

# MARINE PROTECTED AREA NETWORKS IN THE CORAL TRIANGLE: *Development and Lessons*





# MARINE PROTECTED AREA NETWORKS IN THE CORAL TRIANGLE: DEVELOPMENT AND LESSONS

*An initiative of*

**The Nature Conservancy**

**World Wildlife Fund**

**Conservation International**

**Wildlife Conservation Society**

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*of the* **United States Agency for International Development**



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## MARINE PROTECTED AREA NETWORKS IN THE CORAL TRIANGLE: DEVELOPMENT AND LESSONS

(Results from a Learning Activity under the Global Conservation Program of the US Agency for International Development on Effective Design and Management of Tropical Marine Protected Area Networks through Cross-institutional Learning)

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Back cover photos: Boobies in Tubbataha Reefs Natural Park (Lene and Klaus Topp, [toppx2.com](http://toppx2.com)); map of the Coral Triangle (TNC); coral reefs in Wakatobi Marine National Park of Southeast Sulawesi (Burt Jones and Maurine Shimlock, Secret Sea Visions); the next generation of fishers in Hoskins, Kimbe Bay, West New Britain (Stuart Green); floating rangers' station, Wakatobi, Northern Sulawesi (Stuart Green); community consultation in Cebu (CCEF).

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## ACRONYMS & ABBREVIATIONS

<b>AOI</b>	area of interest
<b>BAPPEDA</b>	Badan Perencanaan and Pembangunan Daerah (Provincial / District Development Planning Agency)
<b>BESTARI</b>	Berau Lestari (NGO in Indonesia)
<b>BFAR</b>	Bureau of Fisheries and Aquatic Resources
<b>BMCA</b>	Berau Marine Conservation Area
<b>BPS</b>	Biro Pusat Statistik (Indonesia's Bureau of Statistics)
<b>CAP</b>	conservation area planning
<b>CBD</b>	Convention on Biological Diversity
<b>CCEF</b>	Coastal Conservation and Education Foundation
<b>CCIF</b>	Community Conservation and Investment Forum
<b>CI</b>	Conservation International
<b>CLE</b>	coastal law enforcement
<b>CMC</b>	Cluster Management Committee
<b>CMT</b>	customary marine tenure
<b>COMVIRO</b>	Community and Environmental Enhancing Quality Institute (Berau NGO)
<b>CRMP</b>	Coastal Resource Management Project
<b>CTC</b>	Coral Triangle Center
<b>CTI</b>	Coral Triangle Initiative
<b>DA</b>	Department of Agriculture
<b>DENR</b>	Department of Environment and Natural Resources
<b>DKP</b>	Dinas Kelautan dan Perikanan (Ministry of Fisheries and Marine Affairs)
<b>EBM</b>	ecosystem-based management
<b>EEZ</b>	Exclusive Economic Zone
<b>EIA</b>	environmental impact assessment
<b>ELAC</b>	Environmental Legal Assistance Center
<b>Execom</b>	Executive Committee
<b>FHM</b>	fisheries and habitat management
<b>FP</b>	Foreshore Management Program
<b>G8</b>	The Group of 8 is an international forum of 8 governments (namely, Canada, France, Germany, Italy, Japan, Russia, the United Kingdom and the United States of America).
<b>GCP</b>	Global Conservation Program
<b>GDP</b>	gross domestic product
<b>HDI</b>	human development index
<b>ICM</b>	integrated coastal management
<b>ICRS</b>	International Coral Reef Symposium
<b>IMPAC</b>	International Marine Protected Area Congress
<b>IUCN</b>	International Union for Conservation of Nature
<b>Kimbe Bay MPA</b>	Kimbe Bay Marine Protected Area Network
<b>KNP</b>	Karimunjawa National Park
<b>KNPA</b>	Karimunjawa National Park Authority
<b>KSDA</b>	Konservasi Sumber Daya Alam (Indonesia's local agency for natural resources and conservation)
<b>LGCMF</b>	Local Governance for Coastal Management Project
<b>LGU</b>	local government unit
<b>LLG</b>	local level government
<b>LMMA</b>	Locally Managed Marine Area



<b>MCA</b>	marine conservation area
<b>M&amp;E</b>	monitoring and evaluation
<b>MG</b>	Maritime Group
<b>MMA</b>	marine management area
<b>MOA</b>	Memorandum of Agreement
<b>MOU</b>	Memorandum of Understanding
<b>MPA</b>	marine protected area
<b>MPA Learning Partnership</b>	Marine Protected Area Networks Learning Partnership
<b>MSN</b>	MPA Support Network
<b>NGO</b>	nongovernment organization
<b>NIPAS Act</b>	National Integrated Protected Areas System Act
<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>NPA</b>	National Park Authority
<b>NRC</b>	National Research Council
<b>PAWB</b>	Protected Areas and Wildlife Bureau
<b>PCG</b>	Philippine Coast Guard
<b>PCP</b>	participatory conservation planning
<b>PCSD</b>	Palawan Council for Sustainable Development
<b>PCSDS</b>	Palawan Council for Sustainable Development Section
<b>PDK</b>	Pariwisata dan Kebudayaan (Indonesia's agency for tourism and culture)
<b>PEMSEA</b>	Partnerships in Environmental Management for the Seas of East Asia
<b>PENRO</b>	Provincial Environment and Natural Resources Office
<b>PHKA</b>	Perlindungan Hutan dan Konservasi Alam (Indonesia's Natural Resources Conservation and Forest Protection)
<b>PISCO</b>	Partnership for Interdisciplinary Studies of Coastal Oceans
<b>PNG</b>	Papua New Guinea
<b>PNP</b>	Philippine National Police
<b>PO</b>	people's organization
<b>RA</b>	Republic Act
<b>SaGuDa</b>	Sagipin Gubat at Dagat (Save the Forest and Sea - a local NGO in Palawan)
<b>SCCRM Council</b>	Southeast Cebu Coastal Resource Management Council
<b>SEA</b>	strategic ecological assessments
<b>SPAG</b>	spawning aggregation site
<b>SPSS</b>	Statistical Package for the Social Sciences
<b>SSME</b>	Sulu-Sulawesi Marine Ecoregion
<b>TMO</b>	Tubbataha Management Office
<b>TNC</b>	The Nature Conservancy
<b>TNMP</b>	Tubbataha National Marine Park
<b>TPAMB</b>	Tubbataha Protected Area Management Board
<b>TRNP</b>	Tubbataha Reefs Natural Park
<b>TWG</b>	Technical Working Group
<b>USAID</b>	United States Agency for International Development
<b>WCPA</b>	World Commission on Protected Areas
<b>WCS</b>	Wildlife Conservation Society
<b>WMA</b>	Wildlife Management Area
<b>WMNP</b>	Wakatobi Marine National Park
<b>WWF</b>	World Wildlife Fund

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## FOREWORD

Billions of people are dependent on the vital resources, services and goods provided by our oceans and coral reefs. Yet, the world's oceans and biodiversity are under tremendous threats from overuse, increasing populations and global climate change. The food security, livelihoods and well-being of coastal residents in developing countries are the most vulnerable and threatened by these impacts.

Marine protected areas (MPAs) are recognized as important and effective tools for managing and conserving our ocean and marine resources. MPAs are being used in fisheries management and biodiversity conservation to safeguard ocean resources for future generations and enhance ecosystem resilience. Recently, our understanding of the interconnectedness of marine habitats and processes has highlighted the importance of moving beyond managing individual MPAs to networks of MPAs. Such larger-scale approaches are necessary to protect and conserve ecological processes.

The US Agency for International Development (USAID) has a legislative mandate to support international biodiversity conservation in developing countries as part of the US government's foreign assistance program. About ten years ago, the Agency embarked on an effort to scale-up conservation impacts by moving from a focus on individual protected areas to larger-scale networks of protected areas and corridors. In 1999, the USAID initiated the Global Conservation Program (GCP) in partnership with six leading NGOs. The goal of the GCP is to increase impacts and achieve more effective conservation dividends through landscape and seascape approaches coupled with a threats-based approach.

In addition to larger-scale approaches to conservation, there is an urgent need to accelerate conservation effectiveness through targeted learning, not only within institutions but also across institutions. USAID and its NGO partners initiated a series of Learning Activities under the GCP with the intent of accelerating learning around select priority topics. This learning agenda focused on learning both for and by conservation practitioners, thus emphasizing the practice of conservation.

The Marine Learning Partnership is one of the Learning Activities initiated by USAID and four of its NGO partners – Conservation International, The Nature Conservancy, Wildlife Conservation Society and World Wildlife Fund. The goal of the MPA Learning Partnership is to accelerate the implementation of effectively managed and sustainable networks of MPAs through improved learning and knowledge exchange. Key objectives and expected outcomes of the Learning Partnership included: improved conservation practice on the ground; more effective approaches to scaling-up from MPA sites to ecological networks of MPAs; and the generation and dissemination of increased knowledge through interorganization collaboration.

During the last year of the MPA Learning Partnership, it adopted a regional learning perspective and focused on the Coral Triangle region as described in this book. The Coral Triangle represents the center of marine and coral reef biodiversity and includes part or all of six countries — Indonesia, the Philippines, Malaysia, Papua New Guinea, the Solomon Islands and Timor Leste. This decision by the MPA Learning Partnership to focus on the Coral Triangle was strategic and timely in light of the emerging Coral Triangle Initiative and commitments of the countries to work together to promote food security, sustainable fisheries and climate change adaptation. The Coral Triangle Initiative can benefit and build on the extensive learning and outputs achieved by the MPA Learning Partnership. Furthermore, the collaboration and interinstitutional learning achieved by the partnership can serve as an excellent platform upon which to build strong and lasting partnerships in the Coral Triangle region.

Learning and capacity building, both on individual and institutional bases, are essential for effective and sustained conservation impacts. As we work to conserve our coral reef resources, we need to focus not only on establishing effective MPA networks, but also on effective learning approaches to accelerate learning and disseminate lessons. The MPA Learning Partnership offers a model for effective learning across organizations, field sites and conservation practitioners. In light of rapidly increasing threats from global climate change and globalization, we need to focus not only on *ecosystem resilience*, but also on those factors, such as learning and capacity building, that promote *management resilience*, i.e., more effective, responsive and stable management systems.

**Dr. Barbara Best**

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# PREFACE

The *Marine Protected Area Networks in the Coral Triangle: Development and Lessons* summarizes the results of the MPA Learning Partnership Project of TNC, CI, WWF, WCS and USAID.

This book provides a comprehensive summary of the current status of six different MPA networks and their complexities. It analyzes MPA networks through their various stages of development including planning and design, implementation and evaluation as they are emerging within and around the Coral Triangle.

The contents represent the culmination of one year's efforts, including working with the teams of six of the most advanced MPA networks in the region. The process of collecting information for this book involved activities in the field, conducting interviews, consultation workshops and interactions with stakeholders, government and nongovernment organizations, academic institutions and the private sector.

The work is attributed to the various specialists, technical experts and scientists who participated in the meetings and workshops, to whom heartfelt gratitude is expressed.

The editors and authors have attempted to provide a balanced view of the complex issues while looking at the many proposed solutions to marine and coastal management. It seems that MPAs are permanent yet evolving mechanisms, while MPA networks are developing. There is still much work to do in reaching the right balance of social and natural sciences and sustainable financing to make MPA networks effective and sustainable so they can thrive in the world's most biodiverse region.

The authors take full responsibility for any factual errors or omissions in this publication.

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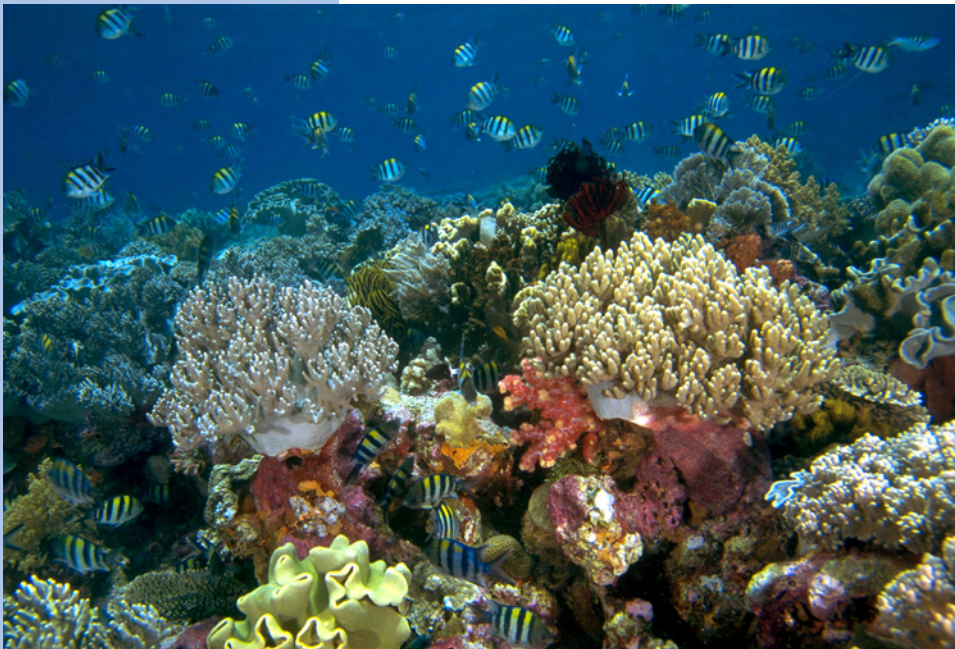
# CHAPTER 1

## Rationale for Marine Protected Areas and Networks

### Marine Conservation and Marine Protected Areas

Coastal and marine ecosystems are in decline worldwide. Overfishing, runoff of nutrients and other land-based pollutants, habitat degradation and the increasing impacts of climate change are leading to ecosystem collapse in all the major coastal and ocean regions of the world (Wilkinson 2004; Hughes et al. 2005).

A key management strategy to address many issues affecting marine and coastal ecosystems and resources is the establishment and implementation of marine protected areas (MPAs). An MPA is a coastal or offshore marine area that is managed to protect natural and / or cultural resources (Agardy and Staub 2006). The most commonly used, international definition of MPA is given by the World Conservation Union (IUCN 2008) as:



Coral reefs in Wakatobi Marine National Park of Southeast Sulawesi, Indonesia. (Burt Jones and Maurine Shimlock, *Secret Sea Visions*)

*a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.*

MPAs are being established worldwide in response to the recognition of the need for conservation efforts, as seen through the degradation of ocean systems. If designed correctly and managed well, MPAs have an important role to play in protecting ecosystems and, in some cases, enhancing or restoring the productive potential of coastal and marine fisheries. However, it is recognized that

MPAs are not the only solution. When MPAs are used in conjunction with other management tools, such as integrated coastal management (ICM) and broad area fisheries management, they offer a comprehensive strategy for marine conservation. The benefits that MPAs can deliver are also related to the effectiveness of management outside of MPAs (Christie et al. 2002; Cicin-Sain and Belfiore 2005).

When appropriately located and well managed, MPAs contribute to:

- ♦ conserving biological diversity and associated ecosystems;
- ♦ protecting critical spawning and nursery habitats; sites with minimal direct human impact to help them recover from stresses; and settlement and growth areas for marine species and spillover benefits to adjacent areas;
- ♦ building of focal points for educating the public about marine ecosystems and human impacts;
- ♦ establishing nature-based recreation and tourism;
- ♦ providing undisturbed control or reference sites that serve as baselines for scientific research and for designing and evaluating other areas;
- ♦ sharing costs and benefits among local communities, private sector, regional and national governments, and other stakeholders; and
- ♦ reducing poverty, and increasing the quality of life of surrounding communities.

The broad applicability of MPAs as a tool for protection and management of marine resources ranges from no-entry areas, to extensive, multi-use protected areas that integrate multispecies and fisheries management. As such, no-take areas are one of the most restrictive types of MPAs, and act as benchmarks for assessing the state of the environment and the success of management regimes. They also contribute significantly towards recovery and protection of marine ecosystems (NRC 2000).

MPAs involve a series of tradeoffs that must be balanced to meet ecosystem protection goals. For instance, a large MPA may be ecologically optimal, but economically, socially or institutionally impractical. Multiple-use MPA zoning, to include no-take areas, provides a way to accommodate multiple users, balancing the trade-offs between sustainable use and conservation objectives for effective management.

### Why Scale Up to Networks?

When used in isolation, small MPAs may not support fish and invertebrate populations that are large enough to sustain themselves. To ensure that young marine organisms are available to replenish and sustain populations within MPAs, the area of protection must be fairly large. However, in many regions, economic, social and political constraints make it impractical to create one large MPA of sufficient size to support viable, self-sustaining populations of all species. Establishing networks of many small to moderately sized MPAs can help to reduce socioeconomic impacts without compromising conservation and fisheries benefits (PISCO 2007).

Furthermore, well-planned networks provide important spatial links needed to maintain ecosystem processes and connectivity. Spatial links and connectivity improve resilience by spreading risk in the case of localized disasters, climate change, failures in management or other hazards, and thus help to ensure the long-term sustainability of populations better than single sites can (NRC 2000).

As science and experience continue to provide more evidence of the importance of biological connectivity and resilience in the face of climate change, natural disasters, and economic, political and social fluxes, networks of MPAs are increasingly becoming valuable management tools. MPA networks can contribute to sustainable development goals by fostering integrated ocean and coastal management through three interrelated functions and benefits:

- ♦ **Ecological** – help maintain functional marine ecosystems by encompassing temporal and spatial scales of ecological systems.
- ♦ **Social** – help resolve and manage conflicts in the use of natural resources.
- ♦ **Economic** – facilitate the efficient use of resources.

The implementation of MPA networks that cover all major marine habitats and ecosystems will help in restoring and sustaining the health of the oceans. If widely adopted, MPA networks can help stem the losses of marine resources and recover not only marine life, but entire ecosystems. When effective, MPA networks can magnify benefits of individual sites, protect large-scale processes, slow the loss of endangered marine species and restore depleted fisheries. In general, MPA networks have more potential to achieve conservation and fishery objectives than single MPAs (Roberts 1997a).

Setting aside marine areas to help replenish resources has been part of traditional management in many societies. But conservation of biodiversity through management tools, including MPAs, is relatively new. It has its roots in the 1982 World Parks Congress in Bali, where participants recognized that conserving biodiversity through the use of protected areas should be applied to the oceans, as well as the land (McNeely and Miller 1982). Since 1982, many international gatherings have endorsed the need for MPAs and MPA networks (Table 1.1). Recently, the Fifth World Parks Congress called on the international community to create a global system of MPA networks that greatly increases the coastal and marine area covered and that should seek to include strictly protected areas that amount to at least 20-30% of each habitat. Currently, only a small portion of this area is being protected (IUCN 2005). Much work remains to reach sufficient area covered within MPA networks and to achieve international commitments.



Boobies take a good vantage point in Tubbataha Reefs Natural Park. (toppx2.com)

**Table I.1. International commitments and current global status of MPAs (WCPA 2008).**

- ♦ **World Summit on Sustainable Development, 2002**, called for establishing a global system of MPA networks by 2012, as part of a strategy to protect and restore marine biodiversity and to maintain the natural resource base for economic and social development.
- ♦ **Fifth World Parks Congress, 2003**, called on the international community to create a global system of MPA networks that “greatly increases” the marine and coastal areas covered.
- ♦ **Evian Agreement signed by the G8 Group of Nations, 2003**, called for the establishment of ecosystem networks of MPAs by 2012, consistent with international law and based on scientific information.
- ♦ **Convention on Biological Diversity, 2004**, agreed to the establishment and maintenance of MPAs to contribute to a global network. Various regional agreements complement these global undertakings.

Current global marine protection targets aim to protect 10-30% of marine habitats within the next 2-4 years. Based on the MPA Global Database, current estimates of MPA coverage include the following (Wood 2007):

- ♦ Approximately 5,000 MPAs have been designated worldwide.
- ♦ Approximately 2.58 million km<sup>2</sup>, 0.65% of the world’s oceans and 1.6% of the total marine area within Exclusive Economic Zones (EEZs), are currently protected.
- ♦ Only 0.08% of the world’s oceans, and 0.2% of the total marine area under national jurisdiction is no-take, where extractive uses are prohibited.
- ♦ Currently, the three largest MPAs are the: Phoenix Islands Protected Area (at 410,500 km<sup>2</sup>); Great Barrier Reef Marine Park (344,400 km<sup>2</sup>); and North-western Hawaiian Islands (at 341,400 km<sup>2</sup>).
- ♦ An immediate global concern is the need for rapid increase in MPA coverage in conjunction with scaling up of ocean management. The increase required to meet the targets is equivalent to another 35 countries creating an MPA the size of the Phoenix Islands Protected Area before 2012.
- ♦ The global distribution of protected areas is both uneven and unrepresentative at multiple scales, and only half of the world’s MPAs are part of a coherent network.
- ♦ A global review of MPA network programs is underway. It documents the experiences generated and variety of approaches taken to develop MPA networks (UNEP-WCMC 2008).

Global MPA area subject to no-take regulation: 12.8%

Area within EEZ covered by MPAs: 1.6%

### What Constitutes an MPA Network?

Not just any collection of MPAs constitutes an MPA network. A network can include several MPAs of different sizes, located in critical habitats, containing components of a particular habitat type, or portions of different kinds of habitats, and interconnected by the movement of animals and plant propagules (PISCO 2007). MPAs must be appropriately placed, sized and spaced to collectively function as an ecological network and to successfully achieve biodiversity goals. In addition, a network implies a coordinated system of MPAs, linked through biological levels, as well as administrative levels, reflecting a consistent approach to design, management and monitoring.

*An MPA network can be defined as a collection of individual MPAs or reserves operating cooperatively and synergistically, at various spatial scales, and with a range of protection levels that are designed to meet objectives that a single reserve cannot achieve.*

An MPA network is also a network of people managing the components of individual MPAs and promoting the network’s viability and longevity. In addition to MPA networks based on ecological considerations, social MPA networks can be formed to facilitate learning and coordination of administration and planning by linking people and institutions involved in MPAs into a coordinate and holistic initiative. The social network provides a rationale for individual MPA stakeholders or communities to coordinate with each other to share experiences and to enhance efforts in managing their respective MPAs (White et al. 2006). In the social MPA network, all agencies, management authorities or communities share the same overall goal, and they can mature, just as ecosystems mature (Agardy and Wolfe 2002).



