IUCN Programme on Protected Areas

How is your MPA doing?

A Guidebook of Natural and Social Indicators for Evaluating Marine Protected Area Management Effectiveness

Robert S. Pomeroy
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WWF
NOAA
IUCN
The World Conservation Union

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Contents

JEFF ROTMAN/NATUREPL.COM

Most of our planet is a marine system. Human impacts on the seas need to be effectively managed, a process in which Marine Protected Areas (MPAs) are vital.

Foreword

Management of the world's ocean resources and habitats is entering a new phase. A key outcome of the 2002 World Summit on Sustainable Development was the commitment to establish "… marine protected areas consistent with international law and based on scientific information, including representative networks, by 2012". This outcome translated a long-standing goal of the IUCN World Commission on Protected Areas under its programme for the marine biome (WCPA Marine) into a political imperative. The challenge of establishing a representative system of marine protected areas (MPAs) is surpassed by the challenge that they are managed effectively over time. There is a long way to go in achieving this goal, with less than 1% of the world's ocean declared under marine protected areas and fewer than 10% of marine protected areas that exist today achieving their management goals and objectives (Kelleher *et al.*, 1995). Ultimately, it is only by assuring their effective management that MPAs can contribute to the ambitious overarching goals of biodiversity conservation, sustainable use of marine resources, and an improved quality of life for coastal communities.

Marine protected areas are established for a wide range of purposes, including protecting marine species and habitats, conserving marine biodiversity, restoring fisheries stocks, managing tourism activities, and minimizing conflicts among diverse resource users. To achieve these goals, specific and measurable objectives must be defined in terms of what outputs and outcomes are being sought. This in turn requires that well-defined management plans be developed, measures of MPA success be identified, impacts of management actions be monitored and evaluated, and that the results of these activities be fed back into the planning process to revise objectives, plans and outcomes. In other words, MPAs need to be adaptively managed. ***It is only by deliberately integrating monitoring and evaluation into the overall MPA management process that such benefits of adaptive management can be fully realized.***

Too often in the past, protected area management has been assessed on the basis of how much money has been spent, how many permits issued, how many enforcement actions have been taken, or how many laws and regulations have been adopted. These 'input' measures may or may not necessarily be indicative of management progress.

Evaluation consists of assessing whether the actions taken have produced the desired results (outcomes and outputs), however they are defined. It is something that many managers already do where the link between actions and consequences can be simply observed.

But the link between action and outcome is often not so obvious. Faced with the daily demands of their jobs, many managers are not able to systematically monitor and review the results of their efforts. In the absence of such reviews, however, money and other resources can be wasted on programmes that do not achieve their objectives. In a climate of ever-greater emphasis on performance and value for money, managers must expect to come under greater pressure to introduce systems for monitoring and evaluation that will:

- Promote and enable an adaptive approach to management where managers learn from their own and others' successes and failures; and

- ❑ Keep track of the consequent changes in management objectives and practices so that people can understand how and why management is being undertaken in this way.

Governments, funding agencies and stakeholders who are to benefit from MPAs are increasingly requiring information on management effectiveness that will allow them to assess whether results are commensurate with the effort and resources being expended and are in line with policy and management goals.

Managers are likely to experience greater support and trust when they provide information about what they are doing and what they are achieving. Management is therefore seen to be open and accountable.

Managers can also use the results of management effectiveness evaluations to develop convincing requests for additional resources. Such proposals are more likely to win support when they can be justified on the basis of evaluation results.

In practice, evaluation results are usually used in more than one way. Information used by managers to improve their own performance (adaptive management) can also be used for reporting (accountability), or lessons learned by others can be used to improve future planning.

Regardless of what drives the process, evaluation should be seen primarily as a tool to assist managers in their work, not as a system for punishing managers for inadequate performance.

This initiative to improve the evaluation of management performance in marine protected areas has evolved from the work of a larger IUCN/WCPA collaboration on the management effectiveness of protected areas in all biomes. This guidebook is the result of a close and productive partnership between the programme for the marine biome of the IUCN World Commission on Protected Areas, the World Wide Fund for Nature, and the US National Oceanic and Atmospheric Administration.

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MPA Management Effectiveness Initiative Leads

Preface

Greetings. This publication represents over three years of work by dozens of people around the world, many of whom – like you – are MPA managers or practitioners of marine conservation and protection. It is our hope that you will find this guidebook useful in your challenging position as a manager or conservation practitioner.

JOHN PARKS

How the guidebook was developed

This guidebook was developed to help MPA managers and practitioners better achieve the goals and objectives for which their MPA was created. The IUCN World Commission on Protected Areas under its programme for the marine biome (WCPA Marine) and the World Wide Fund for Nature (WWF) both work throughout the world to support MPAs, their managers and constituents. In keeping with their missions, the two organizations jointly formed the *MPA Management Effectiveness Initiative* (MPA MEI) in 2000 with four main objectives: 1. develop a set of *marine-specific* natural and social indicators to evaluate MPA management effectiveness with expert input from around the world; 2. develop a process for conducting an evaluation in the form of an easy-to-use guidebook, incorporating insight and experience from international peer review; 3. field-test and ground-truth a draft of the guidebook process and indicator methods at MPA sites operating in diverse conditions around the world; and 4. encourage and support managers and practitioners to use the revised evaluation methodology and guidebook to adaptively manage their MPAs and increase effectiveness.

To accomplish these objectives a number of activities were conducted between 2001 and 2003 to construct a product that was well grounded in both the marine and social sciences and includes real-world expertise and feedback by those who work closest with MPAs as part of their careers, research or livelihood. These activities included:

- A survey of MPA goals and objectives from around the world, falling into three primary categories: biophysical, socio-economic and governance (April–July 2001).
- Research on over 130 indicators used to measure various aspects of the marine environment and coastal communities, linking indicators to relevant MPA goals and objectives, and peer review of draft sets of goals, objectives and indicators (August–September 2001).
- Holding a workshop of 35 experts from 17 different countries, who reviewed, evaluated and prioritized each of the potential indicators, resulting in a revised set of 52 indicators and information on each indicator (Venezuela, October 2001).
- Refining and making 44 indicators operational by describing definitions, methods of measurement, and guidance on analysis of the results, followed by two rounds of peer review (November 2001–June 2002).
- Identifying and selecting volunteer MPA pilot sites to field-test the guidebook (February–May 2002).
- Preparation of the first draft of the book, and distribution to external experts and pilot sites for peer review (July–August 2002).

TONY ECKERSLEY

- ❏ Revision of the draft guidebook based on external reviews and preparation of a second draft for the pilot sites (August–September 2002).
- ❏ Holding of a training workshop with representatives from 20 MPA pilot projects to learn how to use the guidebook and how to test the indicators in the field (Hawaii, September 2002).
- ❏ Field-testing of the guidebook at pilot sites (November 2002–April 2003).
- ❏ Revising the guidebook into a third draft and distributing this for final peer review (November 2002–March 2003).
- ❏ Completion of final revisions to the book based on reports from the MPA pilot projects (April–July 2003).
- ❏ Sessions held at the Vth World Parks Congress in Durban, South Africa to introduce the guidebook and case studies from field-testing (September 2003).

As you can see with this summary timeline, one of the most important activities in the development of this guidebook was to ground-truth a draft version by field-testing the evaluation process and indicators at different MPA pilot sites around the world (see the Appendix to learn more about these sites). This effort helped to ensure that the draft guidebook was realistic and applicable under real-world MPA conditions, or 'in-the-water' so to speak. Testing and revising the draft guidebook was also a way of involving many of those who work in MPAs everyday and deal with the daily pressures and demands of managing these areas. These colleagues provided the necessary experience and wealth of feedback to make the guidebook practical and as useful as it can be for as many different types of MPAs as possible. In order to highlight some of this knowledge and experience, we have included actual results and examples from the pilot sites.

Partners and sponsors

The **IUCN World Commission on Protected Areas (WCPA)** is one of six Commissions of IUCN – The World Conservation Union and is the world's leading global network of protected area specialists. It has over 1,200 members from 140 countries. It is coordinated by a steering committee and organized into 16 regions, two biomes (including marine), six theme areas (including management effectiveness) and nine task forces. The WCPA work programme is undertaken with the support and partnership of many organizations. WCPA's programme for the marine biome (WCPA Marine) was established in 1986 with the goal of *providing for the protection, restoration, wise use, understanding and enjoyment of the marine heritage of the world in perpetuity through the creation of a global, representative system of marine protected areas and by building the capacity to manage these areas.* The activities of the WCPA Marine programme are conducted at national, regional and global levels to increase the management capacity of institutions and practitioners while building an effective network of globally representative MPAs.

The **World Wide Fund For Nature** (**WWF)** is one of the world's largest and most experienced independent conservation organizations, with five million

supporters and a global network of offices in more than 90 countries worldwide. WWF's mission is to stop, and eventually reverse, the accelerating degradation of our planet's natural environment, and to help build a future in which humans live in harmony with nature. To achieve this ambitious goal, WWF is working to conserve nature and ecological processes by preserving genetic species and ecosystem diversity; to ensure that the use of renewable natural resources is sustainable now and in the longer term, for the benefit of all life on Earth; and to promote actions to reduce to a minimum the pollution and the wasteful exploitation and consumption of resources and energy. WWF-International, based in Gland, Switzerland, leads and coordinates the WWF Network, develops joint policies and standards, fosters global partnerships, and implements part of WWF's international conservation programme.

National Ocean Service, National Oceanic and Atmospheric Administration (NOS/NOAA). The National Ocean Service (NOS) is part of the National Oceanic and Atmospheric Administration (NOAA), US Department of Commerce (DOC). NOS views its role as the nation's principal advocate for coastal and ocean stewardship. It works to carry out this role through a combination of scientific research; monitoring, observing and predicting scientific phenomena; preserving and restoring ocean and coastal areas; establishing and enhancing the capacity of state and local governments to manage coastal resources; mapping and charting; and responding to spills of hazardous substances. The NOS International Program Office (IPO) serves as the focal point for NOS-wide international activities and collaboration with national and foreign government agencies, non-governmental organizations (NGOs), academic institutions and others. International activities are focused on integrated coastal management; the management of marine protected areas (MPAs); mitigation of impacts from climate change; safe, efficient and environmentally sound maritime navigation; the reduction of impacts from natural disasters; and capacity-building. In addition to IPO, the NOS Office of Coastal Programs and the NOAA Coral Grants Program sponsored several of the pilot sites that field-tested this guidebook.

TONY ECKERSLEY

The David and Lucile Packard Foundation has supported the development of the MPA Management Effectiveness Initiative and has made possible the publication of this guidebook for MPA managers and practitioners around the world.

The authors

Robert S. Pomeroy is a marine resource economist and an internationally recognised expert on coastal and marine resource management and collaborative management. He is an Associate Professor in the Department of Agricultural and Resource Economics and a Fisheries Extension Specialist with the Connecticut Sea Grant College Program at the University of Connecticut-Avery Point. He also serves as a Senior Conservation Research Associate with the Community Conservation Network. He has held positions as faculty at the Department of Applied and Agricultural Economics at Clemson University, Senior Scientist at the International Center for Living Aquatic Resources Management, and Senior Coastal and Marine Associate in the Biological Resources Program of the World Resources Institute.

PARKS CANADA

PARKS CANADA

Dr. Pomeroy has led numerous international research projects on fisheries management and aquaculture.

John E. Parks is an applied researcher who works through both the biological and behavioural sciences to better understand and improve the practice of marine conservation. He is a Research Associate with the Community Conservation Network in Honolulu, Hawaii and a fellow with the Environmental Leadership Program. Previously, John served as a Research Associate with the Biological Resources Program of the World Resources Institute and as a Senior Program Officer with the Biodiversity Support Program of the World Wildlife Fund. John focuses principally on the adaptive management of marine protected areas, the testing and appropriate use of community-led conservation in the Indo-Pacific, and exploring the role of psychology in addressing conservation questions.

Lani M. Watson is a marine ecologist and specializes in the management and protection of the marine environment. She is an International Affairs Specialist with the National Oceanic and Atmospheric Administration National Ocean Service, where she began as a Knauss Sea Grant Fellow in Marine Policy. She works on domestic and international marine policy, management and protected area issues, and advises on applying management effectiveness evaluations and indicators in marine programmes. Lani is the Project Manager for the WCPA-Marine/WWF MPA Management Effectiveness Initiative.

Acknowledgements

This guidebook reflects an enormous group effort. Each of three drafts were developed through collaboration with dozens of experts and practitioners from numerous organizations working in the fields of the natural and social sciences and the science and management of marine protected areas and marine conservation. The substantial support and contribution made by these colleagues greatly assisted in our writing and revising this guidebook. We would like to acknowledge the contributions of a number of individuals.

