indicators](#)
- Socio-economic Monitoring by Caribbean Challenge MPA Managers, Caribbean Challenge [www.cavehill.uwi.edu/cermes/cc\\_socmon\\_documents.html](http://www.cavehill.uwi.edu/cermes/cc_socmon_documents.html)
- [Coral Reefs. A Reef Resilience Toolkit Module.](#) Measuring Management Effectiveness. Need for Evaluating Management Effectiveness.