## Learning Partnership for Effective Design and Management of MPA Networks

In response to the need for sharing of lessons related to MPAs and MPA networks, the “Effective Design and Management of Tropical Marine Protected Area Networks through Cross-Institutional Learning” program was established. The program aims to increase collaborative lesson sharing among major conservation organizations that are working towards scaling up marine conservation efforts from site to system or network level. This program was designed to build on and draw key lessons from ongoing site-based MPA network initiatives within and among four Global Conservation Program (GCP) partner-institutions – The Nature Conservancy (TNC), World Wildlife Fund (WWF), Conservation International (CI), Wildlife Conservation Society (WCS) – and the United States Agency for International Development (USAID).

Despite the move toward large-scale marine conservation initiatives, major challenges to effectively manage and sustain individual MPAs remain. The emphasis on MPA networks is relatively new, so practitioners have few resources to draw upon as they seek to design, adaptively manage, monitor and finance such networks. There is an expressed need for practical guidance based on real experience on how to create and sustain MPA networks. This need stimulated the formation of the MPA Learning Partnership for MPA Networks to capture and analyze the experience gained thus far among conservation institutions working across sites and countries around the world.

The four large nongovernment organizations (NGOs) (CI, TNC, WWF and WCS), together with USAID, created the MPA Learning Partnership to accelerate collective analysis and provide practical guidance to partners and colleagues around the world. This partnership was built on a growing convergence among the organizations toward a framework for tropical marine conservation that emphasizes resilient and representative MPA networks. Through this partnership, the four NGOs have worked together to understand the range of challenges faced in the field, learn from each other’s experience, and collaborate with partners to generate new knowledge and guidance on creating and sustaining functional MPA networks.

The goal of the MPA Learning Partnership is to improve conservation practice in the field as partners scale up from MPA sites to ecological networks, by generating and disseminating increased knowledge of MPA networks through interorganizational collaboration.

### Program overview

The partnership was formed in 2005, with 30 field staff from the 4 organizations and a few key partners. The partnership’s Learning Group represented a variety of backgrounds, responsibilities and experience. In 2005, three



Survey with the District Fisheries Department officers regarding management of the Karimunjawa National Park, Java. (Stuart Green)

regional workshops (in Africa, Latin America and Asia-Pacific) were held to provide an opportunity for members to become acquainted, discuss a standard set of issues across their sites and visit one MPA to learn from its experience in some depth. With this background, the group as a whole met in Australia in October 2005 – in conjunction with the First International Marine Protected Area Congress (IMPAC1). There, working groups were established to address three specific questions related to MPA networks.

In 2006, the MPA Learning Partnership focused on fulfilling two priority learning areas:

#### 1. **Biophysical aspects of MPA network design**

*What are the critical biophysical elements and tools required to design ecologically connected and functional MPA networks? How can we most effectively establish networks of MPAs given the current gaps in this information?*

#### 2. **Social and institutional resilience of communities in and around MPA networks**

*What are the enabling factors necessary to build social and institutional resilience into a network of MPAs? How can we best build the principles of social and institutional resilience into MPA networks so they are more robust?*

Working group co-leaders worked with advisors from the Global Conservation Project (GCP) partner institutions and the learning facilitator to complete literature reviews of the biophysical and social resilience topics, as well as a framework for creating MPA networks and a questionnaire based on this framework for data collection from the participating sites. The questionnaire was piloted in six sites in mid-2006. The information was shared at a joint biophysical-social working group session in Washington DC, USA, in October 2006. Issue experts from NGO partners and other institutions participated in the workshop to share their knowledge and experience. In 2006, the group collated available literature on those topics into

comprehensive summaries and annotated bibliographies intended as reference tools for both partnership participants and the broader community. These documents were shared with the partnership participants (Abesamis et al. 2006; Skilbred et al. 2006). An annual report summarized the workshop results and project to date (February 2007), with recommendations.

The fundamental approach was to support a learner-driven process that addressed the most pressing issues of field staff and partners and engaged them in a global partnership to learn about how best to scale up MPA network efforts. Participants in the October 2006 workshop reviewed the proposed data collection methodology and provided excellent feedback for revising the process for implementation. Through the workshops and site visits in the first two years of the project, these issues were identified and refined into four target questions which were refocused into one questionnaire. Covering biophysical, social and institutional aspects, the questionnaire aimed to be an instrument to: (1) collect baseline data on the extent to which field efforts have begun to scale up to MPA networks; (2) identify good practices (e.g., critical biophysical and social elements and tools); (3) determine the enabling factors necessary to build social and institutional resilience into a network; and (4) flag areas where there are substantial gaps between theory and practice of creating functional MPA networks. The questionnaire provided a means to test the recommendations generated in the October 2006 workshop with what practitioners are attempting to accomplish in the planning and development of MPA networks.

## Program methodology

Based on experience in 2005-2006, the feedback provided by the Learning Group members, and internal and outside experts, and the resources available, the four sponsoring organizations modified implementation plans for the Learning Partnership in two significant ways for the 2007-2008 workplan. First, the focus was narrowed to efforts being undertaken to develop MPA networks within the Coral Triangle. This focus emerged because of the high priority being placed on marine conservation in this region for marine programs in all four organizations. Second, it became clear that the MPA Learning Partnership needed fully employed staff through a learning coordinator with a sound background in field-level MPA work. Thus, it was proposed to employ a short-term learning manager and a learning manager assistant to work closely with the Learning Group members and other practitioners. This arrangement was also aimed at synthesizing the lessons emerging from the members' experience.

In late 2007, the learning manager and learning assistant<sup>1</sup> were hired, together with a part-time consultant

to conduct the third phase of the MPA Learning Partnership through field surveys in six MPA network sites by the four GCP partner-institutions (Figure 1.1).

The following steps summarize the methodology used during the period of October 2007 through September 2008 to implement the workplan as approved by USAID and the four NGOs:

**Step 1:** Data collection was based on a revised questionnaire (Appendix 1) and focused on two learning questions at the core of the Learning Partnership as well as recommendations made in the February 2007 annual report. The revised questionnaire was completed by the learning manager and all key learning partners. WWF and CI technical leads integrated the social and natural science components, building on what have been developed to date. The learning manager and assistant visited each of the six emerging MPA networks within the Coral Triangle region to work closely with the Learning Group members and other practitioners. The purposes of the collaboration were to develop responses to the questionnaire, and to identify good practices and other lessons learned, as well as gaps between the current science of MPA networks and realities on the ground.

**Step 2:** Following these field visits, the learning manager and assistant prepared an initial synthesis of findings on the learning questions. The manager also collaborated with the consultant and lead members and resource persons of the four NGOs on analysis of the findings, as appropriate.<sup>2</sup>

**Step 3:** The learning manager and assistant organized a workshop in the Coral Triangle region in May 2008, to which representatives of the sites / MPA networks visited, were invited. The purpose of the workshop was to review the initial synthesis document and to provide additional input to it. The resulting document, as represented in this publication, includes analytical case studies of all of the participating sites and other examples of good practices that have been used within the region. It also includes an initial set of recommendations for areas / issues that should be addressed by the four NGOs and the marine conservation community more generally to narrow identified gaps between the science and practice of MPA networks.

**Step 4:** The learning manager revised the synthesis document and recommendations based on the results of the regional workshop and the International Coral Reef Symposium (ICRS) in July 2008. The two workshops allowed as many members of the Learning Group as possible to participate, thus broadening the reach of learning to worldwide participants.

**Step 5:** The final report with inputs from the regional and ICRS workshops was disseminated through the World Commission on Protected Areas – Marine web portal for global distribution. As such, it serves as a contribution to

<sup>1</sup> Learning manager: Stuart J. Green; learning manager assistant: Anna Blesilda T. Meneses; consultant: Dr. Patrick Christie.

<sup>2</sup> Lead NGO members were: Dr. Helen Fox and Kate Newman (WWF); Dr. Leah Bunce-Karrer and Dr. Giselle Samonte-Tan (CI); Dr. Caleb McClennen and Dr. Stuart Campbell (WCS); and Dr. Alan T. White and Scott Smith (TNC).





Coral Triangle boundary source: Coral Geographic (Veron et al. 2008)

**Figure 1.1. Coral Triangle map showing locations of the six study sites.**

deliberations on MPA networks at world and regional forums in 2009 and beyond.

### Basic Questions

The overarching questions addressed in this publication stemmed from the beginning of the MPA Learning Partnership in 2005:

1. How can we effectively design, implement and manage representative and resilient MPA networks in tropical marine ecosystems?
2. What ecological, socioeconomic and institutional principles, if met, will ensure that MPA networks provide enduring and effective conservation for marine diversity?

In addition, particular questions were posed on the design of effective MPA networks:

- ◆ Which ecological elements and processes are most critical to the design of static, spatially defined MPA networks?
- ◆ How can we integrate the delivery of economic benefits with ecological benefits in the design of MPA networks?
- ◆ Which management approaches are most effective?
- ◆ What is the most effective design process to ensure social sustainability?

Another aspect of the field surveys was to determine the extent to which ICM is being applied with the realization that MPAs are only one type of coastal and marine conservation strategy. Several basic assumptions were tested regarding what builds sustainable coastal management as drawn from lessons of the ICM Sustainability Research Project in Indonesia and Philippines (Christie et al. 2005), as follows:

- ◆ Management must improve biophysical conditions.
- ◆ Stakeholder participation in decision process should be high.
- ◆ There must be a contribution to economic returns and livelihood.
- ◆ Adequate legal and policy framework must be in place.
- ◆ Capacity for law enforcement is essential.
- ◆ Building durable institutions beyond leadership changes is essential.
- ◆ The role of the private sector in performing tasks is important.
- ◆ ICM should not become too dependent on project resources and should be more reliant on government resources.
- ◆ Education and raising awareness are an integral part of implementation.

# CHAPTER 2

## Methods for the MPA Learning Partnership Field Surveys

### Introduction

This chapter summarizes the methodology used during the last phase of the MPA Learning Partnership. The different tools used, sites, approach and some of the limitations of the data are discussed. To date, the vast majority of research and literature on MPAs has focused on natural science, with mostly anecdotal references to social science. Few rigorous research efforts have evaluated the complexities of the human dimensions of MPAs (NOAA 2005). Studies have shown that in some cases social factors, rather than biological or physical factors determine the success of an MPA (Kenchington and Bleakley 1994; Christie 2004; FAO 2006).



Survey with the Department of Forestry officials, Wakatobi. (Stuart Green)

A survey tool was designed to address various aspects of MPA networks in each of the sites and to begin the task of validating the factors that influence MPAs and their ability to “scale up”. The field survey employed a learning tool to:

1. understand the challenges related to the design, adaptive management, monitoring and financing of networks of functioning MPAs;
2. address specific learning questions affecting marine conservation efforts, learn from each other’s experience, and collaborate with partners at the scale of MPA networks; and
3. provide guidance and resources to help direct recommendations for future applied research and improvements in MPA network planning, design and management and to enhance the effectiveness of achieving a network’s ecological and social goals.

The field interview team members had a variety of disciplines and wide-ranging experience within the Coral Triangle. The MPA Learning Partnership had already prepared a survey tool in the previous phases of the project that served as a good basis for the research tool, while enabling systematic and comparable surveys within the different sites. The survey tool also drew from several publications (Bunce et al. 2000; Pomeroy et al. 2004; and White et al. 2006) and previous MPA Learning Partnership meetings and documentations. The revised tool was field-tested in two sites to ensure it was unambiguous. The interview team also used this as an opportunity to synchronize interview techniques to ensure consistency.

### Site Selection

The six focal areas for the study were preselected during a workshop in 2006 in Washington, DC, USA, among the four NGO partners. The sites shown in Figure 1.1 included three networks in Indonesia, two in the Philippines and one in Papua New Guinea. During the fieldwork in Indonesia, the Karimunjawa National Park north of the island of Java, was added. This replaced the Raja Ampat portion of the Indonesian Birdshead Seascape as Conservation International Indonesia indicated that it was premature for the project team to visit when implementation was only just beginning.

### Survey Design

The following tools were used for data collection and field survey in each MPA network:

1. Secondary data analysis: Various secondary data sources were reviewed to help gain better understanding of each site and refine data collection tools.
2. Presurvey questionnaire: Completed by the MPA network staff, this questionnaire identified secondary data available for each MPA network. The questionnaire also served as an introduction to the objectives and activities of the MPA Learning Partnership.
3. Focus group discussions: These were conducted with small groups of managers and implementers in each of the MPA networks. These in-depth discussions generated qualitative and quantitative data and information about the MPA network. This gave the field team a good introduction to each site. It also generated good discussions on the varying perspectives of the managers and implementers within the MPA network.
4. Learning tool: This was a structured interview questionnaire using a combination of open and close-ended questions. The tool examined the role of governments, institutions and processes, attitudes, perceptions and beliefs within each MPA



Shown are large boats that are used for trade with Singapore docked in the Wakatobi Marine National Park, Sulawesi. Commercial shipping companies should be involved during the national park establishment and management. (Stuart Green)

network. The underlying theme of the questionnaire was to highlight positive lessons and evaluate the management effectiveness of each MPA network.

5. Sustainable financing questionnaire: A structured mini-interview was conducted in each site to gain a better understanding of the consideration of the MPA financing prior to and during the implementation of the MPA network. This was prepared by the Community Conservation and Investment Forum.
6. Workshops: Each partner organization was invited to participate in a workshop held in the Philippines in May 2008. At the workshop, a representative from each site prepared and presented a case study about his / her MPA network. The discussions helped refine details about each MPA network and facilitated inter and intracountry comparisons of MPA networks. A second workshop was conducted in Fort Lauderdale, Florida, USA, following the International Coral Reef Symposium, in July 2008. The workshop was attended by MPA Learning Partnership members, representatives from nongovernment organizations (NGOs), colleagues from the visited sites and experts in the learning areas. Preliminary survey results were shared to generate discussions on MPA network guidelines, and specifically in the context of the Coral Triangle. The results of the case study and the workshops are summarized in Chapters 3 and 6.
7. MPA Learning Partnership database: A database containing background and contact information of all persons interviewed or involved in the workshops was prepared and distributed.

### Itinerary

The project team visited six sites between January and April 2008 (Table 2.1). The itinerary included visits to the different organizations' headquarters in Manila, Philippines, and in Jakarta, Bogor and Bali, Indonesia, to meet with senior management prior to traveling to the field sites.

**Table 2.1. The workshops and survey sites for the MPA Learning Partnership.**

MPA Workshops and Network Sites	Schedule (2008)
Southeast Cebu Cluster field testing of questionnaire	14-19 January
Tubbataha Reef Natural Park	4-8 February
Berau Marine Conservation Area	22 February - 3 March
Wakatobi Marine National Park	7-12 March
Karimunjawa National Park	14-19 March
Southeast Cebu Cluster	2-6 April
Kimbe Bay Marine Managed Area	7-10 April
MPA Learning Partnership Workshop in Tagaytay, Philippines	17-19 May
MPA Learning Partnership Workshop, International Coral Reef Symposium, Florida	12 July

**Survey Methodology**

A mix of MPA network practitioners was interviewed at each site. Target respondents included program implementers, biologists, planners, government officials, economists, university researchers, private sector representatives, local NGOs and other local partners. Local cultural sensitivities were considered, particularly in Indonesia. At two sites, Wakatobi and Berau, questions relating to “management effectiveness” were not asked due to sensitivities of the lead NGO and local government.

A minimum of 15 surveys was administered per MPA network. Interview times ranged from 1 to 3 hours, while the average time was about 1.5 hours. Long interviews occurred when interviewees provided very important historical background and anecdotes. When combined with the different tools and case studies, the quantity and quality of the information provided the project team with a comprehensive overview of each of the MPA network sites.

The field team adopted an inclusive approach (involving local implementers and stakeholders together in the questionnaire process), as opposed to keeping them separate. After interviews, general results were promptly shared and discussed with the field teams. Interviewees were assured of confidentiality for their responses. Due to time and language constraints, interactions with fishers at the Indonesian sites were limited.

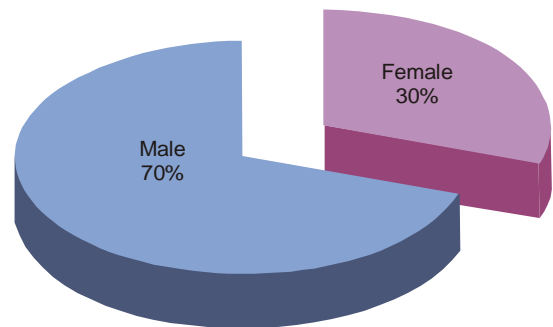
Poor weather conditions prevented the team from traveling by boat to the MPA networks of Karimunjawa and Tubbataha. Despite this limitation, phone interviews were conducted with island-based respondents. Focus group discussions were not conducted at Kimbe Bay due to lack of time and because a fish spawning aggregation occurred that required monitoring by members of the Kimbe network and took priority over the interview schedule.

Generally, interviews were primarily conducted in English. In the Philippines, interviews were also conducted using the local language. In Papua New Guinea, Pidgin English was used. In Indonesia, TNC staff in Derawan, Berau, translated the questionnaire into Bahasa Indonesia, and interviews were conducted with the presence of a translator, when respondents requested.

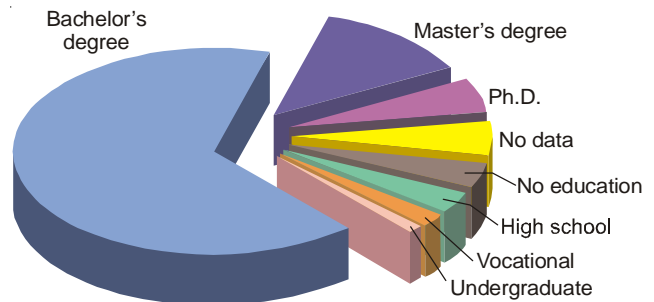
The field tools used in each site were the same<sup>1</sup> to ensure consistency of results, enabling a cross-site analysis. Interviews were conducted through the learning tool. This structure was necessary to acquire reliable and comparable qualitative and quantitative data among sites. A total of 94 respondents were interviewed during the survey. The composition of the interviewees was according to gender (Figure 2.1), educational attainment (Figure 2.2), educational course (Figure 2.3) and organization / representation (Figure 2.4).

**The Field Learning Tool: Structured Interview**

To simplify the questionnaire, it was formulated into six different sections as shown in Table 2.2. A full copy of the questionnaire is in Appendix 1.



**Figure 2.1. Gender of survey respondents (n=94).**



**Figure 2.2. Educational attainment of survey respondents (n=94).**

<sup>1</sup> However, questions relating to management effectiveness were removed for both TNC sites, Berau and Wakatobi, and interaction with local fishers was discouraged upon the request of the lead scientist for the Coral Triangle Center of TNC.





Community monitoring and planting of mangroves with Ewase Community School children at Bialla, West New Britain Province. (Freda Paiva)

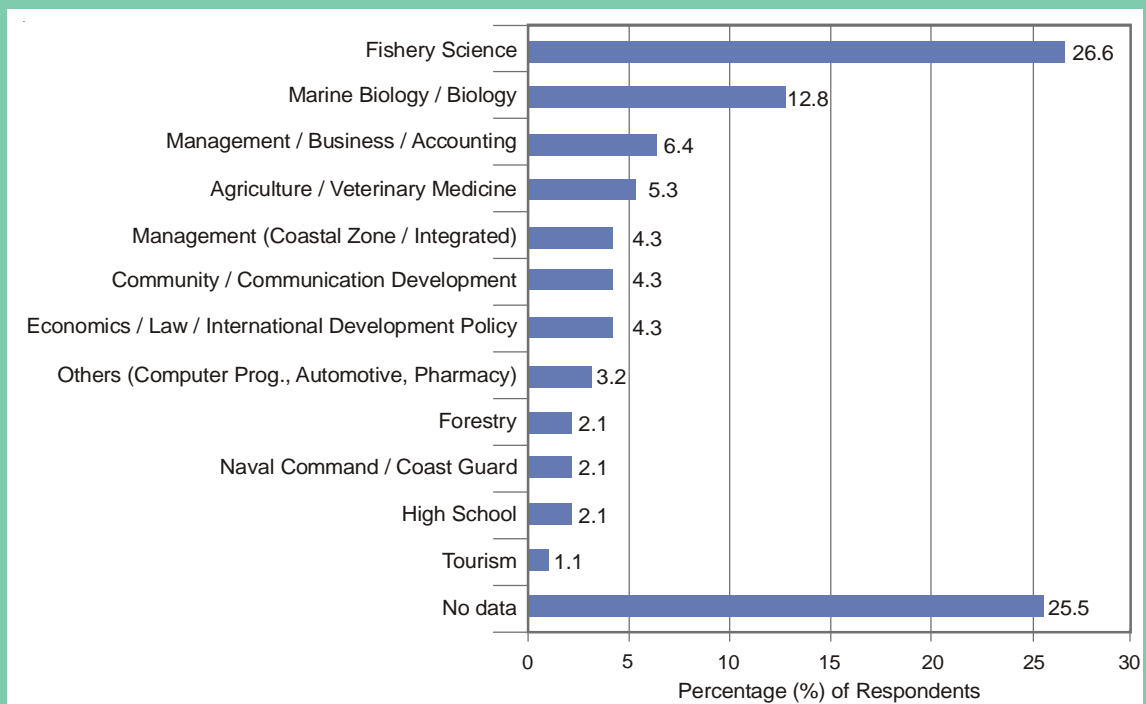
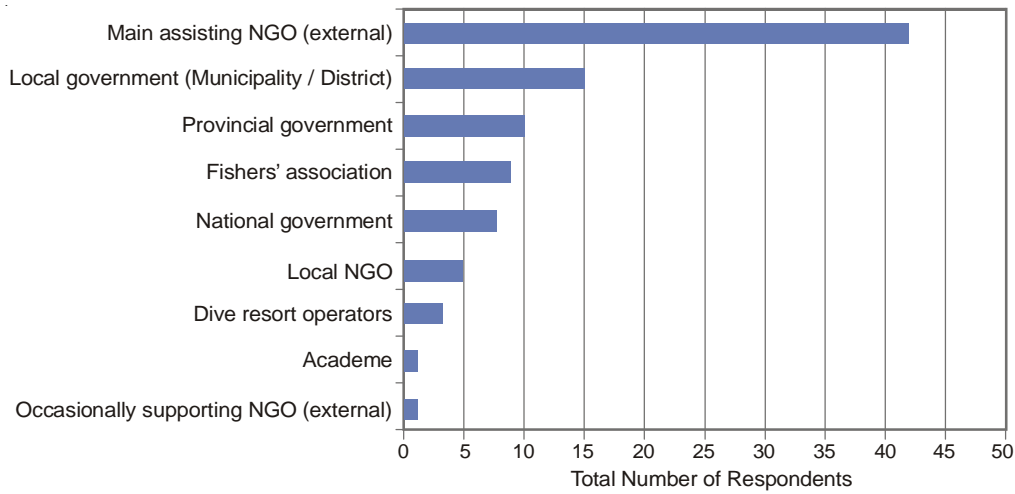


Figure 2.3. Educational course of survey respondents.