This guidebook is a product of the *WCPA Marine/WWF MPA Management Effectiveness Initiative* that is led by Charles "Bud" Ehler, Director of the International Program, NOS/NOAA, and Vice-Chair, WCPA Marine, and Simon Cripps, Director of the Endangered Seas Programme, WWF International. In addition to the authors and leads of the Initiative, a core team of the following NOAA and WWF staff dedicated significant time and skills to assist in all aspects of the Initiative, including the development of this guidebook: Miguel Jorge (WWF) provided guidance in the design and development of the Initiative and coordinated the WWF pilot sites and technical assistance in field-testing this guidebook; Leah Bunce (NOAA) provided expertise and reviewed the draft socio-economic indicators, facilitated an expert group review of them, and assisted in training pilot sites in their use; Gonzalo Cid (NOAA) assisted in the pilot site selection, in the synthesis and analysis of both external peer reviews and reports from pilot sites, and helped in generating the guidebook, including lending his artistic and design talents on draft versions of the guidebook; Steve Morrison (NOAA) and Alison

Hammer (NOAA) developed the internet site for the Initiative (http://effectiveMPA.noaa.gov), which included developing profiles of the pilot sites and ensured that the hyperlinks throughout the guidebook are available online; Lisa Max (NOAA) assisted with the initial research conducted on the biophysical goals, objectives and indicators.

As mentioned previously, field-testing was a critical step in making this guidebook flexible enough for a wide range of MPAs. The people who served as the project leads and represented the MPA pilot sites and management teams devoted their enthusiasm, participation, and technical expertise in applying the process and methods of the draft guidebook at their sites. Their findings, feedback and experiences are reflected in this published version. We would like to express our deep gratitude to the following pilot site representatives for their contributions to this text: Thorne Abbott (Bird Island Marine Sanctuary and Sasanhaya Fish Reserve, CNMI), Antonio Araújo (Banc D'Arguin National Park, Mauritania), Miguel Alamilla (Hol Chan Marine Reserve, Belize), Sylvain Archambault (Saguenay-St. Lawrence Marine Park, Canada), Mohamed Ould Bouceif (Banc D'Arguin National Park, Mauritania), José Campoy (Upper Gulf of California and Colorado River Delta Biosphere Reserve, Mexico), Erica Cochrane (Bird Island Marine Sanctuary and Sasanhaya Fish Reserve, CNMI), Marco Costantini (Miramare Marine Protected Area, Italy), Nancy Dahl-Tacconi (Bunaken National Park and Sebesi Marine Reserve, Indonesia), Marivel Dygico (Tubbataha Reef National Marine Park, Philippines), Simon Ellis (Lenger Island Marine Protected Area, Micronesia), Yimnang Golbuu (Ngemelis and Ngerumekaol, Palau), Pablo Guerrero (Galapagos Islands Marine Reserve, Ecuador), Jay Gutiérrez (Achang Reef Flat Preserve, Piti Bomb Holes Preserve and Tumon Bay Marine Reserve, Guam), Eugene Joseph (Lenger Island Marine Protected Area), Sylvestor Kazimoto (Mafia Island Marine Park, Tanzania), Rosa Maria Loreto (Banco Chinchorro Biosphere Reserve, Mexico), Andrey Malyutin (Far East Marine Preserve, Russia), Jason Rubens (Mafia Island Marine Park, Tanzania), Murray Rudd (Achang Reef Flat Preserve, Piti Bomb Holes Preserve and Tumon Bay Marine Reserve, Guam), Ileana Solares-Leal (Sian Ka'an Biosphere Reserve, Mexico), Jorge Torre (Loreto Bay National Park, Mexico), Mark Tupper (Achang Reef Flat Preserve, Piti Bomb Holes Preserve and Tumon Bay Marine Reserve, Guam), and Anne Walton (Channel Islands National Marine Santuary, USA).

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The opinions expressed are those of the authors. Any errors or omissions included in the text are the sole responsibility of the authors and should be reported to them accordingly.

A few points to keep in mind

We'd like to ask you to think of this guidebook as a map that is meant to guide you down the general path of evaluating your MPA, but that does not try to predict every step along the way. We recommend that you use this guidebook along with other sources and methodologies that offer alternate routes or short cuts for your particular needs. It is our hope that this guidebook will provide a complementary resource that helps people reach their final destination: a completed evaluation with results that enable them to adaptively manage and improve MPAs.

The aim of this guidebook is to be as practical and applicable as possible, so that it can be used by many different MPA managers and conservation practitioners in varying types of MPAs. Therefore, the methodologies presented in this guidebook have been chosen to reflect more approachable, rather than the most advanced, scientific methods. As such, the data collection and analysis techniques lean towards simplicity, rather than complexity. We did this deliberately so that this guidebook would be a starting point in helping MPA managers and conservation practitioners measure management effectiveness. Our vision is that someday soon, sufficient management capacity will exist globally to develop more advanced sets of measurement and analytical techniques. Until then, we hope that this guidebook strikes a balance for all those who apply it to their particular needs and resources.

One final, but critical, caveat: this guidebook is not intended to be used as a scorecard to compare one MPA site or groups of MPA sites to each other. The evaluation process and indicators are intended for use in a positive way to help managers and practitioners improve the management of MPAs by reaching their MPA goals and objectives more effectively and efficiently. The indicators should highlight successes, as well as challenges, and the information should not be used against an MPA or to negatively impact the support for any given MPA.

In closing, we hope that the process described in this guidebook will be rewarding for all involved. Although conducting an evaluation can seem like a daunting or mundane task, both others and we have learned that the evaluation process can foster much learning and even be fun. The evaluative process can highlight both successes and failures, however the insight and clarity that can be gained are incentives for continuing such important work in marine management and conservation. We wish you a rewarding experience and journey ahead.

Robert S. Pomeroy *John E. Parks* *Lani M. Watson*

Box 1

What this Guidebook is

- Flexible so that it can be integrated into what you are already doing
- A basic and generic starting point on how to evaluate your MPA
- A 'toolbox' of indicators to pick and choose from
- Something that should be used with other MPA manuals/texts
- Something you should feel free to adapt, add to and improve on as needed
- Written for MPA managers and conservation practitioners
- To be used with input from scientific professionals and MPA experts
- A short introduction on analysis and interpretation

What this Guidebook is not

- A summary of all available survey methods
- A source of advanced, state-of-the-art scientific techniques
- One-size-fits-all that should be used by all MPAs everywhere
- A finite set of indicators or prescription of minimum indicators that should be used by MPAs
- Trying to be all things to all MPAs and management levels
- Written for scientific experts and advanced researchers
- Requiring a high level of statistical expertise from the reader
- A complete guide on data analysis

Tony Eckersley

Artisanal fishing is at the heart of many MPA strategies, in the knowledge that closing areas to fishing can dramatically reverse decline of fish stocks and improve catches in neighbouring areas. Monitoring the effects of such closures can provide evidence of their benefits that helps build the case for conservation.

Introduction

Purpose of this guidebook

This guidebook offers managers and other conservation **practitioners**[1] a process and methods to evaluate the effectiveness of **marine protected areas** (MPAs) for the purposes of adaptive management. The evaluation is based on indicators that measure the effectiveness of management actions in attaining **goals** and **objectives** that are specific to MPAs, the marine environment and coastal communities. It presents a flexible approach that can be used in many types of MPAs, such as multiple-use areas or **no-take zones**, where each may have different goals and objectives. It offers a variety of indicators that reflect a diversity of MPA goals and objectives. These can be selected to best match your MPA based on the needs and resources of your site.

> *There is strong consensus and a growing volume of scientific evidence that identifies the needs of MPAs and the values that they provide. Guidelines on how best to design and manage MPAs are available (e.g. Salm* et al.*, 2000; Kelleher, 1999; Kelleher and Kenchington, 1992). If you are familiar with this literature and actively managing or working with an MPA – this guidebook is for you. It will help you evaluate whether or not the desired outcomes of your MPA are being achieved.*[2]

There are a number of methods available for monitoring and evaluating protected areas. To date there has not been a comprehensive methodology developed for monitoring and evaluating **management effectiveness** of MPAs. To fill this gap, this guidebook includes indicators that address various aspects of management effectiveness: biophysical, socio-economic, and governance. The majority of these indicators measure **outputs** and **outcomes** of MPA management. Outputs and outcomes represent tangible benefits associated with the MPA. Learning from indicator results can help to improve MPA management and secure resources and support.

> *This guidebook is not a 'one-stop-shop' for MPA management or evaluation. This guidebook should be used in conjunction with other materials and literature that are available to practitioners (see References). For example, other works focus on the context, planning, process and inputs into MPAs (Hockings* et al.*, 2000, Mangubhai and Wells, 2004, in draft).*

Why evaluate management effectiveness?

Marine and coastal resource management has evolved into a professional practice. There is recognition of the need for marine and coastal managers to

"This guidebook offers managers and other conservation practitioners a process and methods to evaluate the effectiveness of marine protected areas (MPAs) for the purposes of adaptive management."

Box 2

What is a Marine Protected Area?

This guidebook follows the accepted IUCN (1999) definition of an MPA as:

"Any area of **intertidal** *or* **subtidal** *terrain, together with its overlying waters and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment."*

In many cases effective MPA management will need to reflect the relationship between the marine and terrestrial environments and human uses. For example, to be an effective coastal MPA, managers will need to work with inland developers and take into consideration broader watershed issues.

1 *Terms highlighted in bold in this way are defined in the Glossary (pp. 213–215).*

2 *Points that the authors wish to emphasise are highlighted with a vertical bar.*

Key principles

The evaluation process in this guidebook is founded on five key principles. It must be:

- ***Useful*** to managers and stakeholders for improving MPA management.
- ***Practical*** in use and cost.
- ***Balanced*** to seek and include scientific input and stakeholder participation.
- ***Flexible*** for use at different sites and in varying conditions.
- ***Holistic*** through a focus on both natural and human perspectives.

be more systematic in using MPAs to improve marine conservation learning and create a set of best management practices. To meet this need, there is general consensus among conservation practitioners that evaluation of management effectiveness will improve MPA practice. It is particularly relevant now given the focus on implementing MPAs and increasing their number.

Effective management of MPAs requires continuous feedback of information to achieve objectives. The management process involves planning, design, implementation, monitoring, evaluation, communication and adaptation. Evaluation consists of reviewing the results of actions taken and assessing whether these actions are producing the desired outcomes. Evaluation is a routine part of the management process and is something that most managers already do. The evaluation of management effectiveness builds on this existing routine.

The link between actions and outcomes is often not so obvious. Faced with the daily demands of their jobs, many managers are not able to regularly and formally step back and reflect on the cumulative results of their efforts. In the absence of such reflection, resources may be wasted and objectives may not be achieved. The evaluation of management effectiveness provides a formal way to learn from successes and failures and help people understand how and why management practices are being adapted.

Adaptive management is a fundamental concept underlying this guidebook. Adaptive management is the cyclical process of systematically testing assumptions, generating learning by evaluating the results of such testing, and further revising and improving management practices. The result of adaptive management in a protected area context is improved effectiveness and increased progress towards the achievement of goals and objectives.

Evaluation is often perceived as a difficult, excessive and overly technical activity that requires the involvement of outside 'specialists'. For some, the word 'evaluation' implies supervision, discipline and potential penalties. It is important to clearly communicate the reasons and benefits of doing a management effectiveness evaluation to both internal staff and external stakeholders. This will help you to focus on improving conservation success.

"Learning from indicator results can help to improve MPA management and secure resources and support."

The use of adaptive management in a conservation context is well documented in the literature (see References). An overview of the use of evaluation results for adaptive management of MPAs is included in Chapter 4, Communicating results and adapting management. Materials on adaptive management can be found at http://effectiveMPA.noaa.gov

"This guidebook offers a variety of indicators that reflect a diversity of MPA goals and objectives. These can be selected to best match your MPA based on the needs and resources of your site."

What is 'management effectiveness'?

This guidebook builds on the IUCN management effectiveness framework (Hockings *et al.*, 2000; see Box 3, The IUCN Management Effectiveness Framework). Management effectiveness is the degree to which management actions are achieving the goals and objectives of a protected area. This allows for the improvement of protected area management through learning, adaptation, and the diagnosis of specific issues influencing whether goals and objectives have been achieved. It also provides a way to show accountability for the management of an MPA.

Evaluating the management effectiveness of protected areas is not an easy task. For example, despite the best management efforts natural disturbances can radically alter ecosystems regardless of how well a protected area is being managed. The evaluation needs to be appropriate and accurate in assessing the degree of achievement directly linked to management actions.

> *In 1997, IUCN's World Commission on Protected Areas (WCPA) created a task force of experts in protected area management from different countries to develop guidelines to measure and evaluate the effectiveness of management and provide tools to better understand and improve the management of protected areas worldwide. Following extensive research, work, and testing, the IUCN Task Force created a framework entitled* "Evaluating Effectiveness: A Framework for Assessing the Management of Protected Areas" *(Hockings* et al., *2000).* See Box 3.

Fish from Mei Hol Chan, Belize, one of the MPA Management Effectiveness Initiative pilot sites.

Box 3

The IUCN Management Effectiveness Framework

The IUCN management effectiveness framework (Hockings *et al.*, 2000) presents an iterative protected area management cycle of design, management, monitoring, evaluation and adaptation.

Through this process, managers are empowered with the ability to diagnose and adaptively improve their management actions. To begin the evaluation process in this management cycle three sets of simple questions must be answered:

1. In terms of the design of the protected area:

   What is the *context* in which the protected area is designated?

   What is the desired result and how will *planning* enable its achievement?

2. In terms of how appropriate are the management system and process:

   What *inputs* are required to designate the protected area?

   What is the *process* used to go about defining it?

3. In terms of the achievement of desired objectives:

   What activities were undertaken and what were the *outputs* (products) of this?

   What *outcomes* (impacts) were achieved based on the outputs and their application?

These questions identify six categories of potential indicators for measuring management effectiveness:

- Context indicators
- Planning indicators
- Input indicators
- Process indicators
- Output indicators
- Outcome indicators

Using this general framework allows protected area managers to customize a set of appropriate indicators to be used on relevant scales. It serves as a foundation from which to further investigate a specific category of indicators (e.g. outcomes) or to determine which indicators are most appropriate based on the use of a specific protected area tool. The framework provides a common language and an important structure from which to improve protected area learning, efficacy and achievement. As a tool for designing an evaluation approach – rather than providing a specific set of indicators and methodologies to measure them – it helps to explain variations in the context, available resources, evaluative purpose and specific management objectives across protected areas.

To learn more about how the indicators in this guidebook relate to the IUCN management effectiveness framework, go to http://effectiveMPA.noaa.gov/guidebook/IUCNframework.html

Things for you to consider when using this guidebook

To conduct a management effectiveness evaluation, it is recommended that your MPA should ideally meet the following minimum requirements:

- ❑ It exists as a formal (legislated) MPA.
- ❑ There is an ongoing management planning process.
- ❑ There is a written management plan including clearly stated goals and objectives (see Box 4, The Goals and Objectives of an MPA).
- ❑ It has been in operation for at least two years.

If your MPA does not meet these minimum requirements, it is still possible to conduct an evaluation if there are stated goals and objectives available.

It is also recommended that you establish an evaluation team made up of individuals with the skills to conduct the type and level of evaluation you want to implement in your MPA. (See Chapter 2, Step 2–3 on forming an evaluation team.)

Finally, it is recommended that your evaluation team should ideally meet the following minimum requirements:

- ❑ Team members have an education or experience that equals a college degree in the natural sciences, social sciences, or related environmental and natural resource management studies.
- ❑ Team members are knowledgeable about the fundamentals and standard methods used in the biological and social sciences.

If you or other MPA staff do not meet these minimum requirements, seek assistance and look through the References.

"Evaluation is a routine part of the management process and is something that most managers already do. The evaluation of management effectiveness builds on this existing routine."

TONY ECKERSLEY

DAVID NOTON/NATUREPL.COM

Box 4

THE GOALS AND OBJECTIVES OF AN MPA

A protected area is one example of a conservation **strategy** that can be used to manage natural resources. When a decision is made to use an MPA strategy, one of the first steps taken is to design an appropriate management plan for the strategy (Salm *et al*., 2000; Kenchington, 1990). A management plan documents an explicit set of goals, objectives, and activities that will be undertaken over a specified period of time and area, and articulates how the conservation strategy being used is designed to address the **threats** present (Margolius and Salafsky, 1998; for more details). While not all MPAs require a complete management plan to begin operation, eventually a comprehensive plan will be needed to guide the long-term goals and development of the area (Salm *et al.*, 2000).

A **goal** is a broad statement of what the MPA is ultimately trying to achieve. A useful goal is:

- brief and clearly defines the desired long-term vision and/or condition that will result from effective management of the MPA,
- typically phrased as a broad mission statement, and
- simple to understand and communicate.

An **objective** is a more specific measurable statement of what must be accomplished to attain a related goal. Attaining a goal is typically associated with the achievement of two or more corresponding objectives. A useful objective (Margolius and Salafsky, 1998) is one that is:

- specific and easily understood,
- written in terms of what will be accomplished, not how to go about it,
- realistically achievable,
- defined within a limited time period, and
- achieved by being measured and validated.

For more information on how to develop good objectives go to http://effectiveMPA.noaa.gov/guidebook/MPA goals.html

Goals and objectives are preferably developed in a participatory manner to reflect a balance of the needs and desires of all stakeholders involved in the management of the MPA and use of marine resources.

Poorly designed and/or articulated goals and objectives can be a serious problem for MPA managers. A set of goals and objectives that have been appropriately developed and are useful for management purposes (as defined by the criteria listed below) will improve the likelihood of the MPA being effectively managed.

To find your goals and objectives and prepare for an evaluation:

- Obtain a list of goals and objectives from the management plan or relevant legislation.
- If there is no such list in the management plan, go through a participatory process to define them.
- Review whether the goals and objectives meet the above criteria that make them useful for doing an evaluation.
- The goals and objectives may need to be clarified or more properly worded for use in conducting an evaluation.

One important application of the results of an evaluation is to improve the quality of goals and objectives that guide management. It is important to examine the goals and objectives regularly to determine if they are appropriate or need to be revised to make them more clearly defined, measurable, and useful for future management purposes.

How to use this guidebook

This guidebook consists of two sections: Section 1 outlines the process for conducting an evaluation, and Section 2 describes the indicators that would be measured in an evaluation.

Section 1 is structured around a set of logical steps that you can follow when you conduct a management effectiveness evaluation. These steps are set out in four chapters that represent the overall evaluation process:

Chapter 1: Selecting an appropriate set of indicators to measure.

Chapter 2: Planning how to evaluate the indicators selected.

Chapter 3: Implementing the evaluation by collecting and analysing data.

Chapter 4: Communicating results and using the results for adaptive management.

Each chapter includes:

- ❏ A set of steps to accomplish each stage,
- ❏ A set of tasks or questions to complete each step, and
- ❏ Guidance, supplementary information and references to help you work through the process.

All of this is illustrated in a flowchart (Figure 1) so that you can easily use the guidebook. In addition, there is a worksheet (Worksheet 1) to help you keep track of where you are as you progress through the book. It is recommended that you go through each chapter in advance to become familiar with it and that you follow this step-by-step evaluation process.

Section 2 contains:

- ❏ An introduction to the MPA effectiveness indicators,
- ❏ Summary tables of goals, objectives and indicators, and
- ❏ Outlines of the biophysical, socio-economic and governance indicators.

Finally, this process takes time, people and money. Read carefully through the entire guidebook, become familiar with the process and the indicators, and understand what will be required to follow this approach.

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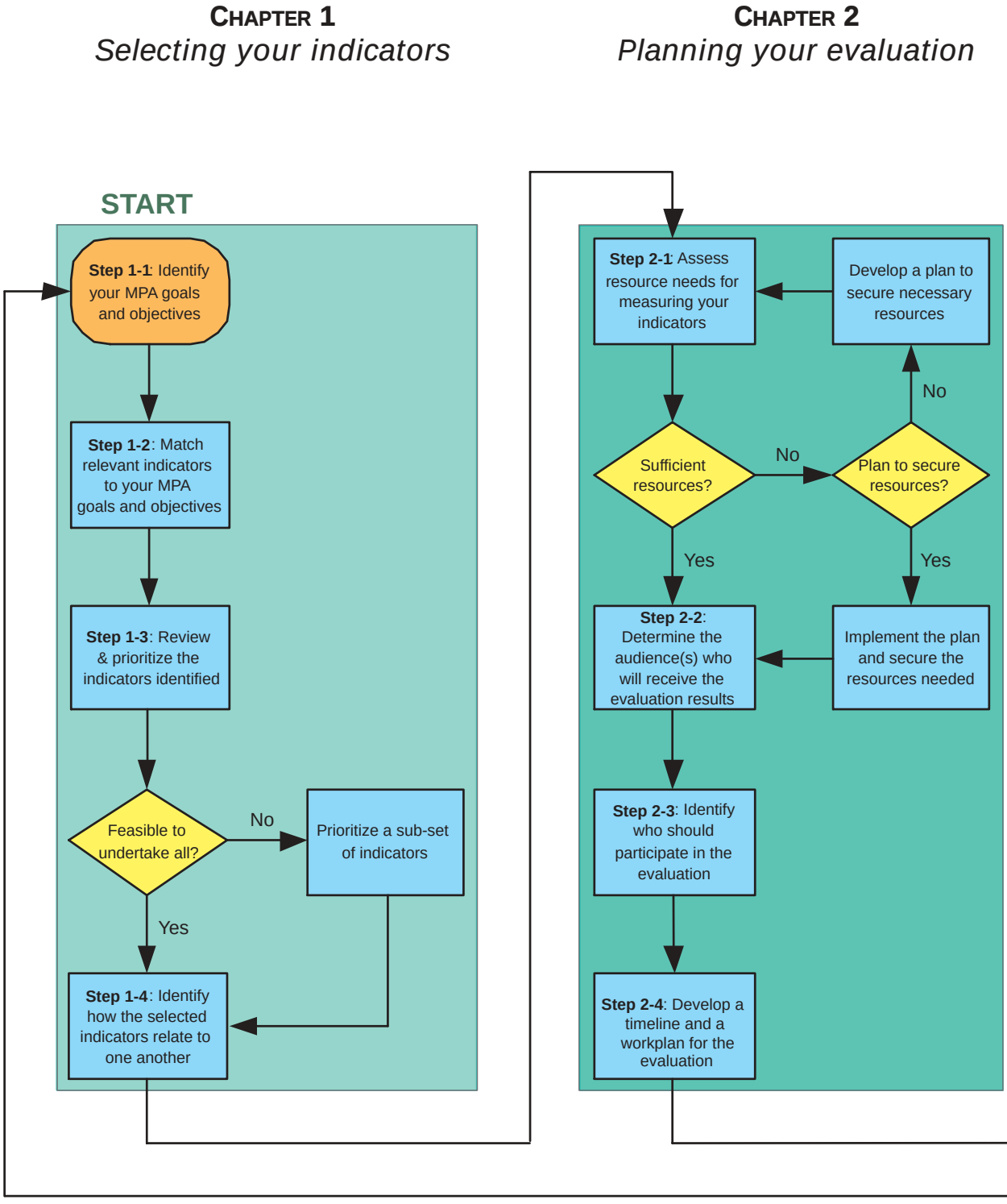
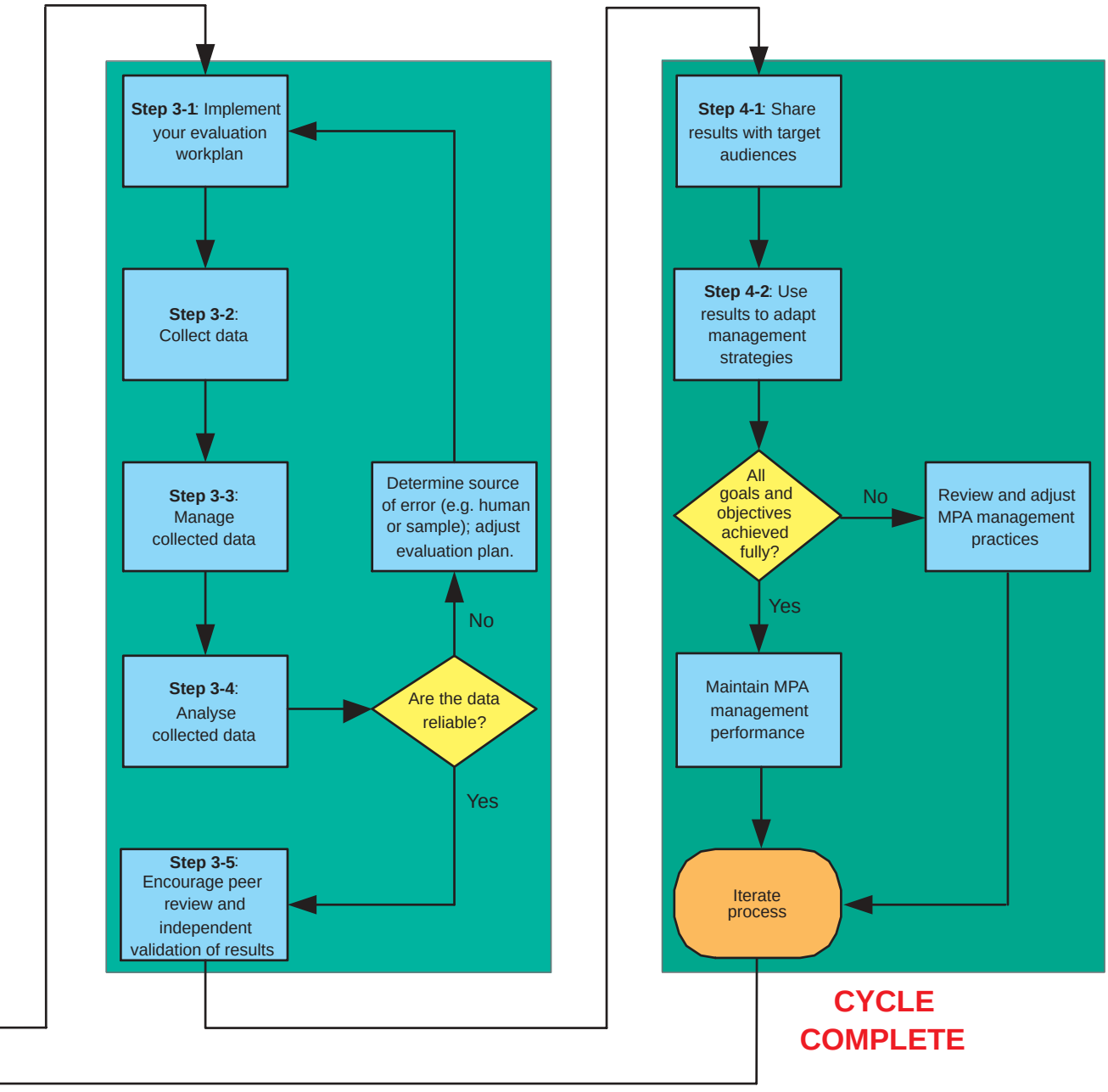
Figure 1