**Figure 2.4. Affiliation of survey respondents.**



Survey interview with a district fisheries officer in Karimunjawa, Java, Indonesia. (Stuart Green)

**Table 2.2. The survey tool sections.**

I. Site description	This section drew out the perspectives of the interviewee on human activities and natural disturbances within the no-take zones. It asked each interviewee to rate the impact of these disturbances on the no-take zones.
II. MPA network planning and design (up to legal declaration)	This section looked into the design of the MPA network. Questions focused around the MPA network planning and design; what scientific, ecological and social information was considered; the stakeholders involved to learn from the planning process as well as to assess site selection of the no-take zones and the final zoning system.
III. MPA / network management and implementation (since legal establishment)	This section asked perceptions of the establishment of the MPA network; the capacity and effectiveness of the management group in charge of the MPA as well as other factors relating to the management of the MPA network. This section also looked at enforcement of the MPA network; levels of compliance; enforcement actions and problems involved in implementation; and identification of priority programs for the coming five years.
IV. MPA network monitoring and evaluation (since implementation began)	Section A. Observed biophysical outcomes: This section asked perceptions of changes seen in the core zone/s and buffer zone/s and in fishing effort in and around the MPA network. It also identified scientific research conducted. Section B. Observed social outcomes: This section asked perceptions of social changes within the site since the MPA network was implemented. Section C. Observed MPA network benefits: This section asked perceptions relating to benefits of those involved in the MPA network, what those benefits are and what factors are inhibiting the MPA network.
V. Social network of MPAs	This section asked perceptions of the presence of any formal and informal network of MPA practitioners within the MPA network as well as having open-ended questions about lessons learned.
VI. The MPA / network in the international / national context	This section asked perceptions of the nationwide directions for MPAs and looked for predictions on the future of MPAs in both the short and long terms.

## Limitations of the Approach

The main tool used to collect information was the structured interview form. While this approach was well suited to the study, there were a few limitations to the tool. These included the following:

- ♦ The tool was time-consuming and expensive, depending on the number of people and whether transcripts of recorded interviews were required.
- ♦ The presence of MPA network project staff could lead to biased responses.
- ♦ The results were difficult to analyze and compare.
- ♦ The questionnaire asked perceptions mostly, so data were based on what people considered and were not actual facts.
- ♦ The quality and quantity of baseline information varied between sites.

When conducting social science research, the reliability and credibility of any information are dependent on the precision of the data collected (NOAA 2005). To standardize the results, only two interviewers were used for the whole of the study. Upon entering a new site, the first five interviews were conducted jointly by both members of the team. Succeeding interviews were conducted individually by each team member. Terminologies used in each network were different, so the interviewers would supplement questions with local terms to confirm the question was standard in each area. For instance “social MPA networks” and even the term “MPA network” had different meanings in each site.

Although the questionnaire was fixed, new variables could be added when necessary without changing the overall questionnaire. The survey tool was able to expand and adapt to local nuances which were not considered in the original questionnaire while still allowing consistent data analysis. For instance, one of the key impacts on the Kimbe Bay MPA network was palm oil, so it was added to the questionnaire. Likewise, in the Philippines, seismic surveys and oil and gas drilling were added as potential threats to the MPA networks.

The questionnaire was a mix of closed-ended questions (yes / no and a simple 1-5 rating system) and open-ended questions. The rating system, which is referred to throughout this book, simplified responses (Table 2.3) and enabled simpler statistical analysis.

## Data Analysis

Within two days of the actual interview, data were encoded into a series of spreadsheets and consolidated by site and country. To analyze the data, several statistical methods were used, including summary descriptive statistics, t-test analysis, correlation analysis and multivariate regressions. Statistical analyses were performed in Excel and the Statistics Package for Social Scientists (SPSS) (<http://www.spss.com/>). Using SPSS, basic descriptive statistics were organized to discern general trends. The mean rating results were then compared using two-tail test to evaluate the differences in means between variables within a group. The results of this analysis are shown in chapters 4 and 5.

A correlation analysis using Spearman two-tail test was carried out for variables using the consolidated data from all the sites surveyed. Correlation is a statistical technique to show whether, and, how strongly pairs of variables are related (Creative Research Systems 2008). This type of analysis indicates the strength and direction of a linear relationship between two variables. Correlation cannot be validly used to infer a causal relationship between the variables. However, correlation can be viewed as evidence for a possible causal relationship.

Thus, to ascertain the causal effect of one variable upon another, a stepwise linear regression analysis was carried out. Regression analysis is a statistical forecasting model that is concerned with describing and evaluating the relationship between a given variable (dependent variable) and one or more other variables (independent variables). Regression analysis can predict the outcome of any given key indicator (dependent variable) based on the interactions of other related drivers (explanatory variables) (Wikipedia 2008). These are all discussed and presented in detail in chapters 4 and 5.

**Table 2.3. Rating system guide for respondents.**

Range	Extent / Capacity / Effectiveness	Abundance	Frequency	Status / Rate	Change
1	Very high / very much	Abundant	All the time (every week)	Excellent	Significant improvement
2	High	Somewhat abundant	Most of the time (every month)	Very good	Slight improvement
3	Moderate	Scarce	Sometimes (every few months)	Good	No change / status quo
4	Low / not so much	Rare	Rarely (once a year)	Fair	Slight decline
5	Zero / none at all	Absent	Not at all (never)	Poor	Significant decline / total loss
DK / NA	----- Don't know ----- Unsure of the answer ----- No information -----				

# CHAPTER 3

## The Study Sites of the MPA Learning Partnership

### Introduction

This chapter introduces the marine protected area (MPA) network sites, the Coral Triangle, the countries and their context. Each MPA network is described, giving some historical and social information. This chapter was prepared in coordination with each of the MPA network management teams.



A diver is barely seen among the soft corals, surgeonfish and snapper in waters surrounding the island of New Britain, West New Britain, Papua New Guinea. (Jeff Yonover)

### The Coral Triangle

Referred to as the “Amazon of the Seas”, the Coral Triangle is located along the equator where the Indian Ocean and Western Pacific Ocean meet. This region consists of portions of the waters and coastal regions of six countries: Indonesia, Malaysia, Philippines, Timor-Leste, Papua New Guinea (PNG) and Solomon Islands. The Coral Triangle covers an extraordinary expanse of ocean encompassing an area of 5.7 million km<sup>2</sup> or 1.6% of the coverage of the world’s oceans (CTI Secretariat 2008).

The Coral Triangle is recognized as an area of global significance, blessed with over 75% of known coral species, over 30% of the world’s coral reefs, over 3,000 species of fish and the greatest extent of mangrove forests of any region. It is the epicenter of marine life abundance and diversity on the planet and home to over 600 reef-building coral species. The region has a population of 360 million people with estimates suggesting that a third of whom are directly dependent on marine resources. The region’s productivity and unique species assemblages and evolutionary significance make it a repository for the different species of the Indian Ocean and Pacific Ocean.

Recognizing the region's rich resources, leaders from the six countries proposed a multilateral partnership, called the Coral Triangle Initiative (CTI) to safeguard the region's extraordinary marine and coastal biological resources. Since then, the CTI has developed momentum, and the six governments are engaged in an aggressive process to finalize a CTI Plan of Action in the World Ocean Conference in Manado, Indonesia, in May 2009 (CTI Secretariat 2008).

Several countries within the Coral Triangle region have had considerable experience with the establishment of MPAs. The Philippines and Indonesia, in particular, have MPAs dating back more than 30 years. As MPAs have developed in the region, there has been a realization that single MPAs can be effective, but their impact needs amplification through improved planning, coordination and networking. As argued by Bailey and Pomeroy (1996) in the context of coastal regions of Asia, "Fishing communities are best understood as dependent not on a single resource but on a whole ecosystem. This expanded understanding of tropical coastal resources is the key to stability for households and communities in South East Asia's coastal zones."

MPA networks are one of the tools that can address large-scale management to achieve sustainable use and conservation of the coastal resources in the Coral Triangle countries.

## INDONESIA

Indonesia is the world's largest archipelago and one of the world centers of diversity for coral reef ecosystems (Tun et al. 2004). It has a coastline of 95,181 km that extends over a vast marine area including an estimated 42,000 km<sup>2</sup>

of mangroves and 51,000 km<sup>2</sup> of coral reef or about one-fifth of the world's coral reef area (UNEP/WCMC 2008) (Figure 3.1). Composed of roughly 17,508 islands, Indonesia has a population of about 230 million, and an annual population growth rate of 1.5% (Hopley and Suharsono 2000; Resosudarmo 2005).

Unfortunately, much of the incredible array of marine biodiversity in Indonesia is threatened by development and overfishing pressures. Data collected in 2000 from 414 reef-monitoring stations located throughout Indonesia found that only 6% of coral reefs are in excellent condition, while 24% are in good condition and approximately 70% are in poor to fair condition. The results from this assessment can be attributed to destructive and unregulated fishing, unregulated tourism, and coral bleaching resulting from pollution and climate changes (JHU 2003).

Indonesia is also ethnically diverse. The largest ethnic group is the Javanese, representing approximately 45% of the population, while the Sundanese, Madurese and coastal Malays make up 14%, 7.5% and 7.5%, respectively. While the official language is Bahasa Indonesia, Javanese, and more than 580 other languages and dialects are spoken. The nation is more homogeneous, however, in terms of religion, with the majority of the population Muslim (88%), with minority groups of Protestants, Roman Catholics and Hindus (Bennett et al. 2005).

## History of MPAs

During the World Parks Congress in Bali (1982), the Government of Indonesia declared its intention to establish a national system of MPAs, covering 100,000 km<sup>2</sup> in its National Marine Conservation Strategy. In 1990, a ministerial decree provided Indonesia with its first specific legal basis for designation and management of MPAs. In 1993, the Biodiversity Action Plan was produced and set a goal of 200,000 km<sup>2</sup> of marine habitat to be protected. The government currently aims to protect 100,000 km<sup>2</sup> by 2010 and 200,000 km<sup>2</sup> by 2020 (UNEP/WCMC 2008).

Indonesia has established 114 MPAs (37 within the Coral Triangle), 38 of which contain coral reefs as the dominant habitat (WFC 2007). Legally designated MPAs currently cover almost 70,000 km<sup>2</sup> (Pet-Soede 2006). Most of Indonesia's MPAs are combined terrestrial and marine parks, administered by the Ministry of Forestry (MOF), many of which were gazetted during the 1980s. Recently, the Ministry of Marine Affairs and Fisheries has taken over the administration and establishment of new



Coral Triangle boundary source: Coral Geographic (Veron et al. 2008)

Figure 3.1. Survey sites in Indonesia and Coral Triangle boundaries.



marine (subtidal) protected areas which are district-based and locally managed. The country is composed of 27 provinces, each with its own government which has jurisdiction over the coastal resources from the shoreline leading out to 12 nautical miles offshore. The newly established MPAs are administered at the national level but managed at the district (regional) level.

Indonesia has placed a considerable percentage of its land and coastal areas under legal protection. However, it is estimated that less than 20% of MPAs are functionally meeting their management objectives (WFC 2007; UNEP-WCMC 2008).

## Indonesian Focal Sites

### Berau Marine Conservation Area

The Berau Marine Conservation Area (BMCA) is located in Berau Regency in the province of East Kalimantan, Borneo, at the junction of Sulawesi and Java Sea (Figure 3.2). The capital city of the regency is Tanjung Redeb. Berau is the wealthiest of the country's 300 regencies. The economy of Berau is characterized by a heavy dependence on the extraction of mineral and other natural resources, mainly coal mining and logging (Keulartz and Zwart 2004). East Kalimantan has the nation's highest per capita income (BPS 2003). In 2002, the annual per capita income in the province was US\$850<sup>1</sup>, while nationally it was US\$705. In 2002, economic growth in the region was at 4.4% (including oil and gas sectors).

Berau Regency has an approximate land area of 24,201 km<sup>2</sup> and a marine area of 12,700 km<sup>2</sup>. The total coastline is 461.77 km with around 31 small islands. There are 26 villages within the BMCA with 23,239 people living in the coastal areas (BPS 2003). Berau's coastal and marine areas are part of the Indo-Australian region, the richest faunal region in the world in terms of biodiversity. The area also has the highest marine biodiversity in East Kalimantan. Berau is Indonesia's largest nesting site for endangered green sea turtles; the world's largest and most diverse jellyfish lake; an aggregation site of manta rays; a comprehensive reef system; and one of the last remaining viable populations of orangutans.

The majority of settlers in coastal villages are Bajaus and Sulawesis who are generally fishers and nomadic. In addition, there are about a dozen other ethnic groups residing in coastal villages using five different languages living in and around the BMCA. About 90% of residents in the area are Muslim.

A combination of factors, including low educational attainment, limited access to land, poor soil quality, low rainfall and limited water supply, have pushed communities to rely on marine resources for their livelihood. About 97% of coastal communities rely on fishing for their basic needs while the rest work as traders or civil servants (Hopley and

Suharsono 2000).

Most people residing within the BMCA live along or near the coast in small communities. Community members have settled in small plots of land upon which they build dwellings, construct traditional shrimp ponds or dry fish. Some villagers hold official land titles while others only have a permit from the head of village and the head of subdistrict. On marine resources, community members must go to the Berau Fisheries Agency to obtain a permit to carry out fishing activities. In Berau, it is common to find traditional laws that govern the community use of marine resources. Village communities do not enforce any formal fisheries management systems. Furthermore, fishers can exploit marine resources in almost all areas and no punishment exists for either the overexploitation of marine resources or the use of destructive fishing practices.

The marine waters are strongly influenced by the major tropical oceanic exchange current between the Pacific Ocean and the Indian Ocean, known as the Indonesian flow trough which is periodic deep-sea upwelling from the Sulawesi Sea, and by the major river outflows. The

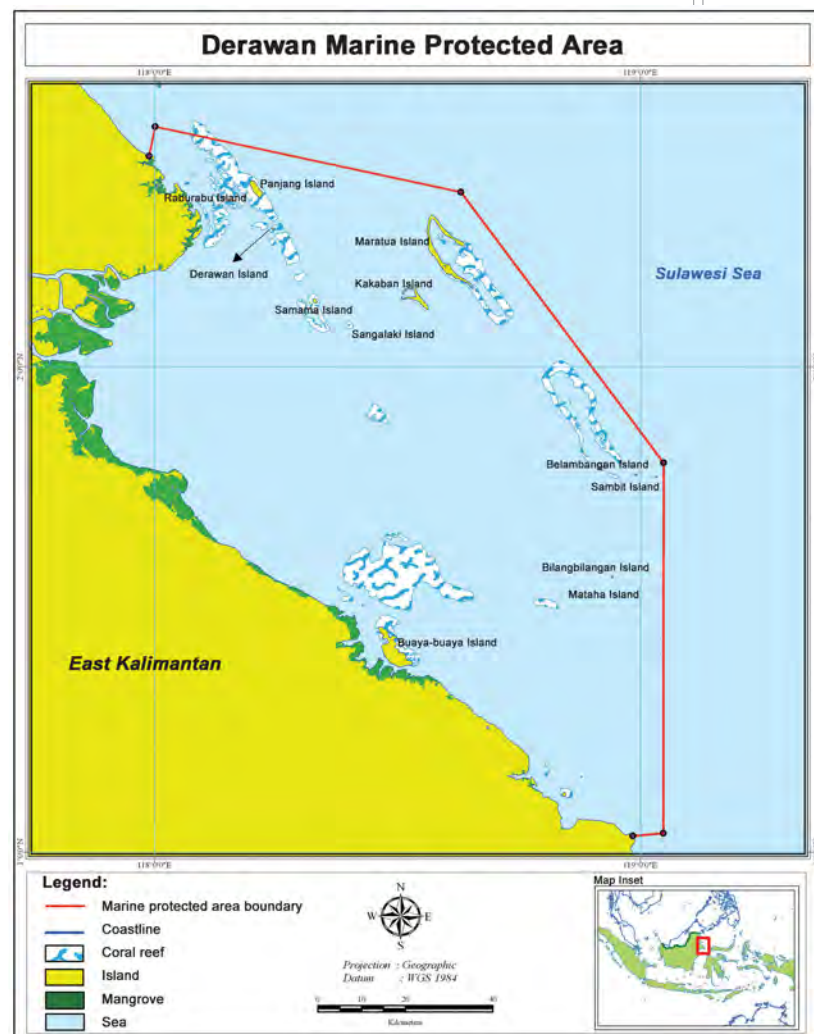


Figure 3.2. The BMCA boundaries.

<sup>1</sup> US\$1 = Rp 9,300 (September 2008)



interisland passages between the major reef complexes and islands are governed by substantial tidal and oceanic exchange currents ranging from 2 to 4 knots. This makes for a diverse and dynamic marine environment.

The BMCA consists of six main islands (Palau Panjang, Derawan, Semama, Sangalaki, Kakaban and Maratua), a unique delta-front patch reef complex, fringing reefs and three atolls. The atolls of Kakaban and Maratua cover 19 km<sup>2</sup> and 690 km<sup>2</sup>, respectively, and Muaras Reef which stretches 288 km<sup>2</sup>. Additionally, the north coast of the Sangkulirang Peninsula has a fringing reef that stretches 180 km<sup>2</sup>. An estimated total of 470 coral species have been recorded in the area, putting it in second position, after Raja Ampat, for the highest diversity of hard coral species in Indonesia (Turak and Shouhoka 2003). The BMCA harbors 872 fish species in 288 genera and 77 families. There are at least eight species of seagrasses that shelter 85 fish species from 34 fish families (Wiryawan et al. 2005) and 26 recorded species of mangrove (Bengen and Dutton 2004).

### Establishment

Initial marine surveys were conducted in 1979 by the national government that identified the turtle nesting sites at Sangalaki and Samama Islands as important areas for protection. In 1982, the Agriculture Ministry Decree No. 604 of 1982 declared the island of Sangalaki as a Marine Park of 2.8 km<sup>2</sup> and Semama Island as a Wildlife Reserve of 2.2 km<sup>2</sup>. The marine park was extended in December 2005, through Decree No. 31/2005 released by the head of Berau District establishing the 12,000-km<sup>2</sup> BMCA.

There are two long-term goals for the protection of Berau marine resources: (1) to develop a large multipurpose MPA and (2) to create a resilient network of MPAs in the seascape of Northeast Borneo. Within these goals, the main

objective is to ensure that BMCA will protect biodiversity while allowing sustainable use of resources by local communities. In the development of the BMCA management design (which is still in process), a collaborative approach with the District Government is being adopted to achieve the following outcomes:

- ◆ delineation of the BMCA boundaries and zones;
- ◆ integration of the BMCA into the newly formed Berau District Spatial Plan and gazetted MPA;
- ◆ establishment of commitment for funds allocation by the District Government Anggaran Pendapatan Belanja Daerah and others for the MCA establishment and management;
- ◆ establishment of a comanagement advisory board for the MCA;
- ◆ stopping issuance of turtle egg collection concessions;
- ◆ design and implementation of a monitoring and surveillance program; and
- ◆ reduction of incidence of illegal and destructive resource use methods such as blast and poison fishing.

The MCA is divided into several programs to carry out the above outcomes. The specific programs of the BMCA are:

- ◆ sustainable fisheries management;
- ◆ marine-based ecotourism;
- ◆ research and development;
- ◆ socioeconomic development; and
- ◆ sustainable marine and coastal resource utilization.

### Management

Initially, the marine wildlife reserve was managed by the local and national government departments. In 1998, the local nongovernment organization (NGO) Kehati Foundation began biodiversity conservation work in the area. One year later, the local NGOs, Bestari and Kalbu, began assisting in the conservation and community empowerment efforts. By 2000, the Turtle Foundation began working on turtle conservation on Sangalaki Island, and the WWF-Indonesia entered to work on the sea turtles under the Sulu-Sulawesi Marine Ecoregion (SSME) Program. In 2001, the Bupati Decrees on establishment of a monitoring and research team for sea turtles, and on collaboration of turtle monitoring, including instructions to stop turtle concessions in the islands of Derawan and Sangalaki, were passed.

In 2002, The Nature Conservancy (TNC) began to work in the area through the Resilient MPA Networks Program. By 2004, a Memorandum of Understanding (MOU) was prepared among Kehati, Bestari, Kalbu, the Coastal Resource Management Project (CRMP), the WWF and TNC, for methods to move forward in management of this important area. This led to District Decree No. 225, which established the Steering Committee with the mandate to “facilitate and socialize district regulations on integrated



A young fisher on paddle boat with crab pots in mangrove areas, Kaledupa, Berau Regency, East Kalimantan. (WWF-TNC Joint Program)



Meeting of the Berau Steering Committee in the WWF-TNC Joint Program Office and the provincial government. (Nina Dwisasanti)

coastal resources management, facilitate the formation of a Joint Committee for the management of a MPA, and serve as a communications, consultation and coordination vehicle in integrated coastal and marine management” (TNC and WWF 2006). The Steering Committee is composed of the following members: regent and deputy regent of Berau, district secretary, heads of the Berau Office for Fisheries and Marine Affairs, District Planning Office, Tourism and Cultural Office, Berau Environmental Management Office, Nature Conservation Agency of Berau, Berau Forestry Office, and Joint Secretariat consisting of the NGOs of Yayasan Berau Lestari (BESTARI<sup>2</sup>), Yayasan Keanekaragaman Hayati Indonesia (KEHATI<sup>3</sup>) and Yayasan Konservasi Alam dan Budaya (KALBU<sup>4</sup>), CRMP (Mitra Pesisir), WWF and TNC (TNC and WWF 2006).