CHAPTER 1
Selecting your indicators
CHAPTER 2
Planning your evaluation
START
Step 1-1: Identify your MPA goals and objectives
Step 1-2: Match relevant indicators to your MPA goals and objectives
Step 1-3: Review & prioritize the indicators identified
Feasible to undertake all?
No
Prioritize a sub-set of indicators
Yes
Step 1-4: Identify how the selected indicators relate to one another
Step 2-1: Assess resource needs for measuring your indicators
Develop a plan to secure necessary resources
No
Sufficient resources?
No
Plan to secure resources?
Yes
Yes
Step 2-2: Determine the audience(s) who will receive the evaluation results
Implement the plan and secure the resources needed
Step 2-3: Identify who should participate in the evaluation
Step 2-4: Develop a timeline and a workplan for the evaluation

CHAPTER 3
Conducting your evaluation

CHAPTER 4
Communicating results and adapting management



Worksheet 1

PART 1 Selecting your indicators

		COMPLETED
1-1	***Identify your MPA goals and objectives***	
1-1a	Locate the management plan and other relevant information relating to your MPA	☐
1-1b	Review the documents and identify the goals and objectives (see Box 4, The Goals and Objectives of an MPA)	☐
1-1c	List the goals and objectives of your MPA on the worksheet provided (Worksheet 2)	☐
1-1d	Identify the goals and associated objectives of your MPA that overlap with those listed in the summary tables of goals and objectives (see Figures 2, 3 and 4 in Section 2)	☐
1-1e	List the overlapping goals and objectives on the worksheet (using the numbers and names in the summary tables)	☐
1-2	***Match relevant indicators to your MPA goals and objectives***	
1-2a	Identify the indicators that match your list of goals and objectives (see Figures 2, 3 and 4 in Section 2)	☐
1-2b	List the relevant indicators on the worksheet (using the numbers and names in the summary tables)	☐
1-3	***Review and prioritize the indicators identified***	
1-3a	Review each indicator identified from the description in Appendix 1	☐
1-3b	Determine the feasibility of measuring the indicators identified	☐
1-3c	If it is not feasible to measure all indicators, prioritize them	☐
1-3d	Complete the list of selected indicators	☐
1-4	***Identify how the selected indicators relate to one another***	☐

PART 2 Planning your evaluation

2-1	***Assess resource needs for measuring your indicators***	
2-1a	Determine the estimated human resources needed to measure and analyse the selected indicators	☐
2-1b	Determine the equipment needed to measure and analyse the selected indicators	☐
2-1c	Estimate the budget that will be needed for the evaluation	☐
2-1d	Assess the available human resources, equipment and budget; if not sufficient, develop a plan to secure funds. Secure additional resources as necessary	☐
2-2	***Determine the audience(s) who will receive the evaluation results***	
2-2a	Identify the target audience(s)	☐
2-2b	Determine and prioritize the primary audience(s)	☐
2-3	***Identify who should participate in the evaluation***	
2-3a	Determine the level of expertise that is needed to conduct the evaluation	☐

		COMPLETED
2-3b	Determine which staff or non-staff will conduct the evaluation	☐
2-3c	Determine how and when to involve the stakeholders	☐
2-3d	Create the evaluation team and determine the people responsible for each task	☐
2-4	***Develop a timeline and a workplan for the evaluation***	
2-4a	Determine the amount of time needed for each activity	☐
2-4b	Determine when the data need to be collected	☐
2-4c	Develop an evaluation workplan	☐

PART 3 Conducting your evaluation

(The checklist may be open at this step for many months while the chosen indicators are evaluated, surveys carried out, and reports completed in accordance with the evaluation techniques suggested in Section 2)

3-1	***Implement your evaluation workplan***	☐
3-2	***Collect data***	
3-2a	Study and understand the data collection methods	☐
3-2b	Familiarize yourself with the best practices and principles for collecting data in the field	☐
3-2c	Determine the sampling approach	☐
3-2d	Ensure everything is in place for data collection	☐
3-3	***Manage collected data***	
3-3a	Determine who will be the 'data manager'	☐
3-3b	Determine how collected data will be submitted to the data manager	☐
3-3c	Code the data	☐
3-3d	Develop a system for storing and entering the data	☐
3-3e	Collate and review the data set	☐
3-3f	Determine how to make the data available for analysis and sharing	☐
3-4	***Analyse collected data***	
3-4a	Review the questions being asked by the evaluation	☐
3-4b	Complete a preliminary analysis	☐
3-4c	Determine and prepare analyses	☐
3-4d	Capture and prepare results	☐
3-5	***Encourage peer review and independent evaluation of results***	☐

PART 4 Communicating results and adapting management

4-1	***Share results with target audiences***	
4-1a	Determine which format to use to provide evaluation results and to reach the target audience most effectively	☐
4-1b	Develop a strategy and a timeline for delivery of results	☐
4-1c	Tell your story! Communicate your findings to the stakeholders	☐
4-2	***Use results to adapt management strategies***	☐

(This step should never be closed since adaptive management is an open-ended tool)

SECTION 1 *The Evaluation Process*

GERRY ELLIS/MINDEN/FLPA

In nature, land and sea are intimately connected. The evaluation process should highlight the importance of protecting land, coast and sea in a continuum.

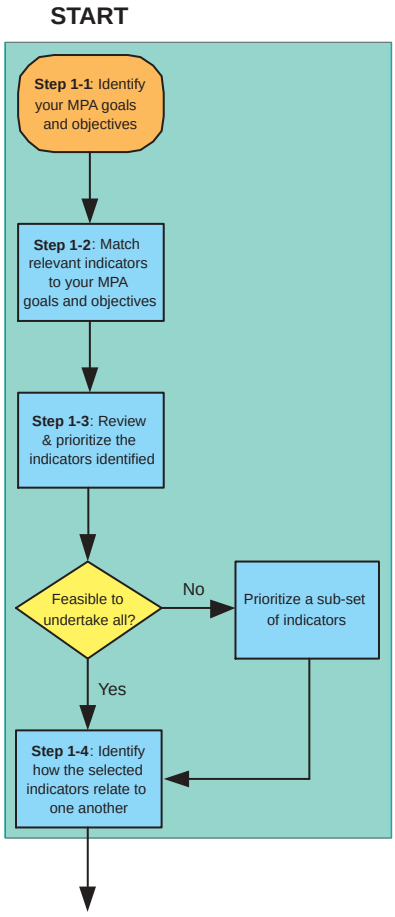
Let's start

Selecting indicators that are appropriate for your MPA is the first part of carrying out a management effectiveness evaluation. This includes the following steps:

- ❑ **Step 1-1 Identify your MPA goals and objectives**
- ❑ **Step 1-2 Match relevant indicators to your MPA goals and objectives**
- ❑ **Step 1-3 Review and prioritize the indicators identified**
- ❑ **Step 1-4 Identify how the selected indicators relate to one another**

Selecting the most appropriate indicators for your MPA is one of the most critical elements in using this guidebook. Before selecting indicators here are a few key points for you to consider:

- ❑ Clearly stated goals and measurable objectives serve as the basis to identify and select indicators that are most appropriate to your MPA (see Box 4, The Goals and Objectives of an MPA).
- ❑ The process of identifying indicators should be flexible to meet the needs of your MPA.
- ❑ If you identify many indicators, it does not mean that you have to measure all of them.
- ❑ If the goals and objectives of your MPA span biophysical, socio-economic, and governance issues, then your indicators should too.



Chapter 2. Planning your evaluation

Step 1-1 Identify your MPA goals and objectives

You can identify the goals and objectives of your MPA by completing the following tasks:

Task a Locate the management plan and other relevant information (e.g. accompanying legislation or declarative documents) relating to your MPA.

Task b Review the documents and identify the goals and objectives (see Box 4, The Goals and Objectives of an MPA).

Task c List the goals and objectives of your MPA on the worksheet provided (Worksheet 2). Some MPAs may have many goals and objectives. In this case, it may be useful to prioritize the goals and objectives and use these to select indicators.

Task d Identify the goals and associated objectives of your MPA that overlap with those listed in the summary tables of goals and objectives (see Figures 2, 3 and 4 in Section 2).

To learn a few ways to prioritize goals and objectives go to http://effectiveMPA.noaa.gov/guidebook/prioritize.html. If you decide to prioritize goals and objectives, it should be done with consideration of the needs of relevant stakeholders. These prioritized goals and objectives can be recorded in Step 1-1c.

Goals related to your MPA	Overlapping goals from summary tables (Figures 2, 3 and 4 in Section 2)	Objectives related to your MPA	Overlapping objectives from summary tables (Figures 2, 3 and 4 in Section 2)	Relevant indicators from summary tables (Figures 2, 3 and 4 in Section 2)

Task e ***List the overlapping goals and objectives on the worksheet (using the numbers and names in the summary tables).***

The generic goals and objectives in this guidebook are based on real MPA goals and objectives. A survey was done of MPAs from around the world – the list of goals and objectives fell into the three categories of biophysical, socio-economic, and governance. To learn more go to http://effectiveMPA.noaa.gov/guidebook/survey.html

Step 1-2 Match relevant indicators to your MPA goals and objectives

You can identify and match the relevant indicators by completing the following tasks:

Task a ***Look at your overlapping list of goals and objectives from Step 1-1. Identify the indicators that match your list of goals and objectives(see Figures 2, 3 and 4 in Section 2).***

Task b ***List the relevant indicators on your worksheet (using the numbers and names in the summary tables).***

A range of indicators is presented in Section 2, from which you can choose an appropriate set for your site (see Box 5, Introducing the Indicators, for a summary of how the indicators were developed). Every indicator may not be relevant to your MPA.

This guidebook is not intended to be used prescriptively. As each MPA is unique, indicators here are not universally applicable or appropriate to all MPAs. Likewise there is no single set of indicators that must be used.

Step 1-3 Review and prioritize the indicators identified

You can review and prioritize the indicators you identified by doing the following:

Task a ***Review each indicator identified from the description in Appendix 1.***

Task b ***Determine the feasibility of measuring the indicators identified.***

Note: Difficulty rankings are provided for each indicator and can be a helpful guide on how much time and effort it will take to measure an indicator.

Task c ***If it is not feasible to measure all indicators, prioritize them.***

Task d ***Complete the list of selected indicators.***

TONI PARRAS

TONI PARRAS

This selection process should not become more complex than necessary. In some cases, it should be fairly intuitive to identify the appropriate indicators given the goals and objectives of your MPA.

To learn ways to prioritize indicators go to http://effectiveMPA.noaa.gov/guidebook/prioritize.html. These prioritized indicators can be recorded in Step 1-3d.

Step 1-4 Identify how the selected indicators relate to one another

Now that you have selected your indicators, consider how they are related to one another by considering the natural and social conditions of your MPA. It is helpful to draw these relationships on paper in a diagram.

For example, legislation passed in your MPA may influence the types of livelihood activities that are allowed in the area. In turn, these livelihoods influence both the degree of fishing effort and the population size of particular target species present. The status of these species influences the degree to which the biophysical goals and objectives of an MPA are met.

In another example, socio-economic factors, such as stakeholder knowledge of natural history and the number and nature of markets, are directly related to the use of marine resources that influence the ecology of your MPA. Likewise, changes to habitat distribution and community composition in the ecosystem

Box 5

INTRODUCING THE INDICATORS

What is an indicator and how is it used?

An **indicator** is a unit of information measured over time that will allow you to document changes in specific attributes of your MPA. An indicator allows you to gauge an aspect that is not directly measurable or is very difficult to measure – such as effectiveness. Because 'effectiveness' is a multi-dimensional concept, a range of different indicators should be used to determine how your MPA is doing. These indicators can provide evidence of whether or not the goals and objectives of your MPA are being achieved. Alone, they are not sufficient proof.

Indicators provide results for several purposes:

- Indicator results feed into the MPA evaluation to measure and demonstrate management effectiveness. The indicators in this guidebook are designed to allow you to regularly diagnose the status of your MPA.
- Measuring, analysing and communicating indicators can promote learning, sharing knowledge, and better understanding of strengths and weaknesses of MPA management actions.
- MPA managers and practitioners can use indicator results to highlight the changes needed in management plans and practices to adapt and improve the MPA. If changes are made in management based on the results of an evaluation, the indicators can help people to better understand how and why changes are made.
- The indicators presented here will help you to learn more about your MPA and the people and resources that are impacted by it.

Go to the beginning of Section 2 to learn more about how the indicators were developed and how they should be used.

influence household occupational structure and enforcement procedures. Also, local values and beliefs about marine resources may influence the level of stakeholder participation in the MPA management process and activities.

To learn more about how these indicators are conceptually related to each other, visit http://effectiveMPA.noaa.gov/conceptualmodel

Box 6

Lessons from Field Tests of the Process

In testing this guidebook, most (82%) of the pilot site teams responded that they found the process of selecting indicators to be useful. A few found it unnecessary to follow the step-by-step process and were able to to match indicators as related to their MPA goals and objectives based on other priorities or methods more suited to their situation.

Also, in working through these steps, several sites reported that their MPAs did not have goals and objectives or found existing ones to be unclear and unmeasurable. They reported that the process of selecting indictors was particularly useful to them because it helped them to identify the need to refine or strengthen their goals and objectives.

To learn more about pilot site testing results, go to http://effectiveMPA.noaa.gov

NOAA Photo Library

Half of the pilot sites that tested a draft version of this guidebook reported that it needed to be simplified. All sites reported their intention to use it in future.

PETER SCOONES/NATUREPL.COM

MPAs are increasingly being considered for use offshore, in deeper waters and even beyond Exclusive Economic Zones (EEZs).

CHAPTER 2 Planning your evaluation

Conducting a thorough evaluation using the indicators you selected will require planning (see Figure 1, Part 2). This part of the guidebook includes the following steps:

- ❑ **Step 2-1 Assess resource needs for measuring your indicators**
- ❑ **Step 2-2 Determine the audience(s) who will receive the evaluation results**
- ❑ **Step 2-3 Identify who should participate in the evaluation**
- ❑ **Step 2-4 Develop a timeline and a workplan for the evaluation**

The planning process should be documented in an **evaluation workplan** to provide a record and structure to follow during the evaluation (see Box 7, Developing an Evaluation Workplan).

Step 2-1 Assess resource needs for measuring your indicators

In completing Chapter 1, you selected a set of appropriate indicators and became familiar with them and how to measure them. You now need to estimate the resources required to measure the indicators by completing the following tasks:

Task a Determine the estimated human resources needed to measure and analyse the selected indicators.

For example:

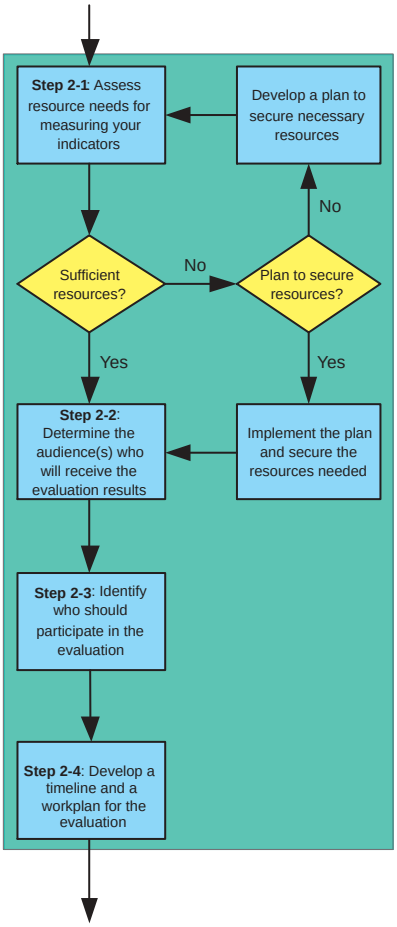
- ❑ How many people will be required to collect data for each indicator?
- ❑ How large an area/population needs to be sampled?
- ❑ How long will it take to complete the evaluation? How much time is needed for each indicator?
- ❑ What level of skills and training are necessary?
- ❑ Do the members of the evaluation team have these skills and training?
- ❑ Will outside technical assistance be required?
- ❑ Which indicators, if any, have similar data collection methods and can be measured concurrently?

Task b Determine the equipment needed to measure and analyse the selected indicators.

For example:

- ❑ What equipment (such as SCUBA gear or hand-held GPS units) and transportation (such as boats, a truck, fuel) are required to measure the indicators?
- ❑ What types of analytical tools (such as **database** and statistical software programmes, or GIS equipment) are needed to generate and analyse results?
- ❑ What types of infrastructure (such as electricity to run computers) are needed on site where the evaluation team will be working?

Chapter 1



Chapter 3. Conducting your evaluation

To help you, each indicator description in Section 2 contains a list of what is required to measure the indicator. In some cases, measuring an indicator is highly technical and resource intensive. Where appropriate, lower-capacity and cost alternatives are provided.

TONY ECKERSLEY

Task c Estimate the budget that will be needed for the evaluation.

For example:

- ❏ What is the cost of the evaluation team's time?
- ❏ How much are the consultant and training costs?
- ❏ What are the equipment and other capital costs?

Task d Assess the available human resources, equipment and budget; if not sufficient, develop a plan to secure funds. Secure additional resources as necessary.

If your MPA has the necessary human and financial resources, and equipment, you can move on to the next step.

If your MPA does not have the necessary human and financial resources, determine if there is a plan to secure these resources. If there is a plan, after you have implemented and achieved it you can move on to the next step.

If you are not ready to undertake this level of evaluation, you can still take steps to work toward adaptive management. Look through the References or go to http://effectiveMPA.noaa.gov for additional references and links.

Box 7

Developing an Evaluation Workplan

As you work through the chapters in Section 1, you will be gathering information on all aspects of conducting an evaluation. This information will help you to map out what you will need to do from start to finish.

An evaluation workplan should clearly and concisely answer eight planning questions:

- Why is the evaluation being done?
- Who is the audience for the evaluation results?
- Who should participate in the evaluation?
- What methods will be used to measure the indicators?
- What resources (human, financial) are needed to measure these indicators?
- What is the timeline for carrying out the evaluation?
- How are the data to be managed and analysed?
- How will evaluation results be communicated and used for decision-making?

The answers to these questions are pulled together into a single summary workplan document or table. This workplan will help the members of your evaluation team to understand why, how, when, and by whom the evaluation will proceed. Think of it as a map that will allow your evaluation team to get to their final destination – a completed evaluation of management effectiveness at your MPA.

> *Be sure to read through all of the guidebook for key information on planning, such as data collection, data analysis, and communications.*

There are a few things to consider when planning your evaluation:

- *Scale* – This guidebook focuses only on conducting evaluations at the single MPA site level, including the immediate surrounding area.
- *System* – Your evaluation will assess the impacts of your MPA on both the natural environment and human aspects at the site.

If you do not have the financial resources or a plan to secure them, you should develop one and implement it. Once you have the necessary resources, you may be in a position to come back to this guidebook.

As you estimate what is required to carry out the evaluation, keep the following in mind:

- ❏ Resource needs will be different at each site, based on factors such as the number of indicators, staff skills, need for outside assistance, and the size of the area.
- ❏ Many of the resources will need to be committed to data collection and analysis.

Step 2-2 Determine the audience(s) who will receive the evaluation results

Before you begin your evaluation, think carefully about the **audience(s)** that you want to reach and develop a plan for communicating and reporting the results. In thinking about this, you may find that there are a number of different audiences.

For example, your primary audience may be whoever requested the evaluation, such as a national agency, programme director, or donor. Keep in mind that there may be others that would find the results useful and that they could bring benefits to your management efforts.

You can determine the most appropriate audiences to receive the evaluation results by completing the following tasks:

Task a Identify the target audience(s).

To identify the audience(s) for your evaluation results, answer the following questions:

- ❏ Who are the potential audiences that may benefit from or be interested in the evaluation results of your MPA?
- ❏ Which of these audiences are internal stakeholders in the MPA management? Which of these audiences are external to the MPA management?
- ❏ For each audience – what level of influence and interest do they have over the MPA and how it is managed? How important is it for you to stay in communication with each audience?
- ❏ For each audience – what do you know about their preferred method of receiving information? This may be closely related to their technical capacity. For example, do they prefer to read information or listen to a radio or television? Are they computer literate and do they use the Internet regularly? Do they gather together periodically at meetings or conferences? If so, when are these meetings scheduled?
- ❏ What language does each audience speak? What is their average educational level? What style of communications do they prefer – technical and academic or casual and conversational? Where and how are oral communications typically done?

JOHN PARKS

Audiences vary widely by MPA site and type. Commonly identified audiences (that could be either internal or external audiences, depending on the site) include:

- Advocacy groups.
- Coastal communities/residents.
- Donors.
- Elected officials.
- Teachers.
- Public.
- Government department heads.
- Native leaders.
- Journalists.
- Fishers.
- Divers and surfers.
- Non-governmental (national, international) organizations.
- Other MPA managers and practitioners.
- Project managers and staff associated with the MPA.
- Researchers and scientists.

Box 8

Why Think About Communications at the Outset?

For many MPA managers communicating and reporting results is often not given much consideration. The right time to begin thinking about and planning for communications is at the beginning of the MPA evaluation project, not the end of it.

For example, if you understand how your primary audiences take in information you can communicate the evaluation results accordingly and make them more useful. Also, knowing your communications needs at the start of the evaluation will help you to budget for the necessary activities, time and resources.

The steps to develop a communications plan are discussed in Chapter 4.

❑ What, specifically, do you expect each audience to do with the results and information you present to them? What actions do you want them to take following the delivery of your results? How are these expectations linked to the goals and objectives of the MPA you are working with?

Task b Determine and prioritize the primary audience(s).

You can prioritize primary audiences based on the need to reach them, and how they will use the results, and the types of actions they can take.

An audience analysis matrix provides a method for identifying and prioritizing the audiences who might be interested in the evaluation results. To learn more about this method, visit http://effectiveMPA.noaa.gov/guidebook/aam.html

Step 2-3 Identify who should participate in the evaluation

The evaluation team is responsible for planning, implementation and initial analysis. This may or may not include the MPA manager; however it is recommended to have an indiviual who will lead the evaluation and evaluation team.

The following tasks will help you identify who should be involved in conducting the evaluation:

Task a Determine the level of expertise that is needed to conduct the evaluation.

The MPA manager and staff, a biologist and a social scientist can do a simple evaluation. A more complex evaluation will require additional people with a diverse set of disciplinary skills, in the fields of marine biology, ecology, oceanography, economics, sociology, anthropology, law and political science.

Task b Determine which staff or non-staff will conduct the evaluation.

Some MPAs will not have staff with the full range of disciplinary skills required. As such, external consultants or organizations with the necessary expertise may be required. In this case, determine which parts of the evaluation will be conducted internally versus externally.

There are benefits and limitations with both external and internal evaluators. Table 1 summarises some aspects to consider when deciding who should be involved in the evaluation.

JURGEN FREUND /NATUREPL.COM

▲ *A large MPA such as the Great Barrier Reef Marine Park in Australia has different needs and resources from a small community-based MPA.*

Task c Determine how and when to involve the stakeholders.

Evaluations should be **participatory** at all stages of the process to capture all issues involved in the management of an MPA. Managers and stakeholders may have very different perspectives on these issues.

Involving stakeholders in the design of the evaluation is crucial because they may be interested in questions that differ from those of the government, managers or scientists. Stakeholders can also be helpful in the data collection and analysis parts of the evaluation process.

For example, local stakeholder participation can provide opportunities for developing stronger relationships between MPA staff and local people. Also, local people may be more aware of cultural complexities and have a natural rapport with others in the community. Training local people to be members of the evaluation team builds capacity and increases the chances that evaluation will continue over time. However, using local people can also create challenges, such as it may be difficult for them to ask certain questions of their neighbours.

A number of participatory research and action references are available online to assist in planning for stakeholder participation in your evaluation. For more about this, visit *http://effectiveMPA.noaa.gov/Bunce.html*

Task d Create the evaluation team and determine the people responsible for each task.

Decide who will lead the evaluation and the responsibilities of each team member based on their skills and experience. Make sure that each member of the evaluation team can complete their activities within the timeline.

Table 1

Considerations for internal versus external evaluators

Internal Evaluators	*External Evaluators*
■ May have a bias or complex relationships with a community	■ Often provide impartiality, a fresh perspective, and credibility
■ Have an understanding of the history, experiences and details of the site	■ May have limited local knowledge, learning is a cost in time and money
■ Often live in or near the site	■ Usually stay for short visits to the site
■ Tend to focus on issues of relevance to the managers (efficiency and effectiveness of work)	■ Tend to focus on questions relevant to external groups (stakeholders, funding agencies)
■ May not have all the skills necessary and need technical assistance	■ Bring technical expertise and perspectives from other sites
■ Are able to enhance the application of results and future work	■ Take away valuable information, knowledge, perspectives and skills

If the members of the evaluation team are not local, they should be briefed on local customs, traditions and behaviours, and particular etiquette so that they can understand as much as possible about the local culture before starting data collection (see http://effectiveMPA.noaa.gov/Bunce.html).

Step 2-4 Develop a timeline and a workplan for the evaluation

A timeline should be prepared for the evaluation, identifying specific activities and time periods for starting and completing those activities. A timeline can also provide a means to set up targets and milestones to accomplish along the way. MPA managers and staff have many activities and evaluation is a part of those activities – consider allocating a minimum of 10% of staff time to evaluation annually. Answering the following questions will help you develop a timeline:

Task a Determine the amount of time needed for each activity.

This will depend on the number of indicators selected, the size of your MPA and choice of methods. Consider which indicators have similar methodologies, such as a survey that could be used for several indicators. Also, consider which of these methods are included in existing monitoring programmes at your MPA.

To see which indicators have similar collection methods see Box 11 in Section 2 on how some of the indicators cluster.

Consider the amount of data that needs to be collected. This will partly depend on internal and external audience needs and on the type of data being collected.

Task b Determine when the data need to be collected.