In July 2005, the WWF-TNC Joint Program for Berau was formed with a ten-year goal. This involved a formal agreement between the two large NGOs to work as a team. The WWF assumes leadership on field operation management and coordinates with field staff from both the WWF and TNC to conduct field interventions following a single project workplan funded by both institutions. By 2008, the Berau  *bupati*  (head) of the regency established the BMCA Steering Team through a decree. This Steering Team is mandated to look into the affairs of the BMCA management.

### Ecological design and zonation

**Table 3.2. Proposed zones for and allowed activities in the BMCA.**

	Small-scale tourism	Large-scale tourism	Settlement village	Local fisheries and mariculture	Nonlocal fisheries and mariculture	Shipping	Local vessel traffic	Research	Management monitoring	Management rehabilitation	Recreational fishing
General use zone	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Traditional use zone	✓	X	✓	✓	X	X	✓	✓	✓	✓	X
Tourism zone	✓	✓	✓	✓	X	X	✓	✓	✓	✓	X
Protection zone (no-take ecotourism)	✓	X	limited to outreach activities	X	X	X	✓	✓	✓	✓*	X
Special management zone (for specific purposes)	X	X	X	X	X	X	X	✓*	✓*	✓*	X

\*With permit

The BMCA zonation plan is currently being developed. It was designed using a combination of scientific information and traditional knowledge. The Marxan software<sup>5</sup> (Leslie et al. 2003) helped guide the placement, size and spacing of no-take zones. The model considered larval dispersal, spawning aggregation sites (SPAGs), home range of focal species such as sea turtle and cetacean migration distances and routes while integrating social concerns. At the time of the survey, the park zonation planning process was still in progress. The specific parameters are shown in Table 3.1, the activities allowed in the zones, in Table 3.2 and the proposed zonation map, in Figure 3.3.

**Table 3.1. Parameters used in deciding the sizes and locations of the no-take zones in the BMCA.**

- ◆ 8% of the entire park is in no-take zone.
- ◆ No-take zone size: minimum = 1.5 km<sup>2</sup> / maximum = 20 km<sup>2</sup>
- ◆ Distance between no-take zones: minimum = 500 m / maximum = 40 km
- ◆ 30% of each of the critical habitats is in no-take zones.
- ◆ Turtle nesting sites are zoned as no-take zones.
- ◆ 100% of seagrass area in the north, which is a turtle feeding-ground, is a no-take zone.
- ◆ 100% of grouper SPAGs are declared as no-take zones (humphead and napoleon wrasse included later), with maximum spacing between SPAGs of 40 km.

The WWF-TNC Joint Program regularly conducts biophysical surveys (annually) together with the Berau District Fisheries Agency, the Agency of Nature and Resource Conservation (KSDA), and the Community Forum. Additional surveys are conducted by the Bogor Agricultural University for mangroves and the Turtle Foundation for turtle research and monitoring. Community

<sup>2</sup> Bestari – The Berau Sustainable Foundation is engaged in the promotion of sustainable natural resources use in Derawan Islands, especially Maratua Island capacitating communities to manage their natural resources.

<sup>3</sup> Kehati – The Indonesian Biodiversity Foundation promotes policies relevant to the conservation and sustainable use of biodiversity; facilitates exchange of information related to the sustainable use of biodiversity among concerned parties; and fosters and improves the ability of the community at large to conserve and utilize biodiversity in a fair, equitable and sustainable manner.

<sup>4</sup> Kalbu – The Culture and Natural Resources Conservation Foundation in Berau district is actively promoting, through awareness raising, conservation and management issues and their solutions.

<sup>5</sup> Marxan is a conservation planning optimization tool that delivers decision support for reserve system design.



perception monitoring is conducted by the WWF-TNC Joint Program every two years.

**Current challenges**

A growing population, lack of education and awareness of MCA laws, unsustainable fishing, deforestation and mining are taking a toll on the marine environment. Green sea turtles and other wildlife are threatened by illegal trade and harvesting. These are perpetuated by cultural traditions (turtles are traditionally served in Indonesian feasts), economic conditions and market demand. Traditional fishing methods are responsible for bycatch of turtles leading to entanglement and death.

The BMCA continues to implement management actions to eliminate persisting causes of stress mentioned above, as well as to achieve the following long-term goals for the marine park:

- ♦ to regularly monitor resource use, reef health, coral cover, SPAGs, etc.;
- ♦ to develop a large multipurpose MCA with community involvement;
- ♦ to create a resilient network of MPAs and MCAs within the North East Borneo Seascape;
- ♦ to adopt a collaborative approach as opposed to working individually;
- ♦ to ensure adequate government policies are in place to support MCA establishment and implementation; and
- ♦ to involve the local community in the BMCA's management plan development.

For example, as part of the turtle social awareness program of the MPA Steering Committee, posters have been created to educate on how to eliminate illegal turtle harvesting.



Poster of Berau's flagship species: "Sea turtles, the future of Berau's ecotourism. Together, let us protect them!" (Nina Dwisasanti)

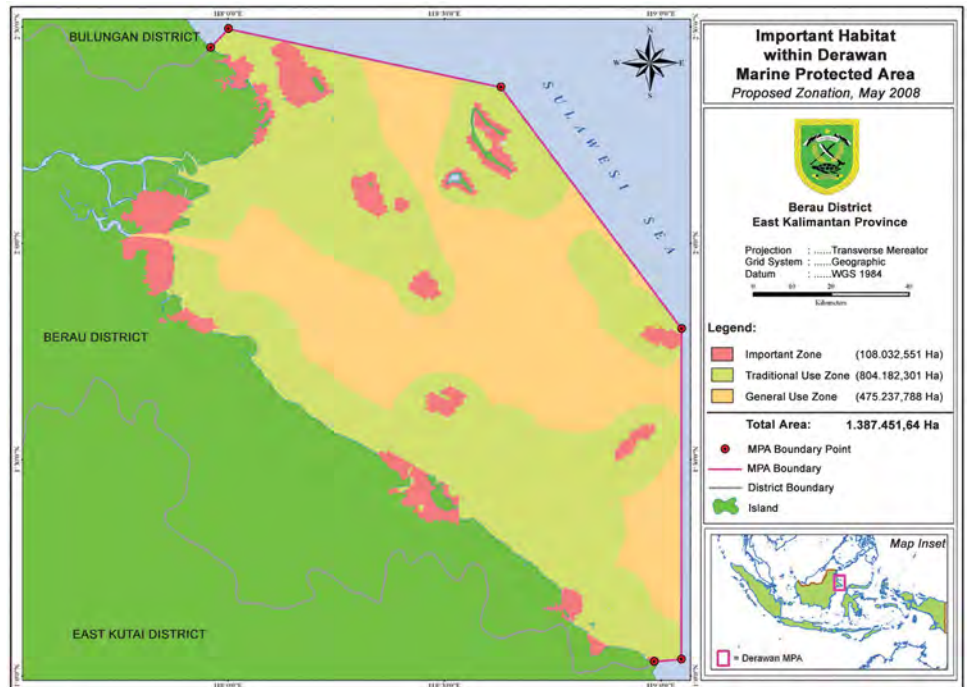


Figure 3.3. Proposed zonation for the BMCA.

**Karimunjawa National Park**

The Karimunjawa National Park (KNP) is located about 75 km off central Java's northern coast in western Indonesia and slightly beyond the outer boundaries of the Coral Triangle as defined by Veron et al. (2008). The park is within the subdistrict of Kecamatan Karimunjawa, under Jepara Regency, central Java province (Figure 3.4). The Karimunjawa subdistrict is composed of 22 islands divided into 3 villages: Karimunjawa, Kemujan and Parang. Among the 22 islands, 4 islands are inhabited - Karimunjawa, Kemujan, Parang and Nyamuk.

The estimated population in Karimunjawa subdistrict in 2003 was 8,842. The dominant ethnic groups are Javanese, Madurese, Buginese and Mandarese, and the dominant religion is Islam. Fishing is the main livelihood practiced by over half the population, with farming practiced by others. The fishers mainly fish during the dry season and throughout the entire area. The education level of the population is low for the area, with most not being able to complete elementary school.

There are five main habitats comprising the KNP: (1) coral reefs; (2) seagrasses and algae; (3) mangrove; (4) beach forest; and (5) lowland tropical rainforest. Ecologically, Karimunjawa Archipelago is one of the few remaining large coral reef areas in western Indonesia in relatively good condition. It contains Dewandaru trees, habitat of the white-bellied sea eagle; green turtles, hawksbill turtles and Olive Ridley sea turtles; and abundant red corals. Coral reefs are of three types: fringing, barrier and patch. Live hard coral reef coverage ranges from 10 to 75%. The park has 353 reef fish species from 43 families, and 5 species of clam (WCS 2008).



Figure 3.4. The location of the KNP.

**Establishment**

Karimunjawa was among the first areas recognized in Indonesia as important for conservation and marine biodiversity protection. It was formally declared a Strict Natural Reserve in April 1986 by MOF (PHKA Decree No. 123/Kpts-II/1986), and has since been declared a priority area for marine biodiversity conservation in Southeast Asia (World Bank 1992).

In 1988, the MOF declared the area a national park and, in 1990, the PHPA zonation was released. By 1999, the ministry established Karimunjawa Archipelago as the KNP, covering 1,106.25 km<sup>2</sup>. The park consists of both terrestrial and marine components. The sea covers 1,101.17 km<sup>2</sup>, while the lowland tropical forest covers 12.86 km<sup>2</sup> and the mangrove forest, almost 3 km<sup>2</sup>.

The goals and objectives of Karimunjawa are to protect biodiversity, ecosystems and resources for sustainable use and livelihoods; preserve species; and provide effective management for community prosperity.

**Management, ecological design and zonation**

The KNP is managed by the Karimunjawa National Park Authority (KNPA) of MOF. The Wildlife Conservation Society (WCS) has an MOU with MOF, and is giving technical assistance to the KNPA. The University of Diponegoro also provides technical assistance.

The park zonation was finalized in 1999, but was evaluated and amended between 2003 and 2005 (Table 3.3). The rezoning was used as an opportunity to work more with local stakeholders and to help define KNP management policies. Workshops and consultation meetings were conducted in Jepara and three villages to foster better communications and commitment from stakeholders to work together and to increase coordination in implementation.

Surveys, which were conducted to serve as bases for planning and designing of the zones, included:

- ◆ ecological surveys (coral reef, invertebrates and reef fish);
- ◆ socioeconomic perception surveys (to assess level of community understanding on zoning); and
- ◆ muro-ami fishing<sup>6</sup> (to assess impact on ecological and socioeconomic aspects).



Muro-ami fishing nets above the water surface (Ahmad Mukminin) and being fixed below surface. (Rizya L. Ardiwijaya)

Table 3.3. The different zones and activities allowed per zone in the KNP.

Zone	Area (km <sup>2</sup> )	%	Activities Allowed
Core	444.63	0.4	No-take zone: scientific research, education, monitoring, patrolling allowed
Protection	2,587.2 (including terrestrial)	2.3	Protected zone: for land areas, these are lowland forest and mangrove ecosystems of Karimunjawa Island Research; education, monitoring, patrolling and limited exploitation activities are allowed with permit. Activities allowed in this zone include limited tourism and education. The KNPA patrols this zone every month.
Tourism	1,226.5	1.1	Developing infrastructure for tourism with special permit
Rehabilitation	122.0	0.1	Rehabilitation zone: these are areas with coral cover less than 25%. The zone is for the restoration of coral reefs. The KNPA develops artificial reefs to restore reef condition in this zone.
Mariculture	7,882.1	0.7	Mariculture: seaweed and fishpond (grouper)
Traditional fisheries	103,884.4	93.1	All nondamaging traditional fishing gears are permitted.
Inhabitant zone	25,715.5	2.3	Zone for community housing

<sup>6</sup>Muro-ami fishing is a method with a net at one end of the coral reef and swimmers moving along from the other end using scaring devices.



The new and emerging science of larval dispersal, resilience and climate change was not available at the time of rezoning, and so rules of thumb were used. The KNP zonation plan was completed in 2005, incorporating basic ecological factors and sociopolitical considerations. Figure 3.5 shows the final and approved zoning.

### Current challenges

Destructive fishing practices, including cyanide fishing and the use of illegal fishing gears, are still done inside the national park and within the no-take zones. Stakeholder compliance with the zoning regulations is still relatively low, as is community involvement in the management of the park. The recent decentralization laws in Indonesia should help the KNP because it can solicit more active involvement of local governments in the management and implementation of the park.

The KNP, in collaboration with the WCS and partners, is working to implement the following programs:

#### A. Conservation

1. Maintenance of boundaries and zoning system
2. Ecological monitoring
3. Restocking endangered species (e.g., white-bellied sea eagle)
4. Rehabilitation (artificial reefs)
5. Environmental awareness and education
6. Patrolling and enforcement

#### B. Fisheries management

1. Pelagic fish
  - Develop traditional fishing zone where only environment-friendly fishing gears are allowed.
  - Develop regulations on fisheries management in traditional fishing zone.
2. Mariculture
  - Develop mariculture zones for indigenous species only and ensure that infrastructure for mariculture is nonpolluting.
  - Mariculture activity has special permit, based on research and environmental assessment (Figure 3.6).

#### C. Tourism

1. Conduct guided tours and sightseeing.
2. Promote educational ecotourism (sea turtle, mangrove, lowland forest, etc.), diving and snorkeling, homestays and local resorts.

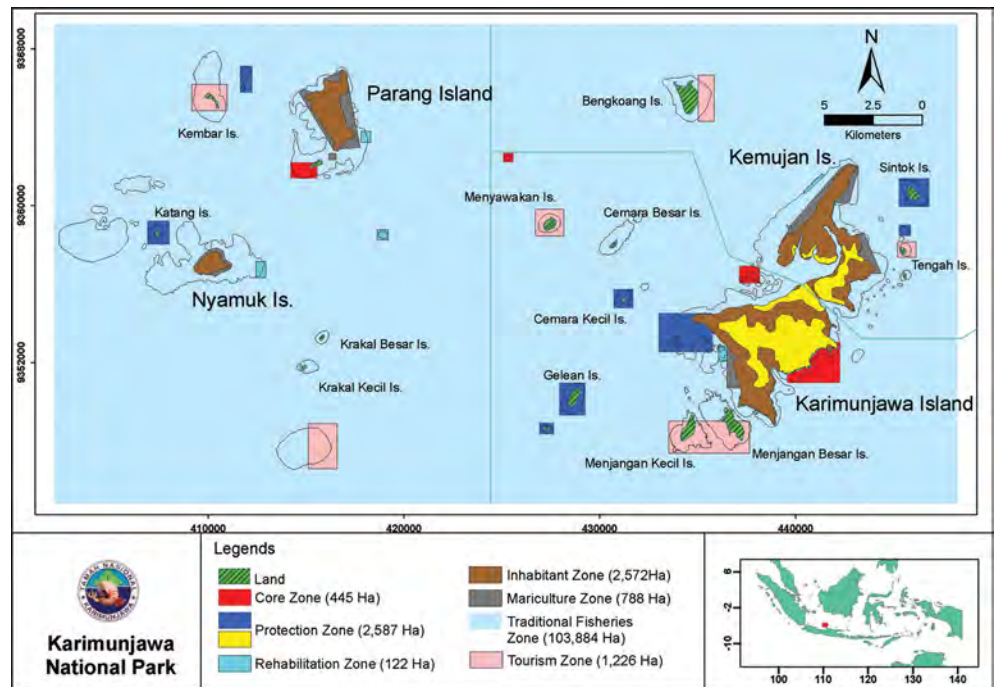


Figure 3.5. The KNP management zones.

### Wakatobi Marine National Park

The Wakatobi Marine National Park (WMNP) is located in the southeastern tip of the island of Sulawesi. The Wakatobi Islands were previously known as the Tukang Besi Islands (Tun et al. 2004) which consists of four main islands – Wangi-Wangi, Kaledupa, Tomia and Binongko with the first two letters of each island making up the acronym “Wakatobi”. The population of the four main islands is approximately 100,000 (Hopley and Suharsono 2000).

While the Sulawesi region is not densely populated, the number and makeup of the ethnic groups are highly complex and classified locally according to region, religion and farming style. Approximately 80% of the population is Islamic, the remaining 20% is Christian. The Pulo and Bajau communities have very different cultural backgrounds, beliefs, values and dependence on natural resources (Sather 1997; Tomascik et al. 1997; May 2005). Both utilize marine resources but the Bajaus are considered to be solely dependent on the sea for food and livelihood, setting foot on land only for fresh water or to trade marine goods.



Top: Seaweed farming in mariculture zones. (Stuart Campbell)

Bottom: Local fishers engage in fish catch monitoring in the KNP. (Tasrif Kartawijaya)



**Establishment**

Wakatobi was declared as a national park on 30 July 1996 through MOF Decree No. 393/KPTS-VI/1996. This was later reiterated by Local Government Law through National Law (Undang Undang) No. 29/2003 declaring Wakatobi as a new district through the Ministry of Internal Affairs. The park covers an area of 13,900 km<sup>2</sup> and is the second largest MPA in Indonesia. Wakatobi ranks as one of the highest priorities for marine conservation in Indonesia in terms of diversity, scale and reef condition (TNC 2007).

The WMNP’s long-term strategy is “to protect Wakatobi’s coral reef resources by creating a resilient network of MPAs that are designed to preserve the area’s biodiversity in the face of local and global threats.” The park is envisioned to support the livelihood of local people by replenishing fish stocks and providing new employment opportunities through sustainable tourism, as well as become a center for marine research and education for national park management in Indonesia.

The key strategy for the park focuses on having an organized, professional team to take the lead in management with the full support of Wakatobi District Governments. The park envisions adequate infrastructure and sustainable financing mechanisms in place with a firm legal foundation and management system for park zoning and enforcement that is environmentally, socially and economically sustainable. The park has plans for a good waste management system in support of fisheries and tourism management.

**Management and ecological design and zonation**

The Wakatobi Marine National Park Authority (WMNPA) manages the park together with the Forest Protection and Nature Conservation, the Department of Marine Affairs and Fisheries, South East Sulawesi Provincial Government, Wakatobi District Government, local communities, local and foreign NGOs and the private sector. Since late 2002, similar with Berau, TNC and the WWF have worked together under their Joint Program, through a formal agreement, to assist the WMNPA in developing a collaborative management system, financial plan and guideline modules on awareness raising, outreach work, monitoring, patrolling and park zoning. The WWF assumes leadership on field operation management and coordinates field interventions following a single project workplan.

Overfishing and overexploitation of coral reef resources, including destructive fishing practices like the use of dynamite, cyanide and gillnets, remain a threat to the park. Considerable efforts have been made to improve law enforcement and capacitate communities in patrolling and surveillance activities so they can assist the WMNPA in law enforcement. Recently, a new large floating ranger

station was provided to supplement the two speedboats of the park.

The park was recently rezoned, and this has been approved at the national and district levels. The new zoning plan was based on a combination of science-based information and traditional knowledge. The Marxan software was used as a tool to help guide the zonation using different data on SPAGs, larval dispersal and home ranges of commercial species. Table 3.4 shows parameters used for the basis of the zones. Information on larval dispersal and climate change was not yet available but rules of thumb were used. The zoning plan is shown in Figure 3.6. The approved activities per zone are shown in Table 3.5.

**Table 3.4. Parameters used in deciding the sizes and locations of the no-take zones in the WMNP.**

- ♦ 3.16% of the entire park is a no-take zone.
- ♦ Distance between no-take zones: minimum = 10 km / maximum = 20 km
- ♦ Size of no-take zones: minimum = 13 km<sup>2</sup> / maximum = 365 km<sup>2</sup>
- ♦ Protection (%) of the following critical habitats:
  - 30 - coral reefs (fringing, barrier, atoll and patch)
  - 40 - mangrove forests
  - 20 - seagrass beds
  - 100 - SPAGs
  - 100 - turtle nesting sites
  - 100 - seabird nesting sites



The floating rangers’ station that conducts regular patrols within the WMNP boundaries. (Stuart Green)

**Current challenges**

During the rezoning process in 2006-2007, the following management priorities were identified:

- ♦ resources mobilization and capacity building;
- ♦ reducing dependency of local community on resources;
- ♦ resolving conflict of interest among different stakeholders;
- ♦ support from the local legislative body; and
- ♦ program for sustainable financing for park management.

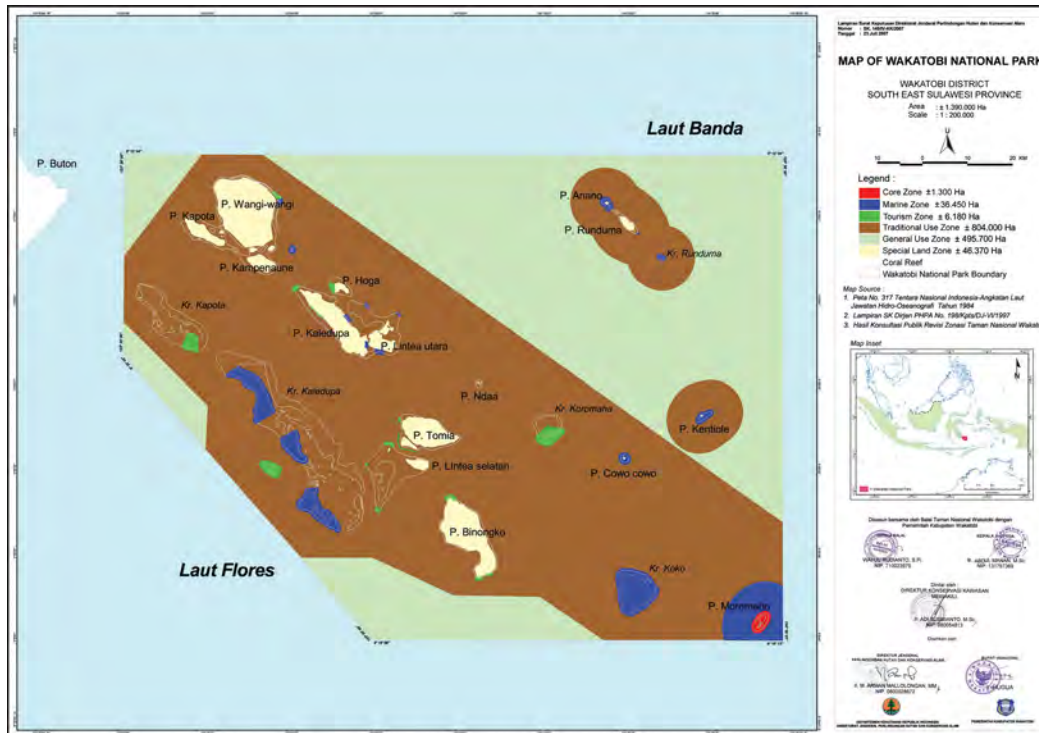


Figure 3.6. The WMNP zonation scheme.

Table 3.5. The different zones and activities allowed per zone in the WMNP.

Marine Regulated Zones	Combined Area km <sup>2</sup>	%	Prohibitions and Regulations	Habitats Covered
Core zone	13.0	0.1	No entry and no take	Coral reefs, mangroves, seabird and turtle nesting sites
Marine protected zone	364.5	2.7	No take	Coral reefs, mangroves, seagrasses, SPAGs and turtle nesting sites
Tourism zone	61.8	0.5	No take	Coral reefs, mangroves, SPAGs and turtle nesting sites
Local use zone	8,004	59.7	Only artisanal fishing by local fishers is allowed.	Coral reefs and deep-sea (pelagic)
General use zone	4,957	37.0	Common fishing activities are allowed.	Deep-sea (pelagic)

In response to these areas for improvement, the following programs are currently incorporated into the WMNP’s plan:

- ◆ Management planning implementation: improve the WMNP’s management framework and conduct efficient, transparent and collaborative management of the park that is supported by majority of stakeholders.
- ◆ Ecological monitoring: results to be used for adaptive management and feedback to stakeholders of ecological change due to management efforts.
- ◆ Patrolling and surveillance: target of 20 days per month.

- ◆ Promotion of sustainable use of resources through increased awareness: increase stakeholders’ understanding and appreciation of the WMNP’s benefits to gain improved support for park management and high compliance to regulations. Main activities include monthly village meetings and regular perception monitoring surveys.
- ◆ Sustainable financing for park management.

Additional potential MPA sites within Southeast Sulawesi will be studied and eventually established using connectivity principles to create a larger and resilient MPA network with the WMNP as the platform site.

## PHILIPPINES

The Philippines stretches 2,000 km from north to south and consists of 7,117 islands at low tide, with a total coastline of 36,289 km (Figure 3.7). The country's coastal and marine waters contain some of the world's richest ecosystems, characterized by extensive coral reefs, seagrass beds and dense mangrove forests (World Bank 2005). Coral reefs cover about 25,000 km<sup>2</sup> and harbor 488 hard coral species (World Bank 2005; WFC 2007). Similar to Indonesia, total marine biodiversity is very high with over 5,000 species of marine plants and animals occurring in Philippine coastal and marine habitats (World Bank 2005).



Coral Triangle boundary source: Coral Geographic (Veron et al. 2008)

**Figure 3.7. The Philippines in the Coral Triangle.**

The annual economic benefits from the Philippines' coastal ecosystems are estimated at US\$3.5 billion<sup>7</sup> (White and Cruz-Trinidad 1998; World Bank 2005). The economic costs of environmental degradation of these resources are significant. It is estimated that 1 km<sup>2</sup> of healthy coral reef generates an average of US\$50,000 from fishing and tourism. As a whole, Philippine coral reefs contribute at least US\$1.4 billion annually to the economy, 1.4% of gross domestic product (World Bank 2005).

With such rich resources, it is ironic that coastal communities who depend directly on fish and other coastal and marine resources for their livelihood are among the poorest in the Philippines with 4 of 10 coastal residents living at or below poverty level. Household income levels are as low as US\$470 per year, compared to the national average of US\$2,820 (World Bank 2005).

It is estimated that more than 60% of the nation's total population of 89 million (2008 estimate) lives in the coastal zone. The country's fishing industry employs over 1 million

people and provides over half of the animal protein needs for the country (World Bank 2005).

### History of MPAs

The Philippines declared its first national marine park (the Hundred Islands) in 1940 which followed with MPA designations at the local and national government levels in the 1970s and 1980s up to the present. Approximately 1,169 established MPAs, covering about 500 km<sup>2</sup>, are managed by municipal and city governments through comanagement arrangements, most of which contain no-take areas surrounded by some form of managed fishing areas (Arceo et al. 2008). Under the National Integrated Protected Areas System (NIPAS) Act of 1992, 28 national MPAs have been proclaimed that cover about 15,000 km<sup>2</sup>. One of these, the Tubbataha Reef Natural Park and World Heritage Site in the Sulu Sea (covered later in the text), is a coral atoll in no-take status that is well protected (White et al. 2006).

The Department of Environment and Natural Resources (DENR) and the Department of Agriculture's Bureau of Fisheries and Aquatic Resources (DA-BFAR) are the two government agencies mainly responsible for national planning, policies and evaluation of the Philippine marine environment. In particular, the DENR's Protected Areas and Wildlife Bureau (PAWB) is responsible for MPAs and wildlife; the DENR's Coastal Environment

Project, for coastal monitoring and evaluation; and the DENR's Environmental Management Bureau, for pollution management. Much of the actual management authority and implementation has been decentralized to local government units (LGUs) (especially the municipal level) after the ratification of the Local Government Code of 1991. In 1992, Republic Act 7586 provided for the establishment and management of the NIPAS.

The Philippine Marine Sanctuary Strategy, endorsed in 2002, has a target of 10% of "marine waters" to be fully protected in an MPA network by 2020. Criteria for selection of sites address basic principles: biogeographical representation; minimum size; habitats to be included; connectivity and resilience; and social and economic considerations to develop functional MPA networks (White et al. 2006). The Sulu-Sulawesi Marine Ecosystem is the first "seascape"<sup>8</sup> to be systematically planned at a large scale within the region and includes Philippines, Indonesia and Sabah, Malaysia. The Philippine environmental legislation

<sup>7</sup> US\$1 = PhP 47 (September 2008)

<sup>8</sup> Seascape refers to large resource management areas defined by ecological and oceanographic affinities.



is likely one of the most advanced in the region (Jacinto et al. 2000). Implementation, however, of this comprehensive legislation is still weak.

The Philippines has a national database and rating system for MPAs developed through the assistance of several NGOs working closely with the PAWB, several provincial and municipal governments, academic and other organizations. Each member contributes to the database and has access to information that compares biophysical resources, status and trends, and management rating across all MPAs. Management status information extracted from the database indicates that about 600 km<sup>2</sup> of reef habitat lies within MPAs that are well managed nationwide.

The need to accelerate efforts to reduce threats and improve effectiveness has provided the stimulus to forge together into an MPA Support Network (MSN). The MSN continues and seeks to complement other initiatives, such as the Pambansang Alyansa ng Maliliit na Mangingisda at Komunidad na Nangangalaga ng Santuwaryo at Karagatan sa Pilipinas (an alliance of community-based protected areas) and the Community-based Coastal Resource Management networks, to contribute in achieving the goals of the Philippine Marine Sanctuary Strategy. The MSN is also established to work with the different MPAs in the country through trainings and workshops and may have positive influence on management effectiveness nationwide. A recent management effectiveness survey in 200 sites by MSN using the Community Conservation and Education Foundation's MPA rating system reported around 20-30% of the surveyed MPAs to be effective based on the level of enforcement. This suggested an improvement from previous reports of 10-15% effectiveness a decade ago (PhilReefs 2008). Incentives through MPA awards have also promoted good practices among MPA practitioners (Micalat et al. 2008).

### Southeast Cebu Network

The Southeast (SE) Cebu initiative represents an intermunicipal partnership in an attempt to address the interrelated political, institutional, socioeconomic, cultural and environmental concerns plaguing a common fisheries ecosystem. The following details the evolution of integrated coastal management (ICM) practices in the municipal waters of single, autonomous municipalities into an expanded management and governance arrangement by taking into consideration a fisheries ecosystem covering multiple municipalities in the Philippines.

Located in the southeastern portion of the Cebu Province, Central Philippines, the towns of Sibonga, Argao, Dalaguete, Alcoy, Boljoon, Oslob, Santander and Samboan have a combined 118 km of coastline and are bounded by the Cebu-Bohol Strait (Figure 3.8). This area contains some 1,250 km<sup>2</sup> of waters under the jurisdiction of the eight towns. The Philippine Local

Government Code allocates the jurisdiction of all waters within 15 km of the general coastline to the town. Basic management functions of the towns include: policy, law enforcement, planning, and restriction and management of fishing activities.

The population is about 252,000 (NSO 2007) with a 2% annual growth rate. Municipal fisheries provide livelihood for many families - second only to farming - with more than 5,500 full-time small-scale fishers. The Cebu-Bohol Strait provided approximately 6.5% of the annual municipal fisheries of the Central Visayas region in 2003 (Green et al. 2004).

Various small reef MPAs have been established in southeast of Cebu. Sumilon Island was the first municipal MPA (established in 1974) in the Philippines. Then in 1999, the CRMP began work in the area and developed baseline and management plans (Figure 3.9). As the project phased out, it left at least one MPA per municipality and an opportunity for the CCEF to work in the area to build on the work of the CRMP and to ensure effective institutionalization of the coastal management activities as basic services of the municipal governments.

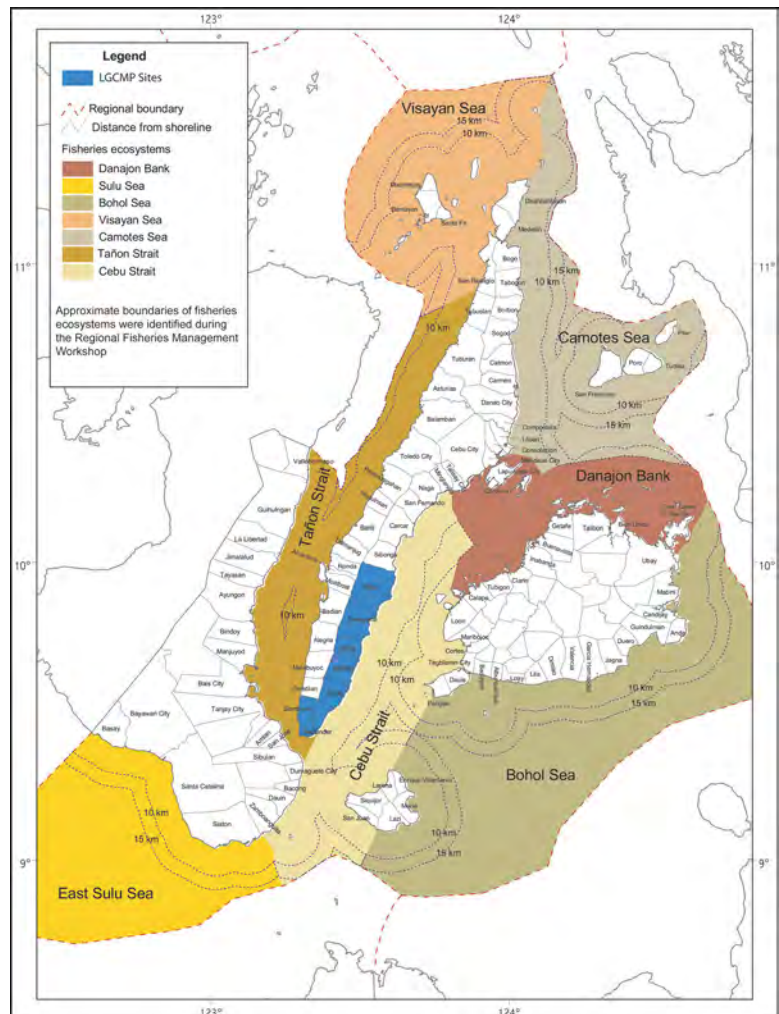


Figure 3.8. The location of the SE Cebu Network and surrounding ecosystems.

Coral reefs cover about 50 km<sup>2</sup>, and about 75% of the reefs have less than 25% living coral cover. Nevertheless, coral cover is stable and improving in many areas. The 22 MPAs cover over 3 km<sup>2</sup>, with average size being 14 ha. The no-take areas which cover 0.24% of the municipal waters (or 6% of reef habitat) are mostly managed by a fishers' association in coordination with the municipal government.

**Establishment**

The SE Cebu cluster initiative is enabled by the Philippine Constitution, which states that “local government units may group themselves, consolidate or coordinate their efforts, services, and resources for purposes commonly beneficial to them,” as well as by the Philippine Fisheries Code and the Local Government Code. The establishment of the SE Cebu CRM Council was prompted by the need for municipalities to work at a broader geographic scope to maximize the impact of initiatives and to scale-up municipal CRM interventions. This came from the realization that what one municipality does affects the others belonging to the same ecosystem.

The eight municipalities (Figure 3.9) decided among themselves and with assistance from CCEF to enter into a Memorandum of Agreement (MOA) outlining the CRM programs for collaboration. The MOA, which was formally signed by the mayors of the eight municipalities of SE Cebu on 19 April 2005, established the Southeast Cebu Coastal Resource Management (SCCRM) Council (Figure 3.10).

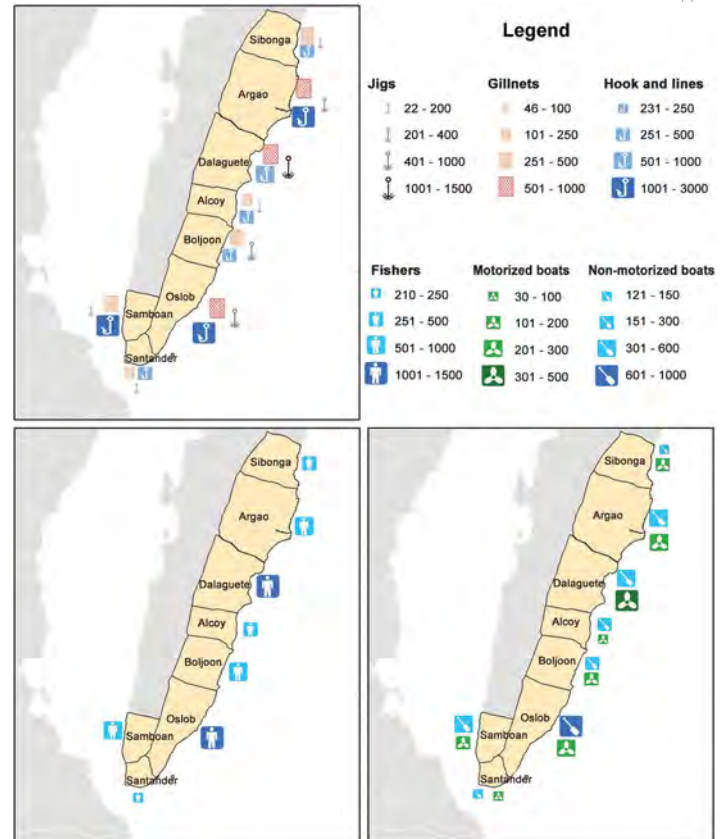
With the signing of the MOA, the participating municipal governments agreed to collaborate on fisheries management interventions for common resources and issues, namely: habitat and fisheries protection and management, gear and harvest regulation, water access regulation, coastal law enforcement, and strengthening institutional and policy support systems. The SE Cebu cluster also serves as an effective information dissemination vehicle and helps facilitate efficient cost-sharing strategies for law enforcement as well as acting as a peer network for local politicians and government employees mandated to manage the coastal resources.

The SCCRM Council seeks to achieve the following objectives:

1. Review and unify municipal policies.



Community consultations and workshops with council members, local fishers and stakeholders are regularly facilitated as part of management. (CCEF)



**Figure 3.9. Key fishing gears and boats within the network area and surrounding municipalities** (adapted from Green et al. 2004).

2. Oversee and monitor implementation of agreed-upon resource management programs.
3. Mobilize resources for the network.

To pursue these goals, the SCCRM Council has accomplished the following in accordance with specified themes:

1. Organizational setup – The council focused on organizational strengthening of the Cluster Management Committee and Secretariat. There was also a series of trainings in financial management and in capacity-building of municipal CRM managers in MPA rating and monitoring, fishing vessel measurement, team building and leadership, and project proposal making.
2. Resource mobilization - To generate more funds for the council, there was an agreement among the eight towns to provide financial contributions annually to the council. Alternative financial resources were also tapped from the provincial government, congressional funds and NGOs. Legal support was likewise obtained from the Environmental Legal Assistance Center.



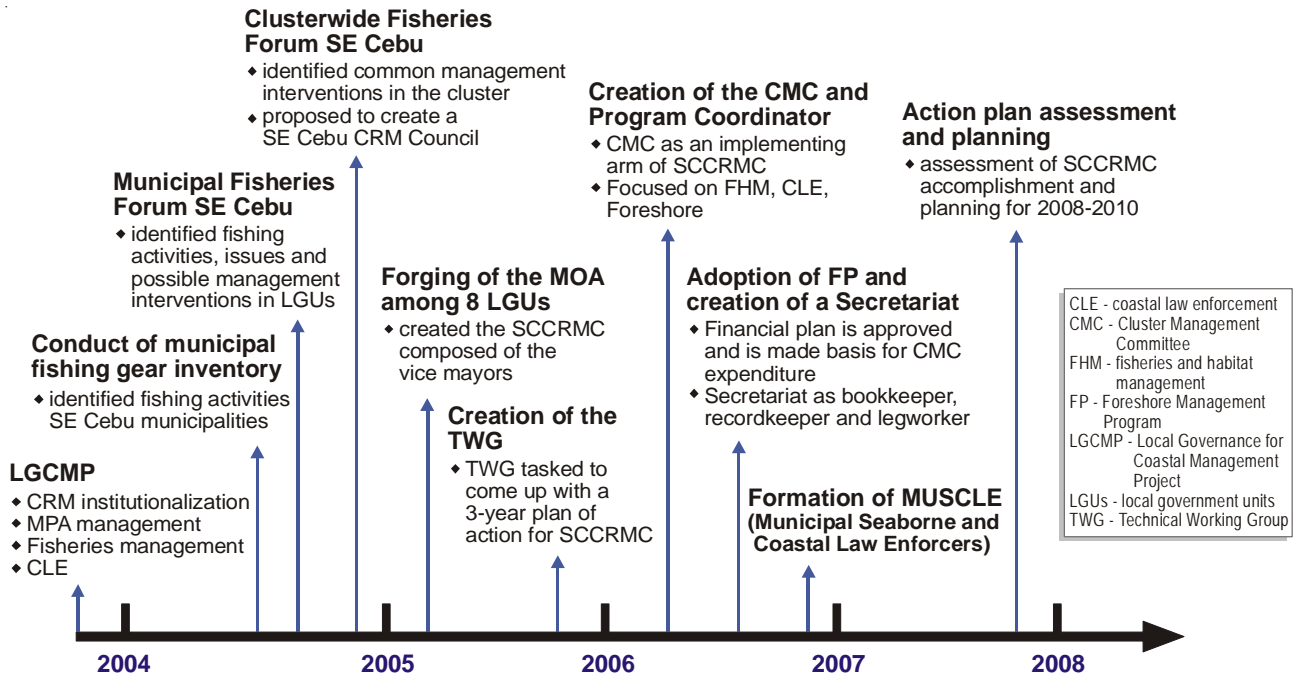


Figure 3.10. Timeline of establishment of the SCCRM Council.

**Management, ecological design and zonation**

The 22 no-take MPAs (Figure 3.11) are mostly managed by fishers’ associations in coordination with the municipal governments. The basic regulations of the MPAs are summarized in Table 3.6.

To ensure the prompt implementation of cluster programs, the SCCRM Council, composed of the municipal vice mayors of all member-municipalities, created a Cluster Management Committee composed of one regular member and one alternate from each participating municipality (Figure 3.12). It was tasked to implement the identified programs of the SCCRM Council which include fisher support services, coastal law enforcement, fisheries and habitat management, foreshore management and other tasks assigned to them by the council. Since its creation, the member-municipalities of the council have taken turns in hosting regular monthly meetings.

Table 3.6. MPA area covered and zones, SE Cebu network.

Marine Regulated Zones	Number	Area (km <sup>2</sup> )	Regulations	Habitat Covered
Marine sanctuaries	6	1.09	<u>Core zone:</u> no take and no human activity allowed <u>Buffer zone:</u> hook-and-line fishing allowed	Coral reefs, mangroves, seagrass, macroalgal beds
Marine sanctuaries allowing diving with user fee system	16	1.88	<u>Core zone:</u> no take; diving with user fee allowed <u>Buffer zone:</u> hook-and-line fishing allowed	Coral reefs, mangroves, seagrass, macroalgal beds, rocky intertidal



Figure 3.11. MPA locations within the SE Cebu cluster.



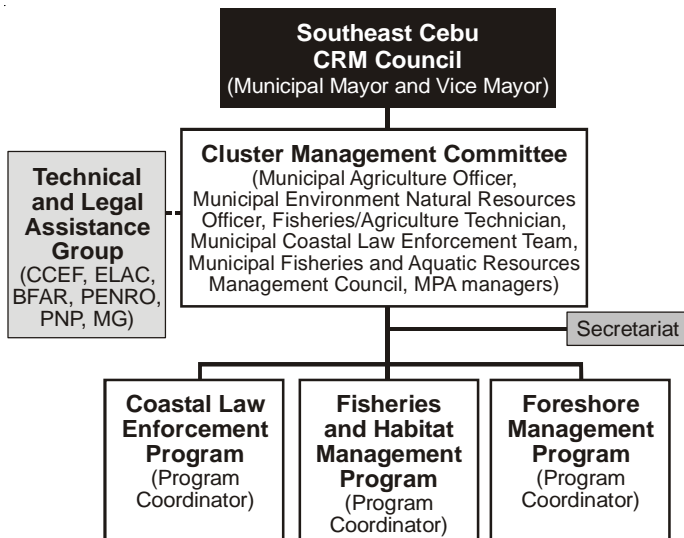


Figure 3.12. The management structure of the SCCRM Council.