Consider factors such as seasonality and frequency. For example, fishing may be seasonal as could the supply of fish for consumption and market needs. There may also be times when it is difficult to do household surveys in a given community because people are away or busy. Data should be collected at the same time of year to ensure comparability over time.

> *The approach to measuring indicators outlined in this guidebook is one that requires periodic but ongoing data collection through time. Some indicators may only need to be measured once every few years, while others may need to be measured once or even twice a year. In either case, planning for the timing of when data are to be collected can be considered in advance by reviewing how often selected indicators are recommended to be measured (see Section 2).*

Task c Develop an evaluation workplan.

Pull together all the components into an evaluation workplan (see Box 7, Developing an Evaluation Workplan). Be sure to include planning elements that are discussed in Chapters 3 and 4. Distribute the evaluation workplan to the evaluation team.

TONY ECKERSLEY

CHAPTER 3 Conducting your evaluation

This chapter describes how to collect, manage and analyse the data that are required for conducting your evaluation. The necessary steps, as illustrated in Figure 1, include:

- ❑ **Step 3-1 Implement your evaluation workplan**
- ❑ **Step 3-2 Collect data**
- ❑ **Step 3-3 Manage collected data**
- ❑ **Step 3-4 Analyse collected data**
- ❑ **Step 3-5 Encourage peer review and independent evaluation of results**

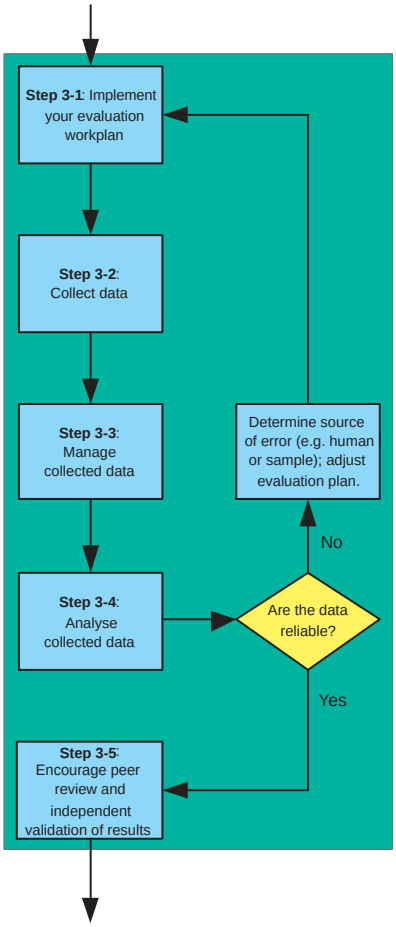
Step 3-1 Implement your evaluation workplan

By this point, you have completed an evaluation workplan and have the necessary resources. You are now ready to put it into action and begin your MPA evaluation. Doing this requires much more than just collecting data; it also includes careful consideration as to the timing, logistics and process of data collection, management and analysis.

In implementing the evaluation workplan, the evaluation team must continually consider and be ready to respond to the following questions:

- ❑ Are there timing restrictions? While your evaluation workplan may include considerations on known natural events (e.g. seasons, tides, life history) and social time constraints (e.g. designated national holidays or pre-determined community obligations), the team needs to remain flexible on the timing of its work with respect to unpredictable events that may arise, such as hurricanes, poor water conditions, sudden community emergencies or cancelled flights.
- ❑ Are there new or changing logistical needs? Anticipate and ensure that the necessary logistical arrangements are made and overseen for the evaluation team throughout the implementation of the evaluation. Such arrangements not only relate to fieldwork and data collection, but also to daily needs such as local travel, lodging and meals, access to telephone, fax and e-mail communications, and computer terminals. In some cases, particularly with large evaluation teams who are charged with measuring many indicators, this may require the full-time attention of a logistical officer.
- ❑ Have the resources been made available? Throughout the implementation of the evaluation, the team will need access to the necessary (and previously secured – see Chapter 2) finances and equipment to do data collection. For example, biophysical indicators may require regular access to boats, crew, sampling equipment and fuel. Having safety equipment and finances available for possible medical assistance is also essential. Having someone regularly monitoring that resources are available will allow the evaluation team to focus on the work at hand.
- ❑ Has the team been cleared to do the work? Ensure that all the necessary permits, approvals and permissions are in place to conduct all the work required for the evaluation throughout its duration. Not having the appropriate research and monitoring permits could delay or cancel the work planned for your evaluation.

Chapter 2



Chapter 4. Communicating results and adapting management

ROBERT POMEROY

- ❑ Are you ready to receive the data collected? Ensure that the data collection, management and analysis systems are in place and have been adequately tested and refined. See Steps 3-3 and 3-4 for more details on some of the aspects that will be needed.

Step 3-2 Collect data

The following tasks will help you plan for and collect the data.

The tasks in Step 3-2 need to be considered when planning your evaluation. Key needs for data collection should be addressed in your evaluation workplan. This will help the evaluation team in data collection activities.

Task a Study and understand the data collection methods.

Data collected are used to answer the specific questions relevant to your evaluation. It is critical that these data are collected accurately. Being trained in, familiar with, and having tested the data collection methods will increase the likelihood that your selected indicators will be measured correctly and consistently. This will help to provide the MPA management team with an accurate and comparable dataset to work with, analyse and refer back to through time.

The methods for measuring the indicators presented in Section 2 have been summarised and simplified. Your MPA may already be monitoring some of the indicators listed, and therefore may have a solid understanding of what is involved in measuring particular indicators. Despite this, keep in mind that for those who have not had relevant training or experience, the data collection methods offered may at first appear challenging. Ideally, your evaluation team will include at least one or two trained and experienced specialists from both the biological and social sciences to conduct the suggested data collection methods.

As discussed in Step 2-2, bringing in external experts can enhance the capacity of the evaluation team. Keep in mind that by building internal capacity to conduct the evaluation it will be easier to continue the evaluation process in the future. Building capacity internally should be done at least several months in advance of the evaluation.

> *As discussed within the indicators, many of the biological and social methods require significant experience, time and labour to complete. The evaluation team should review the selected indicators and their methods, be aware of their requirements and difficulty rating, and continually identify and address capacity needs and seek professional assistance well in advance of the start of the evaluation.*

Task b Familiarize yourself with the best practices and principles for collecting data in the field.

The success of data collection efforts will depend in large part on the skills, flexibility and creativity of the evaluation team, as well as on their approach to and the relationships that they establish with the stakeholders involved. For example, some indicators require boat handling and underwater surveys

requiring the use of compressed air or mixed gas. In such cases internationally approved and accredited boating navigation and dive safety standards must be followed. This may require training or certification by members within the evaluation team prior to data collection.

Task c Determine the sampling approach.

A well-defined sampling approach will ensure that the data collected are accurate and robust. It can provide your team with greater interpretive power and a higher degree of confidence for decision-making.

First, the evaluation team should decide on the sampling units for collecting ecological and social data. For example, the sampling unit for a socio-economic indicator could be an individual, a household or a stakeholder group. Knowing which sampling units are required will help to determine the best approach to data collection.

The following should be considered when developing a sampling approach:

- ❏ Define the sampling site(s). This should include a spatial definition of the geographic locations within the MPA and nearby local communities, that are being measured. For experimental designs, reference (control) sites outside the MPA or community can be included.
- ❏ Choose the type of sampling, for example, non-random sampling or random sampling.
- ❏ When conducting biological surveys, ideally sample within at least three randomly generated replicates at a designated sample site. Maintain similar habitat types and stratify samples along consistent depth/contour profiles. For example, if a biological survey includes two designated sampling sites within the MPA and two designated sites outside the MPA (total of four sites), a minimum of three replicates of the survey must be conducted at random locations within each of these designated sampling sites (12 replicates). The use of replicates is required to minimize variability and increase the confidence level of sampled results reflecting actual conditions. The need and use of replicates within biological surveys is explained further within English *et al.* (1997).

TONY ECKERSLEY

TONY ECKERSLEY

For additional guidance on sampling approaches go online to http://effectiveMPA.noaa.gov/guidebook/sampling.html. If you are not familiar with sampling or are aiming to conduct statistical analysis on data collected, consult qualified experts prior to implementation.

A list of best practices and guiding principles on how to conduct surveys and interviews is available online at http://effectiveMPA.noaa.gov/guidebook/Bunce.html

Task d Ensure everything is in place for data collection.

- ❏ Evaluation team is established; each member has clear tasks and training.
- ❏ Evaluation and data collection activities fall within the planned timeline.
- ❏ Logistics, materials and tools are available and ready to use.
- ❏ Sampling unit and area are defined.
- ❏ The measurement methods and techniques (such as interview questionnaires) have been tested.
- ❏ A system to manage, store and analyse information and data is ready for data entry.

Step 3-3 Manage collected data

Once the selected indicators have been measured the results will need to be processed. This process is commonly referred to as **data management**. This is a critical, and often overlooked, stage of the data collection and analysis process.

Each of the steps in Step 3-3 should be included in the evaluation workplan. This will help the evaluation team understand exactly what happens to data once they have been collected. If the planning information is detailed and not easily summarised, you can create a separate 'data management' document as an appendix to the workplan.

The following tasks provide an overview of the aspects of data management:

Task a Determine who will be the 'data manager'.

Identify a member of the evaluation team to be the 'data manager' who will receive all the collected data for each selected indicator. In some cases this may be the evaluation team leader, or perhaps the same person collecting the relevant information (e.g. the team socio-economist). In other cases there may be a person who is responsible for receiving and handling information, such as a data analyst or a computer specialist.

Task b Determine how collected data will be submitted to the data manager.

TONY ECKERSLEY

This will provide a clear and common understanding for both the person submitting data (data collector) and the person receiving the data (data manager) to know what *type* and in what *form* the data will be submitted. This will greatly improve the accuracy and efficiency of the evaluation.

The *type* of information being collected will depend on the indicator being measured. The types of information include:

- ❏ Numerical (**quantitative**), such as a ranking score, the number of times an organism is observed, a table of numbers, or a total area (km^2).
- ❏ Textual (**qualitative**), such as a word, a few sentences, or a story.
- ❏ Graphical, such as a map or a photo.

The *form* in which specific information will be submitted depends on the type of data.

All numerical data may be given to the data manager in the form of a table that the data manager has provided prior to the data collection. Or total areas can be submitted along with the original maps from which the area was calculated.

Textual data may be submitted in the form of a cassette recording, or as an electronic transcript (written) of this recording. Or household survey responses could be original hand-written responses recorded on the data forms or notes taken on notepaper (this would also assume that the data manager has good handwriting recognition skills!).

TONY ECKERSLEY

Task c Code the data.

Data coding is the process of translating each datum point to prepare for analysis. This translation requires a **code sheet** where the meanings of data collected and their codes are available to the data manager. Identify a member of the evaluation team who will code the data.

In some cases, two or three different words collected as a response to an interview question may be coded (translated) as a single equivalent number. For example, the responses "sometimes", "frequently", and "always" equal "1", whereas "never" equals "0". In other cases, the original datum point and the code may be exactly the same. For example, a numerical ranking ("1", "2", "3") or a single word choice from a respondent survey ("yes", "no") may be the code.

> *As a general rule-of-thumb, collecting data should be done with data coding in mind so as to lessen the amount of coding for the data manager and reduce data management time. The specific data codes should depend entirely on how the data are to be analysed and used. Coding of data should be as simple as possible and, as far as is feasible, it should be consistent.*

Task d Develop a system for storing and entering the data.

As each datum point is coded, it should also be entered. **Data entry** is the (often lengthy and tedious) process of moving coded data into a permanent storage location from which to export the data so that it can be analysed. This permanent storage location is known as a **database**.

How data are entered depends on what type of database is being used and the resources, skills and infrastructure available to the evaluation team and data manager. In most cases the data manager will enter coded data generated from the evaluation into a specified, electronic 'MPA management effectiveness' database, using a computer and software. In such cases, coded quantitative data are entered into a spreadsheet or database programme, and coded qualitative and graphic data are entered into a word processing programme. At some sites, a sufficient and appropriate database may be a filing system of paper and folders or a box of index cards kept in a safe place.

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▲ *In the case of the evaluation process outlined in this guidebook, a 'MPA management effectiveness' database will need to be created by the evaluation team to permanently store all of the collated, cleaned and coded data for measuring selected indicators.*

It should be noted that one of the benefits of an electronic database is that it can be easily duplicated (as a backup) and does not take up much physical space (other than a computer).

Once the system for data entry is developed, begin entering data.

Task e Collate and review the data set.

Once data are entered, the data manager is responsible for the collected data and for managing that data.

The data manager collates and reviews the data set in order to check for completeness and errors (accuracy) – this is known as **data cleaning**. If errors (accuracy) or 'gaps' (missing datum points) are found in the data set, the data manager should work with the data collector to correct or understand the problem. In some cases, an incomplete data set will reflect an inability to collect a particular datum point and cannot be filled in afterwards.

Task f Determine how to make the data available for analysis and sharing.

The aim of data management is to make retrieving data simple and reliable. Coded and stored data are only as good as the ease with which they can be used for analysis and communication.

Develop a process for someone to contact and request access to data or receive stored information from the data manager and database. Include who is and is not allowed access to the database, and what the responsibilities are of the people who have access.

In some cases the data may be available to anyone, such as on the World Wide Web. In other cases the data may be only accessible to one or two members of the evaluation team.