The following are the major committees of the SCCRM Council:

1. Council of Vice Mayors and Mayors - policymaking and supervision to cluster programs.
2. Cluster Management Committee - implementing and technical arm of the cluster.
3. Secretariat – recordkeeper and bookkeeper, facilitates activities.
4. Technical and Legal – technical and advisory group.

The historical and parochial tendency of municipal governments to manage their own fisheries is slowly being replaced by an ecosystem-based cluster management framework. In fact, the council has proposed a uniform policy prohibiting commercial fishing and regulating docking of commercial fishing vessels (of over 3 GT) for adoption in the eight SE Cebu municipalities. It has also prioritized the registration of fishers, fishing gears and boats. This provides the basis for the targeted fisheries management through limitation of access to resources.

The SCCRM Council has three major priority programs:

1. Coastal Law Enforcement: Joint seaborne patrolling through an operations plan named Sundown Bravo, maintenance of the patrol boat and acquisition of equipment for coastal law enforcement.
2. Fisheries and Habitat Management: Facilitating MPA social network activities; common fisheries policies were adopted by the eight municipalities such as registration of fishers and fishing gears, prohibiting compressor, *paaling*<sup>9</sup>, *sagisiw*<sup>10</sup> and *payao*<sup>11</sup> fishing, banning commercial fishing, imposing closed season for some fish species and consensus-gathering for oil exploration activities.

<sup>9</sup> Using compressed air bubbles to scare fish into a drive-in net

<sup>10</sup> Fine-mesh net used like a surface trawl

<sup>11</sup> Use of fish aggregating device

3. Foreshore Management: Supporting municipal initiatives on foreshore inventory and common agreement on the regulation of coastal reclamation.

The SE Cebu Network has other positive, significant outcomes, such as resiliency from frequent political or leadership changes. Despite turnover of key members of the council, who are also political leaders of the municipalities, the cluster initiative has enabled the continuity of coastal management programs.

Furthermore, the network has opened a venue for provincial government to downstream support for coastal management at the intermunicipal levels. Thus far, the council has become a venue for the discussion and resolution of important fisheries issues in the Cebu Strait and has underpinned the creation of an MPA social network for the 22 MPAs within the combined municipal waters.

### Current challenges

The primary challenges facing the SCCRM Council are:

- ♦ Need to establish a council to improve intergovernmental coordination mechanisms and procedures for administrative and fiscal accountability
- ♦ Lack of science in MPA network design - MPAs were not established with overarching ecological principles to maximize biological and social benefits. This perception needs to be rectified while working with local stakeholders.
- ♦ Lack of capacity to manage the entire Cebu Strait fisheries ecosystem because the SE Cebu cluster is not yet institutionally linked with other LGUs / clusters
- ♦ Financial sustainability with continuing support from provincial and government agencies for joint management actions that do not depend only on the goodwill between mayors and agency heads
- ♦ Inadequate trickle-down effect - The community / MPA level does not receive information / support from the cluster programs.



A public consultation in progress between local stakeholders and council members. (CCEF)

The SCCRM Council is focusing on the following courses of action to address the challenges:

- ◆ Collaborate and cooperate with SE Cebu municipalities in fisheries ecosystem management of the Cebu / Bohol Strait to serve as the crucial first step towards EBM.
- ◆ Conduct research to determine whether MPAs are adequately protecting a representative suite of critical habitats.
- ◆ Build capacity for the SCCRM Council for ecosystem-based management of its Cebu Strait fisheries ecosystem.
- ◆ Establish linkages to other municipalities adjacent to Cebu Strait to fully manage fisheries ecosystem.
- ◆ Build financial sustainability mechanisms.
- ◆ Improve information dissemination programs at the community level.
- ◆ Improve individual MPA and network management effectiveness.

**Tubbataha Reefs Natural Park and World Heritage Site**

The Tubbataha atoll lies in the middle of the Sulu Sea, approximately 150 km offshore from Puerto Princesa, the capital city of Palawan on the southwest corner of the country. It is under the political jurisdiction of the Municipality of Cagayancillo, around 130 km to the north of the atoll (Figure 3.13).



Photo by Lene & Claus Topp (2008)

Boobies on the Bird Islet, TRNP. (toppx2.com)

The atolls comprising the park formed thousands of years ago as fringing reefs of volcanic islands. As the islands sank into the sea, the fringing reefs grew up leaving the two atolls with lagoons and scattered sand cays. Two coral atolls, the North and the South, and a submerged reef, the Jessie Beazley Reef, comprise the Tubbataha Reefs Natural Park (TRNP) (Figure 3.13). The islet in the north atoll is called Bird Islet and hosts most of the seabird residents in the park. The South Islet has a lighthouse, constructed by the Philippine Coast Guard in the 1970s.

The two islets are breeding and rookery grounds for migratory and resident seabird species, some of which are classified as priorities for conservation. North Islet is the breeding ground of an endemic subspecies of black noddy, *Anous minutus worcestri*, and an important rookery of the critically endangered Christmas Island frigate (TRNP Management Plan 2007).

“Tubbataha” is derived from the Samal language of the seafaring people of the Sulu Sea and means “a long reef exposed at low tide” (Arquiza and White 1999). Portions of the atolls’ shallow coralline reef platforms are exposed at extreme low tide. The reef systems are composed of continuous reef platforms 200-500 m wide, completely enclosing sandy and coral substrate lagoons with a maximum depth of 40 m. The reef platform deepens at the outer reef flat and reef crests. It ends in steep, often vertical, walls on the seaward side. On the inner side of the platform are shallow reef flats and seagrass beds.

The TRNP harbors a diversity of marine life equal to or greater than any such reef of its size in the world. It is home to at least 379 species of corals or almost 90% of all coral species in the Philippines, 510 species of fish, 11 species of shark, 7 species of seagrass, 79 species of algae, at least 2 species of marine turtles and 12 species of marine mammals. Rays are common in the reefs. Large pelagic fish, such as tuna, mackerel, jacks and barracudas, are observed in schools near the reef crests (WWF 2007).

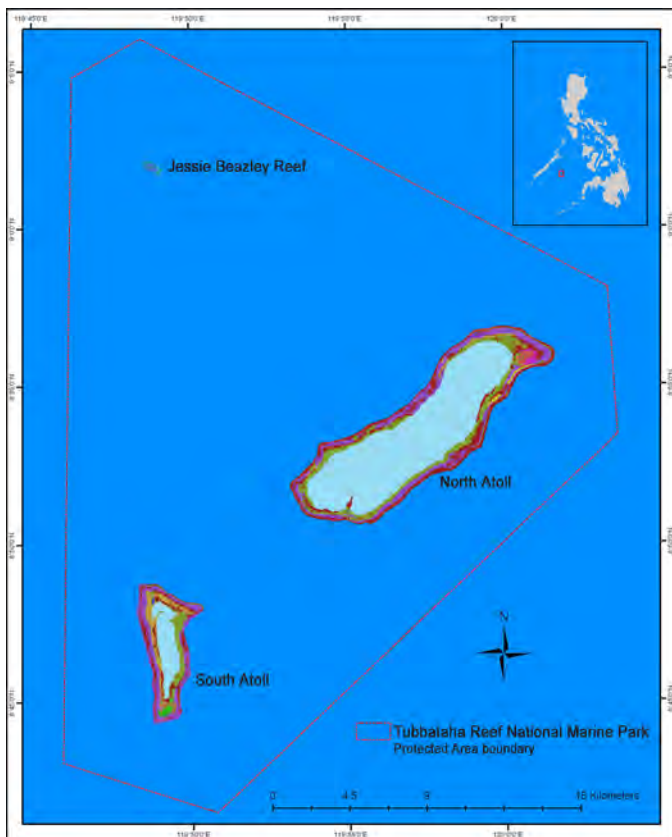


Figure 3.13. The TRNP boundary (WWF 2006).



### Establishment

Prior to the 1980s, fishing was common in Tubbataha, but due to the turbulent sea conditions for nine months out of the year, fishing generally occurs during the calm months of March, April and May. Small groups of fishers came from the local municipality of Cagayancillo, and fishing effort was not major. However, by the mid to late 1980s, the coral cover in the atoll was reduced significantly as a result of destructive fishing methods using dynamite and cyanide. At the same time, the harvest of vulnerable mega fauna like turtles and sharks began when the Visayas and Luzon-based fishers came in large numbers using destructive fishing techniques.

In 1987, the provincial board of Palawan (chief legislative council) passed Resolution 24 requesting the declaration of Tubbataha Reefs as a marine sanctuary. In response, the president at the time, Corazon C. Aquino, designated a 332-km<sup>2</sup> area as a no-take zone and declared it as the Tubbataha National Marine Park (TNMP) under Presidential Proclamation 306, making it the country's first and only national marine park in 1988. Despite the declaration, fishing continued on the reefs. In 1989, the Philippines' largest seaweed processing company, Shemberg, entered the area with plans for a large seaweed farm on the atoll. After considerable debate, the farm was removed in 1991 and the park was declared as a no-take zone which was not effectively implemented until the mid-1990s.

By 1993, the park was declared a World Heritage Site by the United Nations Educational, Scientific and Cultural Organization. To manage the park, the DENR gave initial management responsibility to the Tubbataha Foundation, a group composed of concerned divers and sport fishers. In 1995, a multisectoral Task Force Tubbataha was formed, and then Pres. Fidel V. Ramos ordered the military to maintain a year-round presence on the site. The Armed Forces of the Philippines has since been an active protector and manager of the TNMP.

There are no permanent inhabitants in the park and although it is politically under the jurisdiction of the municipality of Cagayancillo, the Cagayanons have agreed to forego rights for fishing access to Tubbataha. In return, the TRNP Management Plan stipulates that 10% of annual tourism revenues go to the Cagayancillo municipality.

In 2007, the park was expanded to include Jessie Beazley Reef, through Presidential Proclamation 1126 and was renamed the TRNP. Today, the park, at 968.28 km<sup>2</sup>, is the largest MPA in the country.

**Vision for Tubbataha:** “A World Heritage Site that is effectively conserved to maintain ecological integrity contributing to the equitable distribution of benefits and sustained socioeconomic development of present and future generations.”

**Mission Statement:** “We, the stakeholders of Tubbataha commit to conserve its natural endowment through responsible stewardship and genuine partnership.”

**Management Goal:** “To preserve the globally significant biological diversity and ecological processes of Tubbataha and to manage it and the surrounding areas in a sustainable basis.”



Diving the walls of Tubbataha. (toppx2.com)



Three overarching policies apply for the long-term management of Tubbataha:

- ♦ The economic, biological, sociocultural, educational and scientific values of the TRNP shall be conserved and protected into perpetuity for the enjoyment of present and future generations. Activities that compromise this goal shall not be allowed.
- ♦ In consonance with the above, any exploration, exploitation or utilization of nonrenewable resources within the TRNP shall not be permitted.
- ♦ Active collaboration and participation by all stakeholders shall be fostered to engender a sense of ownership and promote compliance to regulations.

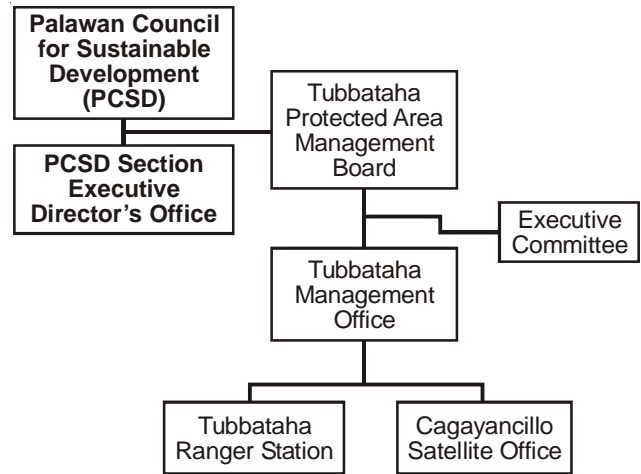
The following specific objectives reflect the desired results of management programs for the TRNP:

- ♦ Biological diversity and ecological processes are protected from unnatural threats and direct human impact.
- ♦ Legal and management structures are effectively maintained.
- ♦ Stakeholder participation and representation are ensured.
- ♦ Public understanding of the benefits of conserving the TRNP is improved.
- ♦ Revenues from ecosystems targeted for conservation are enhanced.

**Management, ecological design and zoning of the TRNP**

The Tubbataha management plan underwent a series of iterations and consultations, beginning in 1992, that culminated in its adoption in 1998. The plan allowed the creation of the Tubbataha Protected Area Management Board (TPAMB) in 1999. The TPAMB is a multisectoral body that formulates policies for Tubbataha. It is made up of 19 representatives from the provincial and municipal

governments, national enforcement agencies, Cagayancillo people’s organization, NGOs, local universities and diving tourism sector. The TPAMB meets quarterly, and there is also an Executive Committee (ExeCom) which meets monthly to keep management current. The ExeCom members are representatives from WWF, Palawan Council for Sustainable Development, Philippine Navy, Philippine Coast Guard, SaGuDa Palawan NGO and DENR (Figure 3.14).



**Figure 3.14. The TRNP management framework.**

Day-to-day park management is carried out by the Tubbataha Management Office (TMO), the executive arm of the TPAMB. The creation of the TMO provided a unit solely dedicated to implementing the management plan and maintaining a presence in the park. It operates according to the yearly workplans and budgets endorsed by the ExeCom and approved by the TPAMB (WWF 2006).

Currently the major programs implemented in the TRNP are:

1. conservation management;
2. conservation awareness;
3. ecosystem research and monitoring; and
4. sustainable resource management.

The management plan was revised in 2002 to incorporate systems developed in regulating park activities, entry permits, collection of conservation fees and ecosystem research. In 2004, another revision incorporated the park management effectiveness monitoring and evaluation program. Other programs were streamlined, based on experiences in the implementation of the UNDP-GEF-funded Tubbataha Conservation Project. The later revision institutionalized the monitoring and evaluation system in managing Tubbataha, and provided a more structured feedback mechanism. The program on policy and advocacy was also incorporated into the conservation management program (WWF 2006).



Volunteers conducting underwater survey in the TRNP. (Alan White)



The rangers' station in the TRNP. (Lorenzo Tan)

The management zones of the TRNP are simple, with only one type – no-take zone. Tourism and research are the only activities allowed. The lagoons of the North and South Atoll are off-limits to tourists. Entry is allowed by permit and user-fees are collected for visiting divers. Certain guidelines are provided for boats entering the park and for diving activities.

Although the first naturalist to land in Bird Islet was in 1911, scientists have been regularly visiting Tubbataha for almost 30 years. In 1982, a combined team from the Philippine Government and the Marine Science Institute conducted one of the first scientific surveys of the reefs. Regular monitoring by the CCEF began in 1992 and by 1997 the research and monitoring of Tubbataha was standardized, allowing data to be successfully compared over the years. The WWF Philippines has also carried out studies in Tubbataha concerning the effects of climate change on coral reef ecosystems.

There are approximately 100 km<sup>2</sup> of coral reef within the park. Monitoring over the last 10 years in Tubbataha has shown that the coral cover averages more than 50% (WWF 2007), is stable and is improving after the bleaching of 1998 when on average coral cover declined about 22% (Arquiza and White 2000). Fish density and biomass have been increasing since Tubbataha was protected from all

fishing activities in the mid-1990s (White et al. 2008). Figure 3.15 shows the park's coral cover increasing over time. At present, seven permanent transect sites for benthic and fish community surveys at depths of 5 m and 10 m have been established within the park. Results of the resource survey / assessment for the park show that fish biomass in the TRNP is the highest recorded in the Philippines at 287 mt/km<sup>2</sup> (Dygico 2007). In 2008, Maypa and Diaz consolidated survey data for six sites with 3-4 replicates per 500 m<sup>2</sup> and found that target fish biomass ranged from 45.7 to 134.3 kg/500 m<sup>2</sup>. This suggests that the total reef fish standing biomass of target species in Tubbataha would range from 91.4 to 268 mt/km<sup>2</sup> or from 9,140 to 65,140 mt for the total reef area approximated at 10,000 ha, thus, reinforcing the park's significance.

### Current challenges

With the recent expansion of the park to almost triple its original size, additional law enforcement inputs will be needed. Adequate enforcement personnel and equipment will have to be provided to cover the whole area, not merely with radar surveillance, but with manned patrols as well. The rangers' station will need to be expanded to accommodate the augmented enforcement team, their supplies and equipment. Emergency equipment must be provided to mitigate the risks inherent in managing an isolated reef. Marine park rangers need to be capacitated to ensure the efficient conduct of enforcement activities and to keep morale high to ensure vigilance.

Even though the present enforcement is efficient and effective by Philippine (and global) standards, there is still sporadic park intrusion by illegal fishers harvesting the protected shell species, *Trochus niloticus*. The vast expanse of the park and the limitations imposed by sea conditions influence the detection of intruders. Despite the active prosecution of intruders, some fishers continue to risk arrest and defy regulations, thereby, requiring the regular conduct

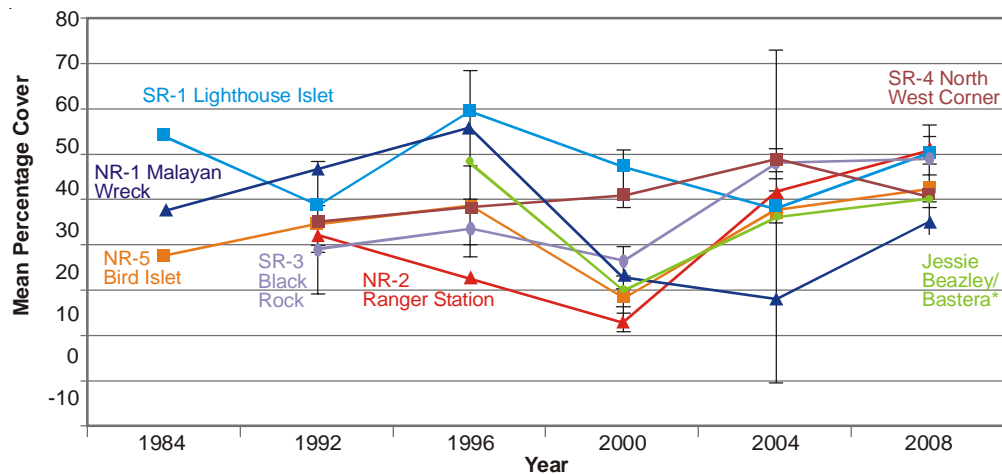


Figure 3.15. Changes in live hard coral (% mean  $\pm$ SE) in sites at the TRNP from 1984 to 2004 (White et al. 2008).

of manned patrols leading to escalating enforcement costs.

Outreach and education efforts were sporadic in the past as efforts and resources were focused on field activities and material requirements. There is a need to intensify information and education activities to raise awareness among the public and increase compliance to regulations. Children and youth need to be well-informed and empowered to take on their responsibility as managers of this precious resource in the future.

Sustainable financing mechanisms need to be developed so that basic park management services can be maintained in the future. Average costs suggest that more than US\$200,000 is needed annually to sustain the management of the park, of which 80% goes directly to field activities and personnel (WWF 2006). A five-year business plan, developed through the assistance of Shell International in 2007, is being employed to achieve financial sustainability.

The Tubbataha Bill has been submitted to the Philippine Congress for enactment since 2002. When passed into law, it will allow for more stringent penalties for park violations and strengthen management structures. The passage of the bill will be a boon to management of the Tubbataha Reefs Natural Park.

### PAPUA NEW GUINEA

Papua New Guinea (PNG) comprises the eastern half of the island of New Guinea and offshore islands. It has a population of 6.7 million (2007 estimate), a land area of some 463,000 km<sup>2</sup> and is the largest of the Pacific island countries (Figure 3.16). The overall population density is low, although pockets of overpopulation exist. The indigenous population of PNG is one of the most heterogeneous in the world. PNG has several thousand

separate communities, most with only a few hundred people. Divided by language, customs and traditions, some of these communities have engaged in low-scale tribal conflict with their neighbors for millennia. There are about 860 spoken languages, of these, only 350-450 are related. About 96% of the population is Christian. A few practice a wide variety of religions that are an integral part of traditional culture, mainly animism and ancestor cults (BEAPA 2008).

The country is well endowed with large reserves of renewable and nonrenewable natural resources. The former include timber, which covers about 75% of the land area, as well as agricultural and marine resources. The marine and coastal resources of PNG are the most extensive and diverse in the South Pacific subregion. The country has a coastline of 20,197 km and the marine area inside the 200-mile declared fisheries zone covers over 1.6 million km<sup>2</sup> (Earthtrends 2003). Sir Alfred Russell Wallace, a 19<sup>th</sup> century biologist, declared PNG as “containing more strange and new and beautiful objects than any other part of the globe.” It is part of the Bismarck Solomon Seas Ecoregion.

### History of MPAs

The majority (97%) of the country’s land is owned and managed under customary tenure and stewardship. Clans or tribes claim customary ownership over mangroves, lagoons and reefs in their nearby vicinity. This traditional form of communal ownership is often referred to as customary marine tenure (CMT) (Ruddle et al.1992), and it is recognized to varying degrees in PNG (Fisheries Management Act 1998).

PNG does not have a national policy framework for establishing MPAs. However, even in the absence of an

MPA policy framework, MPA systems are being developed using ecological and socioeconomic design principles and through the experience of the Locally Managed Marine Areas (LMMAs) Network. PNG declared its first MPA in 2000 with assistance from the LMMA Network. In the same year, the Minister for Environment and Conservation declared 12 ha of Sinub Island as a Wildlife Management Area (WMA) with consent from community members. The responsibility to manage the MPA lies with the Sinub WMA Committee, the members of which were elected by the community.

In 2002, the Madang (Sinub, Tab, Laugum and Tabad islands) Wildlife Management Area (MWMA) was created. This LMMA network covers 10.85 km<sup>2</sup>



Coral Triangle boundary source: Coral Geographic (Veron et al. 2008)

**Figure 3.16. Papua New Guinea in the Coral Triangle.**





Local fishers heading out to sea while the sun sets over Kimbe's volcanoes. (TNC 2007)

and about 27.1% of Madang Lagoon. The MWMA is composed of five villages all actively involved in management. Within the managed areas of the network, around 5.9% are no-take. There are 22 MPAs (including WMAs, marine parks, historic reserves and provincial parks) that have been nationally designated in PNG.

### ***Kimbe Bay Marine Protected Area Network***

Kimbe Bay is located on the north coast of the island of New Britain in the Bismarck Sea (Figure 3.17). The bay is 9,800 km<sup>2</sup> in area and covers a coastline of 560 km.

Approximately 100,000 people live within the Kimbe Bay watershed. Majority of the people depends heavily on local resources for daily survival. Subsistence activities remain a major part of daily life in villages, where garden foods and fishing meet most of their daily food requirements.

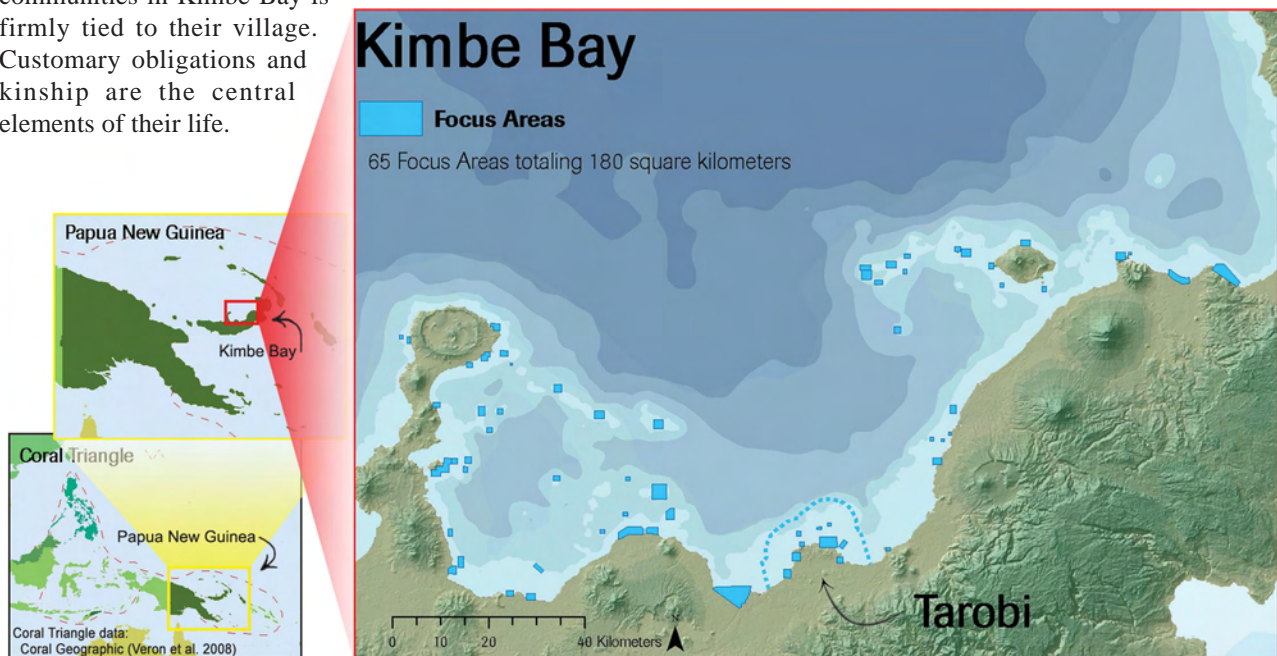
Major activities that generate income for coastal villages include the cultivation of oil palm, coconuts and cocoa on smallholdings, local marketing of food, small business enterprises, fishing and sale of marine products and wage employment. Most people's identity in communities in Kimbe Bay is firmly tied to their village. Customary obligations and kinship are the central elements of their life.

The bay is composed of a wide variety of shallow (coral reefs, mangroves and seagrasses) and deepwater (oceanic waters, seamounts and possibly deep-sea canyons and hydrothermal vents) marine habitats in close proximity. Many of these habitats are of high conservation value (Green et al. 2007). Rapid ecological assessments have described healthy coral reefs with high biodiversity (Turak and Aitsi 2002), particularly on the eastern and mid to outer portions of the bay. Field surveys have also described ecologically significant mangrove forests and seagrass communities in the bay with reasonably high biodiversity (Aitsi and Sapul 2006).

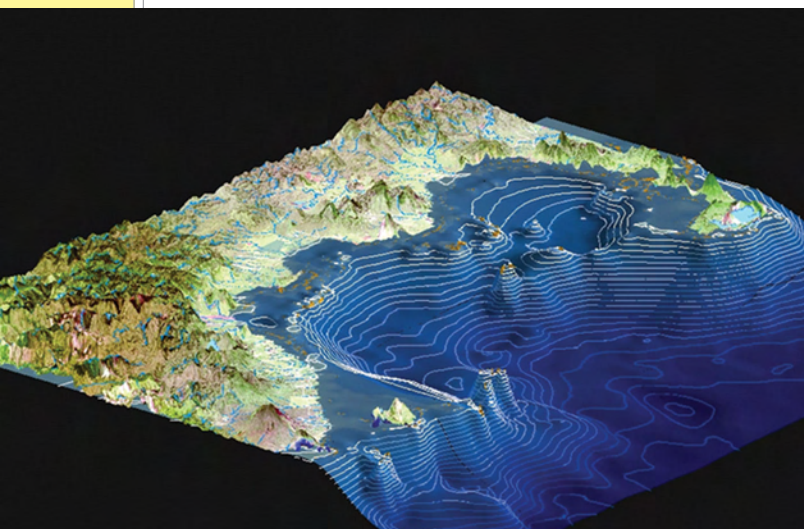
Because of its size and shape, the bay contains a distinct functional seascape (Green and Mous 2006). Kimbe Bay was also recognized as an ecoregional outstanding area for its well-developed inshore reefs and unique offshore pinnacles rising from deep water, its rich coral and fish communities, and frequent whale sightings (WWF 2003).

In Kimbe Bay, the CMT is predominantly matrilineal and includes territorial and resource rights over reefs and seas, which are controlled communally at clan level (Koczberski et al. 2006). Remote and isolated communities tend to have a greater reliance and dependence on marine resources for their subsistence needs than those communities with high market accessibility. Decline in abundance of the most commonly exploited marine resources is mainly attributed to overexploitation, overharvesting of marine resources and destructive fishing practices which also result in the destruction of marine habitats.

The total proposed scientific design of Kimbe Bay Marine Protected Area (KBMPA) Network is 1,328,850



**Figure 3.17. The proposed Tarobi AOI and core zones of the KBMPA Network.**



**Figure 3.18. Kimbe Bay, showing depth soundings. (TNC 2007)**

km<sup>2</sup> and the total area inside areas of interest (AOI) is 168,850 km<sup>2</sup>. Total coral reef area within the AOI is estimated at 132.7 km<sup>2</sup> (Table 3.7 and Figure 3.18).

#### Establishment

Due to PNG's CMT culture, a national policy for governing coastal and marine areas was not thought to be necessary, until now that MPAs have been implemented in PNG. Currently, TNC is in discussion with the Attorney General regarding the Maritime Zones Bill for the inclusion

of the MPA establishment and management, as well as the stipulation of involvement and respective roles of all local governments and communities for MPA implementation.

**Vision for Kimbe Bay:** Harness traditional and community values to protect and use land and sea resources in ways that maintain the exceptional cultural and natural heritage of Kimbe Bay.

**Goal:** By 2008, a large-scale resilient MPA network will be designed and at least 20% of high-priority areas will be effectively protected, with an additional 30% in the process of being protected.

**Objectives:** The specific objectives for Kimbe Bay are to:

- ♦ maximize biological objectives by taking into account key biological and physical processes, including resilience to climate change; and
- ♦ maximize benefits and minimize cost to local communities and sustainable industries.

#### Ecological design and zonation

The KBMPA represents one of the world's first MPA networks scientifically designed to promote resilience of marine habitats to threats of climate change. The design is based largely on a scientific assessment of biodiversity values and identifies 15 AOIs that meet specific

**Table 3.7. Summary statistics for each AOI and the entire MPA network area (Green et al. 2007).**

AOI	Total Area (km <sup>2</sup> )	% of MPA Network Area	Tropical Coast and Shelves (km <sup>2</sup> < 200 m deep)	Tropical Coast and Shelves (% < 200 m deep)	Coral Reef Area (km <sup>2</sup> )	% Coral Reef Area	Minimum Distance to Adjacent AOI (km)
52 fathoms	59.2	0.5	2.3	0.1	0.0	0.0	35
Baia	104.7	0.8	63.8	3.8	2.4	1.8	2
Bialla	60.9	0.5	54.9	3.3	1.2	4.9	14
Buludava	17.5	0.1	10.4	0.6	17.9	0.9	9
Cape Hoskins / Wulai	320.3	2.4	102.1	6.1	2.0	13.5	10
Cape Torkoro	32.7	0.3	28.2	1.7	3.4	1.5	2
Dagi	10.6	0.1	10.6	0.6	4.0	2.6	8
Garua / Restorf	42.1	0.3	33.5	2.0	3.7	3.0	16
Heusner	62.3	0.5	41.6	2.5		2.8	9
Kaiamu / Sulu	6.1	0.1	6.1	0.4	1.5	1.1	4
Kapiuru	9.5	0.1	9.4	0.6	0.6	0.5	5
Kimbe Island	21.7	0.2	10.5	0.6	0.4	0.3	10
Lolobau	724.3	5.5	207.5	12.3	11.2	8.4	11
Numundo	19.3	0.2	18.5	1.1	4.0	3.0	8
Tarobi	197.5	1.5	155.0	9.2	16.9	12.7	4
Total inside AOIs	168,850.7	12.7	754.35	44.7	75.7	57.1	
Total outside AOIs	1,159,999.5	87.3	933.76	55.3	57.0	42.9	
<b>Total MPA network</b>	<b>1,328,850.2</b>	<b>100.0</b>	<b>1,688.11</b>	<b>100.0</b>	<b>132.7</b>	<b>100.0</b>	



conservation goals. Some aspects will require refinement over time as new information becomes available. The design will also be refined as implementation proceeds, with substantial input from local communities and stakeholders (Green et al. 2007).

The AOI is the basic planning unit within the KBMPA. The MPA design focused primarily on shallow water habitats (reefs, mangroves and seagrasses). Community consultation on AOIs is currently in progress, one village cluster at a time. TNC is working with local communities to develop management strategies, objectives and activities that focus on implementing the network of MPAs including LMMAs. Tarobi was one of the areas identified as a high priority for conservation because it is composed of various habitat types and has a large mangrove area (Figure 3.19). Community assembly meetings and participatory resource assessments were conducted to refine their AOI management plan.

**Current challenges**

In 2007, the KBMPA Network design was launched. The Lolobau and Tarobi AOIs that are part of the network are in the process of having their marine management plans recognized by the Biaila local government.

The PNG Maritime Zones Bill addresses general environment issues, but not specifically the establishment of MPAs. It is anticipated that a legal framework to establish and manage the KBMPA will be needed to clearly articulate conservation and management of marine biodiversity in Kimbe Bay. TNC is working with PNG’s Attorney General’s Office to expand a relevant section of the bill so that it establishes MPAs in the absence of any other relevant laws and gets passed through parliament. TNC is also initiating discussions with PNG Department of Environment and Conservation to consider a bill to provide for the management and protection of marine biodiversity (Figure 3.20).

To achieve Kimbe Bay’s vision of harnessing traditional and community values to protect and use land and sea resources in ways that maintain the exceptional natural and cultural heritage of the bay, TNC is working with local communities to develop strategies for improved management of marine resources and land use practice. It has developed objectives and activities that focus on implementing the network of MPAs including LMMAs. The scientific design of the KBMPA Network forms the basis to work with local communities, resource owners and stakeholders to refine and implement the design over time.

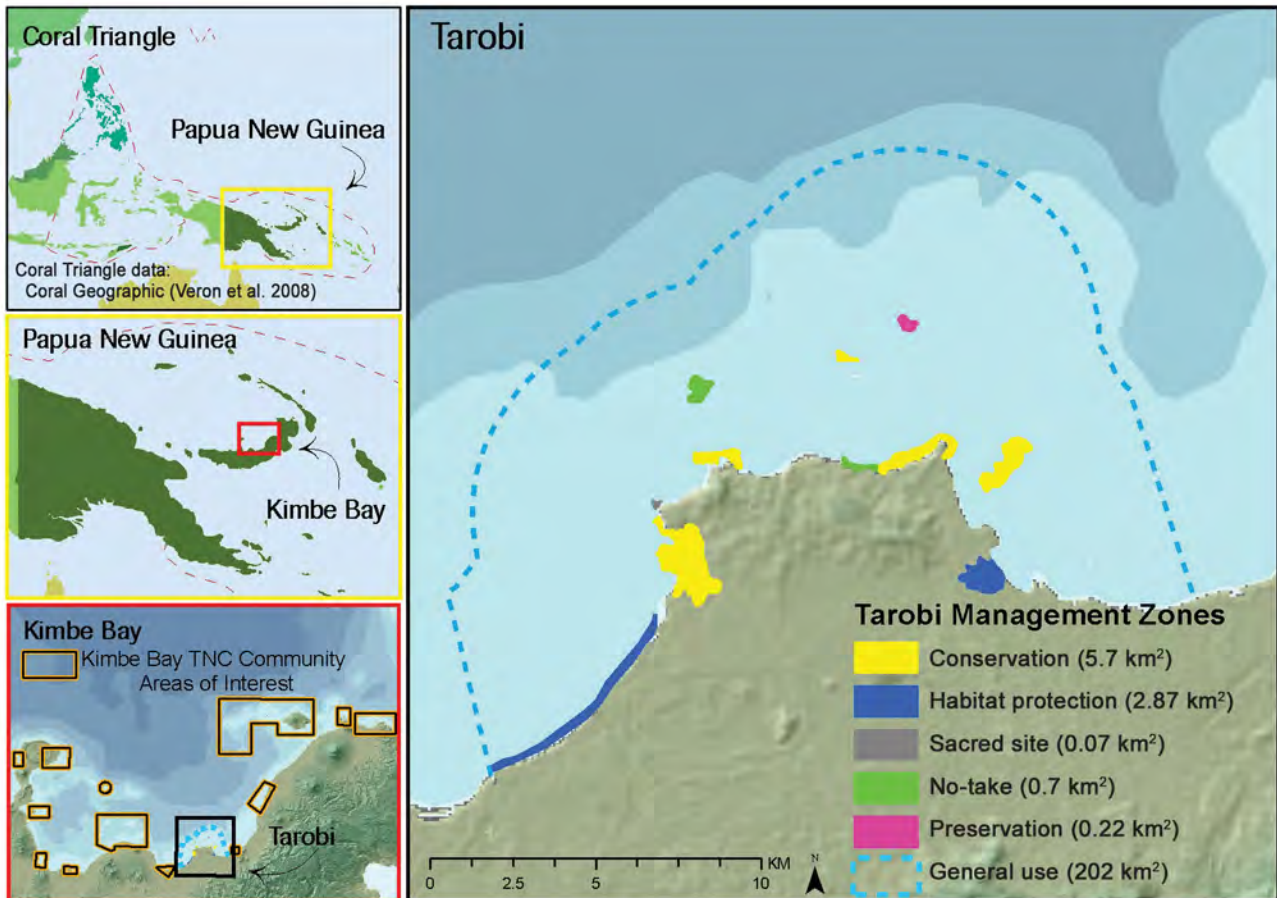


Figure 3.19. Tarobi AOI and identified use-zones after community management planning meetings. (TNC)



Implementing the design will depend on and require participation from the communities since they are the resource owners.

Identifying and addressing high-priority science calls for a resilient KBMPA Network design that provides challenges as it evolves. Lessons learned in the scientific design and implementation process are important. These can aid in MPA design processes in the Bismarck Sea and elsewhere in the Coral Triangle.



A TNC staff orients the community on the declaration of the Lolobau AOI, West New Britain. (Freda Paiva)

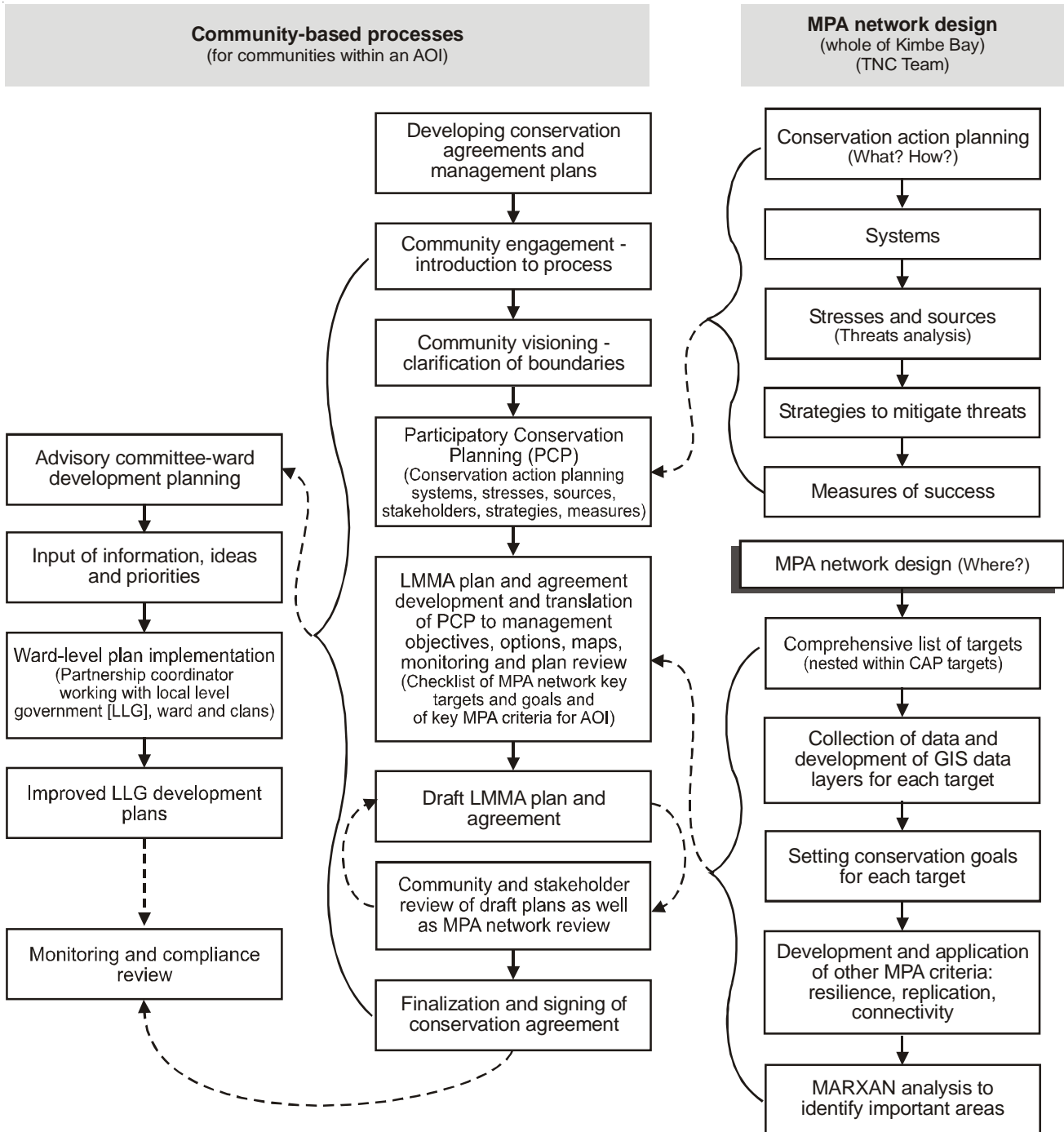


Figure 3.20. The planning process of the KBMPA Network. (TNC 2007)

# CHAPTER 4

## Results of the MPA Learning Partnership Field Surveys



Interview in progress, TNC office, Kimbe Bay, West New Britain. (Stuart Green)

This chapter presents the survey results and a management overview of the six study sites. It provides a sense of what is actually happening on the ground.

### Composition of the Survey Respondents

The survey targeted individuals directly involved in the management of the marine protected area (MPA) study sites, as well as those assisting in one way or another in implementation. A basic profile of the respondents is provided in Table 4.1. It is important to note that these results are *perceptions* of the interviewees. This approach was used considering that people act and plan based on their perceptions of the environment and social conditions.

**Table 4.1. Basic profile of survey respondents.**

Site	Number		Affiliation	Educational Attainment
	Male	Female		
Berau Marine Conservation Area (BMCA)	14	2	WWF-TNC Joint Program Berau (55%); Berau District; Bastari; Turtle Foundation; COMVIRO; Fishers' Group; CI; and TNC-CTC	2 – PhD; 5 – MS degree in fisheries, integrated management or international development policy; 7 – BS degree in fisheries, agriculture or coastal and marine management; 2 – high school level
Karimunjawa National Park (KNP)	11	4	WCS (47%); NPA; Universitas Diponegoro; and Reef Check	1 – PhD; 2 – MS degree in fisheries; 14 – BS degree in fisheries or marine science
Wakatobi Marine National Park (WMNP)	14	2	WWF-TNC Joint Program Wakatobi (44%); BAPPEDA Wakatobi; Wakatobi Regency; NPA; Community Facilitators; Operation Wallacea Trust; and TNC-CTC	2 – MS degree in fisheries; 9 – BS degree in marine science, fisheries or tourism; 5 – no information
Southeast (SE) Cebu MPA Cluster	10	5	CCEF (47%); SCCRM Council; municipalities of Boljoon and Oslob; PENRO; dive resort manager; fish warden; and PEMSEA	1 – PhD in veterinary medicine; 2 – MS degree in marine science or business management; 11 – BS degree in marine biology, fishery, community development or business administration; 1 – vocational level
Tubbataha Reefs Natural Park (TRNP)	7	8	TMO; TPAMB; PCSDS; PENRO; PCG; Navy; Cagayancillo PO; Saguda; Scuba World; PAWB; WWF; and CI	2 – MS degree; 11 – BS degree in fisheries, marine biology, accounting or economics; 1 – undergraduate; 1 – high school level
Kimbe Bay Marine Protected Area (MPA) Network	12	5	TNC (53%); provincial government; Fishers' Association; and a dive resort operator	1 – PhD; 1 – MS degree in marine science; 10 – BS degree in fisheries, biology, agriculture, economics or communication; 1 – vocational level; 4 – no information

## Survey Results

The survey form employed a list of factors / variables for respondents to describe through a simple rating scheme (Table 4.2).