Include the process and means for making data available to people in the evaluation plan.

Tony Eckersley

Step 3-4 Analyse collected data

Analysis is the process of carefully considering, comparing and contrasting information with the intention of helping to clarify uncertainty or elucidate answers and insight to specific questions being asked. In the case of this guidebook, analysis of data collected during your MPA evaluation will help you to address and respond to the questions that are being asked of the MPA.

Specific analytical tasks for the data collected are dependent on the nature of the information collected and the specified indicator. For each indicator description within Section 2, a few suggested approaches to data analysis are provided to help organize and summarise results.

Results can be viewed in many ways. It is recommended that results be interpreted by a couple of different people and to seek external or expert review as well.

The evaluation workplan should describe which analyses will be done with what data and by whom. Include an explanation of why specific analyses are being done and how they relate to specific questions about the goals and objectives of the MPA and management effectiveness.

The following tasks will help you prepare for and conduct the analysis.

Task a Review the questions being asked by the evaluation.

A useful starting point in analysis is to go back to your original reason for conducting the evaluation. What are the essential questions that the management team wants to address or fully answer? Make a complete list of these questions, and highlight the ones that are most essential or priorities to address. Which of these questions can be addressed with the evaluation results of which indicators? In most cases, each question will link back to the goals and objectives of the MPA.

Task b Complete a preliminary analysis.

After all data collected have been coded and entered into the database, an explanatory analysis of the data should be completed to investigate their 'strength', or reliability. There are many ways of doing this – the following are common:

- ❏ Simple descriptive analyses of central tendency (median and mode) and variation (range and skewdness) in data collected; and
- ❏ Statistical techniques such as paired **t-tests** and analyses of variance to determine how data sets vary between one another, within a time series or among sites.

Exploratory results address the following:

- ❏ How much variation is there between and within data sets collected inside and outside the MPA?
- ❏ How do data sets compare between one another at different periods of time?
- ❏ How reliably can perceived changes or trends be explained from the data?

If data collected are found to be in error, they should not be used. Identify and address any source of error before continuing the analysis. Common sources of error include both human and sampling error.

Task c Determine and prepare analyses.

Gather all the relevant information obtained throughout the evaluation. This may include data from the database, written notes from evaluation team members, and any results from the preliminary analysis.

Based on the exploratory analysis, you can determine the most appropriate analysis of the data. For example, you may only need to do simple calculations such as sums and percentages. Or, if data are collected from a statistically representative sample, you can apply more advanced descriptive statistics, such as the standard deviation, means and modes, and paired t-tests.

Compare the results of your quantitative analysis with those from other sources and identify any discrepancies and determine why those might have occurred. If a discrepancy cannot be explained, you may need to collect additional data.

You should begin to have an idea of the key results and messages that can be concluded from the analysis. These should help answer the questions and address the objectives of the evaluation.

Task d Capture and prepare results.

When preparing results and conclusions for public dissemination, determine how to orally and visually present results to target audiences, and how to distribute written reports (including graphs and tables of results). For example, with continuous data, spatially plot one set of data (x-axis, as histograms) against another (y-axis). Do any proportional relationships between the data sets appear?

Include stories or anecdotes from stakeholders or the evaluation team that help to illustrate the results.

In some cases, an evaluation team may want to include an **ordinal scale** to help explain the results of an indicator. For example, using a scale of 1–5 to make complex results more easily understood and to observe overall trends. Scorecard methods often present results in this format. There are some downsides to a scaling format in that it can be seen as arbitrary and simplistic; it can take the focus away from interpreting the actual data, and natural background variability makes it difficult to use a scale.

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To learn more about selecting and conducting analyses go to http://effectiveMPA.noaa.gov/guidebook/analyses.html

Step 3-5 Encourage peer review and independent evaluation of results

It is recommended that you seek out complementary partnerships with research and academic institutions in order to encourage a thorough and independent validation or rejection of the evaluation team's indicator results and analytical findings.

In addition, prior to sharing results with senior management or target audiences, conduct a peer review process of the results and conclusions. Typically, this is a formal process that begins with review by peers who are internal to the evaluation – that is, they are either involved with the evaluation and its

process and/or are affiliated closely (e.g. as staff or board members) with the MPA management team that has overseen the evaluation. Ask them to carefully review the evaluation methods, results and findings, and to provide critical and constructive criticism as to how to address any shortcomings, as well as agree with or reject the interpretation and conclusions of the results. In some cases the feedback may require that the evaluation team discard or reconsider certain results or findings and/or go back and re-plan and re-measure certain indicators.

Once an internal review is done, distribute a revised evaluation report for an external review. Select respected and trustworthy experts from both the technical (scientific and policy research) and target audience ends. Invite them to review and comment on the revised evaluation report within an adequate period of time. In some cases, reviewers will be unable to do a review, so prepare a secondary list of reviewers at the outset. It is also important to keep in mind that this external review process may take a bit longer than the internal review. Once you receive comments, have the evaluation team and senior management review them and incorporate changes to the report as appropriate. The end result of a successfully completed internal and external review process is typically an improved product with greater legitimacy and credibility. This will enable you to provide a well-grounded report for target audiences (see Chapter 4).

> *An in-depth peer review process may take as long as four to six months to complete, not counting any revision work or time in re-doing the surveys. It is important that this activity be built into the timeline and workplan.*

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NELSON BOISVERT

Communicating results can bring new friends and allies to the MPA – including the next generation, vital if MPAs are to survive in an uncertain future.

This chapter will guide you through the steps needed to take the results from the evaluation and develop an adaptive management strategy. The strategy includes sharing the results and analysis with the identified target audiences and identifying ways to adapt management practices to improve MPA management. These two activities will make the data collection and analyses worthwhile and give them a practical purpose.

The steps taken to communicate results and adapt MPA management practices are illustrated in Figure 2, as follows:

- ❑ **Step 4-1 Share results with target audiences**
- ❑ **Step 4-2 Use results to adapt management strategies**

Step 4-1 Share results with target audiences

To share results with target audiences complete the following tasks:

Task a Determine which format to use to provide evaluation results and to reach the target audience most effectively.

Use the prioritized target audiences and characteristics that were identified in Chapter 2, Step 2-2. The results of your survey on how target audiences prefer to receive information will help you develop a logical presentation and format (one-way and/or two-way communications) for sharing the evaluation results with the target audiences.

There are several ways to transmit information to people. These include both one-way and two-way communication mechanisms, as presented in Table 2.

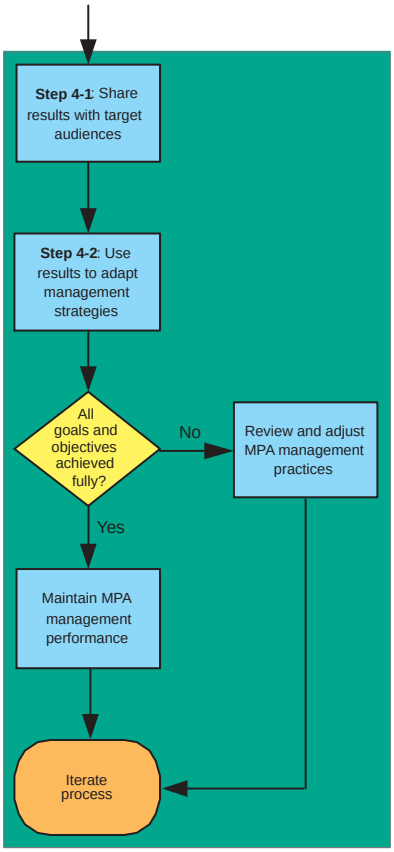

Table 2

Types of one- and two-way communication that MPA practitioners can use to communicate the results of their MPA effectiveness evaluation

One-way communications	*Two-way communications*
■ Written materials (reports, papers)	■ Group discussion (in-person)
■ Visual materials (posters, pictures)	■ One-on-one discussion (in-person)
■ Oral presentations (in-person)	■ Physical and electronic bulletin boards
■ Mass media: newspapers, magazines, radio, television, film	■ Remote communications: telephone, video phone, web camera
■ Internet: World Wide Web	■ Internet: e-mail and Internet chat rooms

The evaluation workplan should include the main points and concepts in the communications plan (see Box 9, Pulling the pieces together into a Communications Plan). This will ensure that the necessary planning has been done for the coordination and the timing of sharing results with target audiences. You may want to add the communications plan as an appendix to the evaluation workplan as a reference for the evaluation team.

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In some cases the ideal presentation format may require assistance from communications specialists such as editors, graphic artists, publication designers, journalists and news agencies, community leaders, professional facilitators, lobbyists, statisticians, and Internet and digital solution technicians.

Once you have identified an appropriate format or set of formats for transmitting results to each target audience, list these formats within the audience analysis matrix.

Task b Develop a strategy and a timeline for delivery of results.

A **results delivery strategy** outlines exactly how to conduct the presentation formats identified and assigned to target audiences. Develop a timeline of when to release or deliver these messages using the various presentation formats. This timeline will depend on the type of formats and style in which results are delivered.

Consider how to make the presentation formats most meaningful and thought provoking to your target audiences and include this in your results delivery strategy. For example, what language, tone, style of text, and voice (i.e. passive or active) will most resonate with the target audience?

The results delivery strategy should include which messages and what formats will be used to communicate with different target audiences. Use the audience analysis matrix to identify outreach opportunities.

For example:

- ❏ Is there a particular format that can be used to communicate results to multiple target audiences?
- ❏ Which communication formats should come before others? What is the timing of sharing results both internally and externally?
- ❏ Are there certain communication formats that should be presented simultaneously or within a restricted timeframe?

Task c Tell your story! Communicate your findings to the stakeholders.

This process is referred to as **messaging** – in other words, what story do you want to share with the target audiences? Because the specific content of these messages will not be known until after the evaluation is complete, messaging requires two distinct activities and timeframes.

A useful discussion of results presentation formats commonly used by conservation practitioners can be found in Margolius and Salafsky (1998).

- ❏ At the start of the evaluation, prior to obtaining the results – identify the themes and concepts of the marine environment and how it is managed that target audiences are both known to listen to and will want to hear about when results are available. Select the priority messages to share with target audiences.
- ❏ After obtaining the results – identify the results that relate to the priority messages (previously identified) and how they address the themes and concepts that target audiences want to know about.

Messaging allows the evaluation team and MPA managers to keep in mind the critical pieces of information that target audiences will be looking for during the evaluation and as results are generated. For example, look for interesting or illustrative stories that can be used after the evaluation to support or contradict the results. Also, highlight results with real-world examples, stories, and anecdotes – these can be powerful tools with certain audiences to build interest in results and enhance an MPA manager's ability to communicate important messages.

For example, an important message that could be identified and shared with a commercial fishing target audience may be that the MPA is replenishing fish stocks. Having a story of a fishermen saying that he or she is now catching more fish in the MPA/near the MPA/since the MPA was established, will support the quantitative evidence that there is a three-fold increase in fish populations inside the MPA compared to outside. This will make for a much stronger message than only presenting the numbers.

A strategic approach to messaging is to ensure that key messages are communicated in a way that encourages action or behaviour that is desired by

Box 9

Pulling the pieces together into a Communications Plan

The information from the different steps to be undertaken to communicate results can then be used to create a communications plan. This will provide a clear process of how results will be shared and logically and strategically organized.

Think of a communications plan as a 'cheat-sheet' of how to best share your stories. A complete communications plan will contain the following elements:

- An *audience analysis matrix* (see Chapter 2) identifying the range of possible internal and external audiences, their characteristics, and a set of *priority target audiences.*
- A strategy for how and where results will be delivered by identifying which *one-way and two-way presentation formats* will be used with each or groups of target audiences, and the *approach and style of delivery* to be taken.
- A set of *key messages* with illustrative examples and stories that explain the results and that help to focus the attention of particular target audiences.
- A *timeline* of when messages and presentation formats are to be released and delivered to target audiences.

Once these pieces of the plan are pulled together, it will be possible to estimate the time, and human and financial resources needed to complete the plan. Based on this estimate, sufficient time and budgeted resources can be allocated. The resources should be available if the necessary resources were secured at the outset of the evaluation (see Chapter 2).

the MPA manager. The proof that key messages have been successfully communicated is how the target audience takes action after the messages have been delivered.

Put all the pieces together into a communications plan (see Box 9), and put it in motion.

TONI PARRAS

Step 4-2 Use results to adapt management strategies

Adaptive management can be defined as the process of integrating design, management and monitoring to systematically test assumptions, learn and adapt (Salafsky *et al.*, 2001). The idea is that by asking specific questions (testing assumptions), you learn and get results to help make informed decisions and adapt your actions, which can lead to improved performance. This process of asking questions, collecting information to answer them, learning from the results, and adapting behaviour and practices is a cyclical one, that in theory should allow a person or group to increasingly hone in on and refine their abilities and impact with each subsequent revolution through the adaptive management cycle. This creates a positive feedback loop that continually improves on itself as it moves closer to its ultimate goal and sustains itself there. The principle of adaptive management is widely accepted and frequently cited not only within natural resource management and environmental conservation, but also within business, health and human services, public service, and development.

For the purposes of this guidebook, the reason for conducting a management effectiveness evaluation is for MPA staff and decision-makers to use the information generated to adapt and improve the MPA's management, planning, accountability and overall impact. Once results are shared with target audiences, such information can be combined with other data sources and decision-making needs for MPA management processes and underlying contextual issues. Such integration is done in order to enhance the power and relevance of decisions made on future actions and the management strategy.

How information and learning provided by the evaluation process are used by target audiences to adapt management must also be monitored as part of an iterative evaluation process. Observations on how results are eventually used will help design future evaluations.

The evaluation workplan should include an outline for a strategy applying results so as to adapt and improve ongoing management.

There are many good references on adaptive management available, including: Walters, 1986; Hollings, 1978; Hilborn and Walters, 1992; Gunderson, Hollings and Light, 1995; and Salafsky et al.*, 2001; these are listed in the References.*

Adaptive management is essentially about iteration. That is, repeating the process or steps that bring you successively closer to your desired result. Iteration involves using the results of your evaluation to improve your MPA management. It helps management to adapt and improve through a learning process. As you evaluate the MPA you may find that you are successfully achieving your goals and objectives and that no changes are needed. Or, you may find that things are not going as well as they could and you will need to make some changes.

Some things to consider when incorporating evaluation results into ongoing planning and the management decision-making process

- ❏ Complement the evaluation results with other information about the MPA in the decision-making process.
- ❏ Maintain flexibility and be prepared to make changes. If your evaluation reveals that something is not working, find mechanisms to make changes.
- ❏ Be willing to learn from both success and failure, as it will help to strengthen your MPA.
- ❏ Use your common sense, your past experience, and the information that is available to you to make decisions.
- ❏ Use tools for negotiating, reaching agreements, and securing commitments to take actions when deciding to make changes based on evaluation results.
- ❏ Determine the best way to make changes in a participatory manner, such as holding workshops with different stakeholder groups.

What if the results are not useful?

There may be cases in which the results that you have obtained from the evaluation are not useful. What can be done? There are several courses of action:

- ❏ Check the data collected and the methods used to ensure that they make sense. Were the correct methods used and used in the correct way for each indicator? Was the data entered correctly? Were the right people interviewed?
- ❏ Review the priority goals and objectives to make sure that they really were the ones that are important to your MPA and revise them as needed.
- ❏ Review the indicators that were selected to ensure that they match the most important goals and objectives and revise them as needed.
- ❏ Return to the evaluation plan and revise it according to adjusted and/or new data collection needs. Make sure that the resources are available to collect this data.
- ❏ Resume data collection using a revised set of indicators and a revised evaluation plan.

TONI PARRAS

Measuring, presenting and discussing the indicators in this guidebook will help you to learn more about your MPA and the people and resources which

are impacted by it. The indicators can provide information that can be used in the decision-making process and in working with stakeholders to understand necessary changes in management plans and practices.

If the evaluation team finds new ways of applying the indicators in this guidebook to an MPA, take detailed notes of how this was done and why. This can then be shared with other MPA managers and evaluation teams.

Other considerations

Using this guidebook to inform new MPAs

The results of the evaluation and lessons learnt can be shared with other people, with other MPAs, and with the broader conservation and development community. The world is interested in you! New MPAs will be developing and the more that they can learn from your experiences, the better they can plan, the less it will cost, and the sooner they can get up and running. It takes years and even decades to demonstrate impacts. However, incremental learning is a part of adaptive management and can be important new knowledge that is quickly transferred to others. In documenting outcomes, a common mistake is to focus only on success and to ignore or hide failures. Everyone can learn from difficulties and others may have faced the same difficulties. By sharing lessons learned everyone benefits (Margolius and Salafsky, 1998).

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Applying management effectiveness evaluations to systems and networks of MPAs

More and more attention is being given to the concept of systems or networks of MPAs in an area or throughout a region or country. One reason for multiple MPAs is to have a representative sample of the types of habitats and organisms that need to be protected. A network also needs to be designed in a way that is socially feasible and acceptable. In the case of networks, using standardized indicators across multiple MPAs in the same area will encourage a more holistic and integrative approach to evaluating how such networked sites are interacting and achieving a common set of goals and objectives. MPA managers working within a network are encouraged to use this guidebook as a common foundation on which to share skills, resources and results. The benefits of this approach can help minimize costs, maximize impacts and build capacity to increase learning and improve MPA management across a network of sites.

Communicating through MPA systems and networks

Evaluation results should be integrated into national MPA systems, frameworks or national marine conservation strategies where applicable. Learning should be actively shared within the network of other national MPA sites and MPA practitioners.

Marine Protected Areas (including management and evaluation)

Alder, J., Zeller, D., Pitcher, T.J. and Sumaila, U.R. (2002). "A method for evaluating marine protected area management". *Coastal Management* 30(2): 121–131.

Agardy, T. (2000). "Information needs for marine protected areas: scientific and societal". *Bulletin of Marine Science* 66(3): 875–888.

Agardy, T.S. (1997). *Marine Protected Areas and Ocean Conservation*. Academic Press, San Diego, CA and R. E. Landes Co., Austin, TX, USA.

Agardy, M.T. (1995). *The Science of Conservation in the Coastal Zone: new insights on how to design, implement, and monitor marine protected areas.* IUCN Marine Conservation and Development Report. IUCN, Gland, Switzerland and Cambridge, UK.

Day, J.C. (2002). "Marine Park Management and Monitoring: Lessons for adaptive management from the Great Barrier Reef". *In* S. Bondrup-Nielsen, N.W.P. Munro, G. Nelson, J.H. Martin Willison, T.B. Herman and P. Eagles (eds.), *Managing Protected Areas in a Changing World*. SAMPA IV, Wolfville, Canada.

Kelleher, G. (1999). *Guidelines for Marine Protected Areas*. IUCN, Gland, Switzerland and Cambridge, UK.

Kelleher, G., Bleakley, C. and Wells, S. (eds.) (1995). *A Global Representative System of Marine Protected Areas.* The Great Barrier Reef Marine Park Authority, The World Bank, IUCN, Washington, DC, USA.

Kelleher, G. and Kenchington, R. (1992). *Guidelines for Establishing Marine Protected Areas.* A Marine Conservation and Development Report. IUCN, Gland, Switzerland.

Kenchington, R.A. (1990). *Managing Marine Environments.* Taylor and Francis, New York, NY, USA.

Mangubhai, S. and Wells, S. (2004, in draft). *Assessing Management Effectiveness of Marine Protected Areas: A workbook for the Western Indian Ocean*. IUCN, Eastern Africa Regional Programme.

Roberts, C. and Hawkings J. (2000). *A Manual for Fully-Protected Areas*. World Wide Fund for Nature, Gland, Switzerland.

Salm, R.V., Clark, J.R., Siirila, E. (2000). *Marine and Coastal Protected Areas: A Guide for Planners and Managers (3rd Edition).* IUCN, Washington, DC, USA.

Sumaila, U.R. (2002). "Marine protected area performance in a model of the fishery". *Natural Resource Modeling* 15(4): 439–451.

Management Effectiveness

Hockings, M., Stolton, S. and Dudley, N. (2000). *Evaluating Effectiveness: A Framework for Assessing the Management of Protected Areas.* IUCN, Gland, Switzerland and Cambridge, UK.

Jameson, S.C., Tupper, M. and Ridley J. (2002). "The three screen doors: can marine protected areas be effective?" *Marine Pollution Bulletin* 44: 1177–1183.

Selecting Environmental Indicators (Chapter 1)

Dixon, J., Kunte A. and Pagiola S. (1996). *Environmental Performance Indicators.* World Bank Environment Department Note. The World Bank, Washington, DC, USA.

Hammond, A., Adriaanse, A., Rodenburg, E., Bryant, D. and Woodward R. (1995). *Environmental Indicators: A Systematic Approach to Measuring and Reporting on Environmental Policy Performance in the Context of Sustainable Development.* World Resources Institute, Washington, DC, USA.

Hunsaker, C.T. and Carpenter D.E. (1990). *Ecological Indicators for the Environmental Monitoring and Assessment Program*. EPA 600/3-90/060. United States Environmental Protection Agency, Office of Research and Development, Research Triangle Park, NC, USA.

Thomas, W.A. (ed.) (1972). *Indicators of environmental quality.* Plenum Press, New York, NY, USA.

Tunsdall, D., Hammond, A. and Henniger, N. (1994). *Developing Environmental Indicators: A report on the World Resources Institute Workshop on Global Environmental Indicators, December 7–8 1992.* The World Resources Institute, Washington, DC, USA.

World Bank (1996). *Performance Monitoring Indicators: a handbook for task managers.* The World Bank, Washington, DC, USA.

Developing Monitoring and Evaluation Plans (Chapter 2)

Campbell, R.A., Mapstone, B.D. and Smith, A.D.M. (2001). "Evaluating large-scale experimental designs for management of coral trout on the Great Barrier Reef". *Ecological Applications* 11(6): 1763–1777.

Munn, R.E. (1988). "The design of integrated monitoring systems to provide early indications of environmental/ecological changes". *Environmental Monitoring and Assessment* 11: 203–217.

Margolius, R.A. and Salafsky, N. (1998). *Measures of Success: designing, managing, and monitoring conservation and development projects.* Island Press, Washington, DC, USA.

Data Collection and Analysis (Chapter 3)

Bunce, L., Townsley, P., Pomeroy, R. and Pollnac, R. (2000). *Socioeconomic Manual for Coral Reef Management*. Australian Institute for Marine Science, Townsville, Queensland, Australia.

Clarke, K.R. and Warwick R.M. (2001). *Change in marine communities: An Approach to Statistical Analysis and Interpretation. 2nd edition*. Primer-E, Plymouth, UK.

Elliot J.M. (1977). "Some methods for statistical analysis of benthic invertebrates". *Freshw. Biol. Assoc. Sci. Publ., U.K.* 25: 1–156.

English, S., Wilkinson, C. and Baker, V. (eds.) (1997). *Survey Manual for Tropical Marine Resources. 2nd Edition*. Australian Institute for Marine Science, Townsville, Queensland, Australia.

Fairweather, P.G. (1991). "Statistical power and design requirements for environmental monitoring". *Australian Journal of Marine and Freshwater Research* 42: 555–567.

Green, R.H. (1979). *Sampling Design and Statistical Methods for Environmental Scientists.* John Wiley and Sons, New York, NY, USA.

Green, R.H. (1989). "Power analysis and practical strategies for environmental monitoring". *Environmental Research* 50: 195–205.

Hilborn, R. and Walters, C.J. (1992). *Quantitative Fisheries Stock Assessment: Choice, dynamics, and uncertainty.* Chapman and Hall, New York, NY, USA.

Margolius, R.A. and Salafsky, N. (1998). *Measures of Success: designing, managing, and monitoring conservation and development projects.* Island Press, Washington, DC, USA.

McAllister, M.K. and Petermen, R.M. (1992). "Experimental design in management of fisheries: a review". *N. Am. J. Fish. Manage* 3: 586–605.

Schaeffer, D.J., Herricks, E.E. and Kerster, H.W. (1988). "Ecosystem health: measuring ecosystem health". *Environmental Management* 12: 445–455.

Stewart-Oaten, A.W. (1995). "Problems in the analysis of environmental monitoring data". *In* R.J. Schmitt and C.W. Osenburg, *Design of Ecological Impact Assessment Studies: Conceptual Issues and Application in Coastal Marine Habitats*. Academic Press, San Diego, USA. pp. 109–132.

Underwood, A.J. (1995). "On beyond BACI: sampling designs that might reliably detect environmental disturbances". *In* R.J. Schmitt and C.W. Osenburg, *Design of Ecological Impact Assessment Studies: Conceptual Issues and Application in Coastal Marine Habitats*. Academic Press, San Diego. pp. 151–178.

Adaptive Management (Chapter 4)

Gunderson, L.H., Hollings, C.S. and Light, S.S. (1995). *Barriers and Bridges to the Renewal of Ecosystems.* Columbia University Press, New York, USA.

Hollings, C.S. (ed.) (1978). *Adaptive environmental assessment and management.* John Wiley and Sons, New York, NY, USA.

Lee, K. (1993). *Compass and Gyroscope: integrating science and politics for the environment.* Island Press, Washington, DC, USA.

Lee, K. (1999). "Appraising adaptive management". *Conservation Ecology* 3(2). [Online URL:www.consecolo.org/Journal/vol3/iss2/index.html]

Oglethorpe, J. (ed.) (2002). *Adaptive Management: From Theory to Practice.* SUI Technical Series, Vol. 3. IUCN, Gland, Switzerland.

Salafsky, N., Margolius, R. and Redford, K. (2001). *Adaptive Management: a tool for conservation practitioners.* Biodiversity Support Program, Washington, DC, USA.

Walters, C.J. (1986). *Adaptive Management of Renewable Resources.* MacMillian Publishing Company, New York, NY, USA.

Walters, C.J. (1997). "Challenges in adaptive management of riparian and coastal ecosystems. *Conservation Ecology* 1(2). [Online URL: www.consecol.org/Journal/vol1/iss2/index.html]

Walters, C. J. and Hilborn, R. (1978). "Ecological optimization and adaptive management". *Annual Review of Ecology and Systematics* 9: 157–188.

Walters, C. J. and Holling, C.S. (1990). "Large-scale management experiments and learning by doing". *Ecology* 71: 2060–2068.