**Table 4.2. The standard rating scheme used during the survey.**

- 1: Very low
- 2: Low
- 3: Moderate
- 4: High
- 5: Very high

## Design planning and establishment of the study sites

This section of the survey asked respondents about the components and approach used in the design and establishment of the MPA study sites. Questions focused on the activities conducted, main objectives of the MPA / network and perception of the process of the startup phase.

To assess the design of the MPA study sites, information on the perception of objectives and the consultation process was collected. Respondents were asked which objectives were perceived to have influenced the design of their respective MPAs. Table 4.3 shows that habitat conservation and fisheries management were consistently high priorities for all the MPA study sites. Economic development was an important consideration for all Indonesian sites and the TRNP. Resilience (ecology) objective was rated most important in Kimbe Bay MPA. It is the newest of all the study sites and is adopting the newly evolving principles of resilience in its design.

The social education objective was rated high in all the Indonesian sites and in SE Cebu MPA Cluster. The high population in coastal areas and the high dependence on natural resources made it necessary to prioritize community awareness fostering a general positive change in perception and attitude on coastal and marine resources.

In identifying where to place the no-take zones, respondents from all the MPA study sites thought that ecological basis was the most important consideration, except for SE Cebu MPA Cluster, as shown in Table 4.4. The MPA designs of Berau, Wakatobi and Kimbe Bay were developed using a combination of science-based information, traditional knowledge and Marxan technology. Marxan was used to optimize the zoning scheme and to guide decisionmaking for the zoning process (Leslie 2003). This tool was designed to guide managers and government officials in the planning for placement, size and spacing of no-take zones. Fisheries information, such as larval dispersal, spawning aggregation sites (SPAGs), home range of focal species, particularly sea turtles, and cetacean data were included when available to populate the model.

For the KNP and the TRNP, fisheries science data were not available. Large MPAs were developed out of necessity using practical knowledge and rules of thumb.

In the case of SE Cebu MPA Cluster, only basic coral and fish baseline studies were available to managers at the time. Thus, ecological considerations were barely covered during the planning of the MPAs. As a result, social factors turned out to be the top priority. However, given this limitation, Filipino managers, officials and fishers aspire to create a balance between ecological and social considerations using their basic knowledge and practical perspective.

Those interviewed at the study sites recognized the importance of consultation process with stakeholders particularly during establishment phase. Table 4.5 shows that Indonesian sites had the greatest number of stakeholder consultation, about six to eight, as compared to just four or five in sites in the Philippines and Papua New Guinea. Local government agencies and nongovernment organizations (NGOs) were consistently rated high by all sites (means ranging from 3.9 to 4.5, high to very high). Local fishers were highly consulted in all sites, except in Kimbe Bay. Traditional leaders / elders were also highly considered in

**Table 4.3. Extent of consideration of the objectives in the design of the MPA / network study sites.**

		Indonesia				Philippines				Papua New Guinea	
BMCA n=16		KNP n=15		WMNP n=16		SE Cebu MPA Cluster n=15		TRNP n=15		Kimbe Bay MPA n=17	
Objectives	Mean	Objectives	Mean	Objectives	Mean	Objectives	Mean	Objectives	Mean	Objectives	Mean
Habitat conservation	4.6	Habitat conservation	4.8*	Fisheries	4.5*	Habitat conservation	4.2*	Habitat conservation	4.4*	Resilience	4.6*
Fisheries management	4.4	Fisheries management	4.3*	Habitat conservation	4.3	Fisheries management	4.2*	Fisheries management	4.1*	Habitat conservation	4.3
Economic development	4.2	Economic development	3.5	Economic development	4.1	Social education	3.5	Economic development	3.0	Fisheries management	4.3
Social education	4.1	Social education	3.5	Social education	4.0	Economic development	3.1	Social education	2.8	Social education	3.9
Resilience	4.1	Resilience	3.4	Resilience	3.7	Resilience	2.8*	Resilience	2.4*	Economic development	3.7

\*The mean is significantly different from the pooled mean for all objectives per site at a  $p < 0.05$  level using a two-tailed T-test.



**Table 4.4. Extent of consideration of aspects in the placement of no-take zones within the MPA / network study sites.**

Indonesia						Philippines				Papua New Guinea	
BMCA n=16		KNP n=15		WMNP n=16		SE Cebu MPA Cluster n=15		TRNP n=15		Kimbe Bay MPA n=17	
Aspects	Mean	Aspects	Mean	Aspects	Mean	Aspects	Mean	Aspects	Mean	Aspects	Mean
Ecological	4.5	Ecological	4.3	Ecological	4.5	Social	3.9	Ecological	4.9*	Ecological	3.9*
Social	4.5	Social	4.0	Social	4.2	Ecological	3.7	Social	3.2	Social	3.5
Manageability	3.9	Manageability	3.7	Manageability	4.2	Manageability	3.7	Manageability	3.2	Manageability	2.8*

\*The mean is significantly different from the pooled mean for all placement considerations per site at a  $p < 0.05$  level using a two-tailed T-test.

**Table 4.5. Extent of consultation with stakeholders during the planning process in MPA / network study sites.**

Indonesia						Philippines				Papua New Guinea	
BMCA n=16		KNP n=15		WMNP n=16		SE Cebu MPA Cluster n=15		TRNP n=15		Kimbe Bay MPA n=17	
Stakeholders	Mean	Stakeholders	Mean	Stakeholders	Mean	Stakeholders	Mean	Stakeholders	Mean	Stakeholders	Mean
Local fishers	4.5*	Local government agencies	4.3*	Local fishers	4.5*	Local government agencies	4.5*	Local government agencies	4.3*	Local government agencies	4.0*
NGOs	4.4*	Traditional leaders / elders	4.1*	Local government agencies	4.4*	Local elected politicians	4.2*	Local elected politicians	4.2*	NGOs	3.9*
Local government agencies	4.3*	Local fishers	4.1*	NGOs	4.0	NGOs	4.0	NGOs	3.9*	Local elected politicians	3.7
Traditional leaders / elders	3.8	NGOs	4.0*	National government agencies	3.9	Local fishers	3.9*	National government agencies	3.9*	National government agencies	3.5
Indigenous people	3.6	National government agencies	3.8*	Traditional leaders/elders	3.8	Traditional leaders / elders	3.4	Local fishers	3.7	Tourism business	3.4
Youth	3.5	Destructive / illegal fishers	3.5	Indigenous people	3.8	Destructive / illegal fishers	3.1	Tourism business	3.3	Indigenous people	3.3
National government agencies	3.4	Indigenous people	3.4	Destructive/illegal fishers	3.7	Women	3.1	National elected politicians	3.0	Traditional leaders/elders	3.3
Tourism business	3.2	Youth	3.0	Youth	3.5	Youth	3.0	Traditional leaders/elders	2.8	Women	3.2
Destructive / illegal fishers	3.2	Tourism business	2.9	Tourism business	3.3	Tourism business	2.9	Youth	2.5	Local fishers	3.1
Local elected politicians	3.2	Nontourism business	2.7	Local elected politicians	2.9	National government agencies	2.9	Women	2.4	Nontourism business	2.9
Women	3.0	Local elected politicians	2.6	Women	2.9*	Indigenous people	2.8	Indigenous people	2.3	National elected politicians	2.8
Transient fishers	2.6*	Women	2.4*	Nontourism business	2.5*	Transient fishers	2.6	Transient fishers	1.8*	Youth	2.8
Nontourism business	2.4*	National elected politicians	2.3*	National elected politicians	2.1*	National elected politicians	2.3*	Destructive / illegal fishers	1.7*	Destructive / illegal fishers	2.5*
National elected politicians	2.1*	Transient fishers	1.6*	Transient fishers	1.9*	Nontourism business	1.9*	Nontourism business	1.4*	Transient fishers	2.4*

\*The mean is significantly different from the pooled mean for all stakeholders per site at a  $p < 0.05$  level using a two-tailed T-test.

all Indonesian sites. Local elected officials were highly consulted in the Philippines and Papua New Guinea.

## Management and implementation of the study sites

The management and implementation section of the survey looked into the activities conducted regularly within the park, perceptions of the management council, involvement of various stakeholders, as well as management effectiveness.

### Berau Marine Conservation Area

The WWF-TNC Joint Program was formed in 2005 as part of a 10-year marine conservation plan for Berau. At this point, the program is working closely with the Steering Team to manage the BMCA and respondents think that the group has a high capacity to manage (mean 3.7) (Table 4.6).

**Table 4.6. Perceived management capacity of MPA / network in study sites.**

Management Group	n	Mean	Rating
Berau	6	3.7	High
Karimunjawa	14	3.4	Moderate
Wakatobi	4	3.5	High
SE Cebu	15	3.5	High
Tubbataha	14	3.9	High
Kimbe Bay	11	3.1	Moderate

According to the WWF-TNC team, the management strategy is to mobilize existing fishers' associations to help implement the MCA, at least in their respective areas. Respondents were asked of their perception of whether some kind of a social network among the fishers' associations is helping in management. Based on the responses, fishers' associations or community forums operate within their villages, and there is no intercommunity collaboration yet (Table 4.7).

The establishment of the BMCA is accepted and supported by 72% of the stakeholders (Table 4.9). Their level of awareness of the MCA is high and as such, they are willing to participate in MCA activities. However, there are some who still oppose (13%) or are indifferent (15%) to the MCA establishment. Turtle egg collection is currently one of the causes of conflict. Unfortunately, it is supported by local officials. Other sectors perceived to oppose are fishers using illegal fishing methods and officials who apparently benefit from illegal activities.

Respondents were asked about the clarity of MCA rules and how well they are implemented. Table 4.10 shows that rules are clear (mean 3.8) while extent of implementation is low (mean 2.0) which may be partly attributed to lack of human resources and logistics to cover the large geographical area of MCA. This was confirmed by the main

**Table 4.7. MPA social network management.**

Questions:

1. Is an MPA social network formally established?
2. If yes, does the MPA social network have a main steering/practitioners' group?
3. If no, is there an informal group of MPA practitioners who meet?

MPA Network	Questions	Percentage		
		Yes	No	Don't know / no answer
BMCA	1	6	69	25
	2	6	0	94
	3	6	6	88
KNP	1	53	47	-
	2	47	7	47
	3	7	-	93
WMNP	1	13	44	43
	2	25	19	56
	3	13	25	62
SE Cebu MPA Cluster	1	80	7	13
	2	80	-	20
	3	7	-	93
TRNP	1	7	73	20
	2	7	-	93
	3	-	-	100
Kimbe Bay MPA	1	35	35	30
	2	35	12	53
	3	12	12	76

priorities of respondents including the need for additional community outreach staff, rangers, information materials, patrol boats and sufficient budget for operations (fuel, etc.). Those who oppose and violate the MCA, although very small in number, are highly influential, thus, making implementation difficult in some areas of the MCA. Other challenges with implementation of the large MCA related to governance and political will are likely relevant. The study was unable to draw much conclusion from existing data on these aspects.

### Karimunjawa National Park

The KNP is managed by the Karimunjawa National Park Authority (KNPA). The Wildlife Conservation Society (WCS) has a Memorandum of Understanding with the Ministry of Forestry, and is assisting the KNPA on technical matters.

The respondents' perception of the KNPA's management capacity is moderate (Mean 3.4) (Table 4.6). Respondents admitted the need for additional knowledge building and capacity development trainings for the KNPA to meet the challenges of park management.

When asked if there is some kind of a social network, 53% of respondents said yes and 47% said that there is a main steering committee that administers the network (Table 4.7). Respondents think that the social network is active (mean 4.0) and has a moderate capacity (mean 3.3) to manage the association (Table 4.8).

**Table 4.8. Perceived rating on social networking of study sites.**

Aspects:

1. How active is the MPA social network?
2. Rate the management capacity of this network group.

MPA Network	Aspects	n	Mean	Rating
BMCA	1	1	2.0	Low
	2	1	4.0	High
KNP	1	7	4.0	High
	2	8	3.3	Moderate
WMNP	1	5	2.8	Moderate
	2	5	2.8	Moderate
SE Cebu MPA Cluster	1	13	4.2	High
	2	13	4.2	High
TRNP	1	0	-	-
	2	0	-	-
Kimbe Bay MPA	1	8	3.6	High
	2	8	3.1	Moderate

The establishment of the KNP is accepted and supported by 57% of stakeholders (Table 4.9). Their willingness to volunteer in activities is high. There is also a good relationship between park management and local stakeholders. However, there are still some who are perceived to be opposed (23%) and to be indifferent (20%) to the establishment of the KNP. Those who oppose are perceived to be illegal fishers, business sector and some community members who historically had access to the no-take zones and now had their access and fishing rights restricted.

Survey results show that clarity of rules (mean 3.3) and extent of implementation (mean 3.4) were perceived to be moderate (Table 4.10). There is generally a lack of understanding of the rules and regulations by fishers. Respondents said that the KNP is still weak in law enforcement. During the discussion with the WCS team, it was realized that budget for equipment, infrastructure, information materials and operating expenses is limited, especially with the recent price rises in gasoline. At present, there is only one patrol boat, which is not fast enough to chase violators. According to the staff, at least six fast boats would be needed to enforce park rules. There were also instances in the past when pre-approved operating budgets for gasoline were reduced by 50% probably due to lack of funds and more recently global escalation of fuel prices.



Moray and whitetip reef shark photographed in the waters of Kimbe Bay, off the northern coast of New Britain, West New Britain Province, Papua New Guinea. (Jeff Yonover)

**Table 4.10. Perceived rating of clarity (1) and extent of implementation (2) of MPA / network rules.**

MPA Network	Rules	n	Mean	Rating
BMCA	1	5	3.8	High
	2	2	2.0	Low
KNP	1	15	3.3	Moderate
	2	14	3.4	Moderate
WMNP	1	3	3.3	Moderate
	2	3	3.3	Moderate
SE Cebu MPA Cluster	1	15	4.2	High
	2	15	3.9	High
TRNP	1	15	4.3	High
	2	15	4.3	High
Kimbe Bay MPA	1	14	4.1	High
	2	14	3.3	Moderate

**Table 4.9. Extent of support of stakeholders to the MPA / network.**

Indonesia				Philippines				Papua New Guinea			
BMCA n=16		KNP n=15		WMNP n=16		SE Cebu MPA Cluster n=15		TRNP n=15		Kimbe Bay MPA n=17	
Attitude	%	Attitude	%	Attitude	%	Attitude	%	Attitude	%	Attitude	%
Supportive	72	Supportive	57	Supportive	60	Supportive	70	Supportive	79	Supportive	70
Opposing	13	Opposing	23	Opposing	20	Opposing	19	Opposing	10	Opposing	10
Indifferent	15	Indifferent	20	Indifferent	20	Indifferent	11	Indifferent	11	Indifferent	20



### Wakatobi Marine National Park

The Wakatobi Marine National Park Authority (WMNPA) manages the park together with the Forest Protection and Nature Conservation (PHKA), Department of Marine Affairs and Fisheries (DKP), Southeast Sulawesi Provincial Government, District Government, local communities, local and foreign NGOs, and the private sector. The WWF-TNC Joint Program is currently providing technical assistance to management. The WMNPA, along with its partners, is perceived by respondents to have a high capacity to manage the park (mean 3.5) (Table 4.6).

The WMNPA recognizes that it lacks the resources to fully guard the whole park. In response to this problem, the management committee is planning to empower local communities through a stakeholder committee to help manage one of the no-take zones that covers 40 km<sup>2</sup> area on the east side of Kaledupa. The committee plans to include people from villages on the island of Kaledupa and its Bajau settlers (Chan 2002). To evaluate the progress of this plan, respondents were asked if a type of social network for WMNP existed. Only a few (13%) indicated the existence of such (Table 4.7), and evaluated the network management capacity as fairly moderate (mean 2.8) (Table 4.8).

The establishment of the WMNP is accepted and supported by 60% of the stakeholders (Table 4.9) who have a high level of awareness and are willing to participate in park activities. About 20% oppose and 20% are indifferent to its establishment. Opposition comes from Bajau<sup>1</sup> fishers, traders and some members of the community who appear to have a lack of understanding of the park and its rules and regulations. Some have had their incomes affected since access to the area has been limited. There are a few local officials who are not very supportive due to apparent misunderstandings in the planning process. The nomadic Bajaus have settled in the park and have built houses raised on reef flats. Unfortunately, some of their activities are destructive. They regularly collect live corals, fueled by demands of businesses for building materials as the park grows. Among WMNP stakeholders, key informants said they still have to reach out to the Bajaus.

### SE Cebu Marine Protected Areas Cluster

Within the SE Cebu MPA Cluster, the 22 sanctuary members are mostly managed by fishers' associations in coordination with the local government. This MPA network is managed by the Southeast Cebu Coastal Resource Management (SCCRM) Council.

Eighty percent of the respondents were aware of the SCCRM Council (Table 4.7). They perceived the council to have a high capacity of managing the MPA network (mean 4.2) (Table 4.8). About 70% perceived that the SE Cebu MPA Cluster is supported by the majority of stakeholders (Table 4.9). There is a good relationship



Fishers collect corals for use in reclamation activities and pier construction in the surrounding islands, WMNP, Sulawesi. (Stuart Green)

between local stakeholders and park management, and this is manifested by their willingness to participate in MPA cluster activities. Some are perceived to oppose (19%) and to be indifferent (11%). Those who oppose are said to be fishers and several dive resorts. The fishers feel that their access to fishing became limited and the dive resorts feel that they were not included in the consultation process.

Respondents perceived the level of clarity of rules (mean 4.2) within the MPA Cluster and their implementation (mean 3.9) as high (Table 4.10). Thus, threats to core / no-take zones appear to be relatively minor according to managers (Table 4.11). Visits to the site, however, suggested that this was not the case for all MPAs in the cluster.

In general, national government officials are not directly involved with implementation (Table 4.12), probably due to the decentralized governance regime in the Philippines.

### Tubbataha Reefs National Park

The TRNP is managed by a multisectoral Tubbataha Protected Area Management Board (TPAMB). Under the TPAMB is an Executive Committee that addresses operational and administrative issues. The TPAMB's secretariat is the Tubbataha Management Office (TMO) which administers the day-to-day affairs of the park. Respondents perceived the TPAMB to have a high capacity to manage the park (mean 3.9) (Table 4.6).

The establishment of the TRNP is supported by the majority of stakeholders (79%) (Table 4.9) whose level of awareness is high. There is a very good relationship between local stakeholders and park management, which is strengthened by their willingness to participate in park activities. The TRNP is also highly supported by local and national officials according to the perceptions of the interviewees. In general, local fishers are not highly involved, perhaps given its remote location.

<sup>1</sup> The Bajau (also written as Badjaw or Badjao), an indigenous ethnic group of Malaysia, Indonesia and southern Philippines, originally came from Sulu Archipelago. The many Bajau subgroups vary culturally and linguistically. For most of their history, the Bajaus have been a nomadic, seafaring people, living off the sea by trading and subsistence fishing. The boat-dwelling Bajaus see themselves as nonaggressive people.

**Table 4.1.1. Human activities and natural disturbances within the no-take zone(s) of the MPA / network study sites.**

Indonesia						Philippines				Papua New Guinea	
BMCA n=16		KNP n=15		WMNP n=16		SE Cebu MPA Cluster n=15		TRNP n=15		Kimbe Bay MPA n=17	
Stresses	Mean	Stresses	Mean	Stresses	Mean	Stresses	Mean	Stresses	Mean	Stresses	Mean
Dynamite fishing	3.8*	Chemical poison fishing	3.5*	Commercial fishing	3.9*	Coastal development for tourism	3.1*	Invertebrates for curio sales	3.7*	Siltation	3.9*
General illegal fishing	3.5*	General illegal fishing	3.1*	Chemical poison fishing	3.5*	General illegal fishing	2.6*	Tourist diving / snorkeling	2.5*	Waste (plastics, etc.)	3.3*
Chemical poison fishing	3.5	Commercial fishing	3.1*	Chemical poison fishing	3.4*	Siltation	2.6*	General illegal fishing	2.3*	Industrial pollution	3.1
Siltation	3.4	Live fish for restaurant	3.0	General illegal fishing	3.3*	Waste (plastics, etc.)	2.5	Waste (plastics, etc.)	1.9	Local plant poison fishing	2.9
Commercial fishing	3.4	Waste (plastics, etc.)	2.8	Crown-of-thorns outbreak	3.2*	Tourist diving / snorkeling	2.4	Commercial fishing	1.9	Invertebrates for curio sales	2.8
Industrial pollution	3.3	Invertebrates for curio sales	2.7	Invertebrates for food	3.1	Commercial fishing	2.4	Coral bleaching	1.9	General illegal fishing	2.7
Waste (plastics, etc.)	3.0	Artisanal / recreational fishing	2.6	Waste (plastics, etc.)	3.1	Crown-of-thorns outbreak	2.2	Typhoons	1.8	Invertebrates for food	2.7
Local plant poison fishing	2.8	Coastal development for tourism	2.6	Artisanal/recreational fishing	3.0	Sewage pollution	2.1	Invertebrates for curio sales	1.7	Commercial fishing	2.4
Invertebrates for curio sales	2.8	Sewage pollution	2.5	Dynamite fishing	2.9	Invertebrates for food	2.0	Crown-of-thorns outbreak	1.7	Coral bleaching	2.4
Sewage pollution	2.8	Crown-of-thorns outbreak	2.4	Sewage pollution	2.7	Chemical poison fishing	1.9	Live fish for restaurant	1.6	Chemical poison fishing	2.3
Live fish for restaurant	2.8	Coral bleaching	2.4	Local plant poison fishing	2.5	Local plant poison fishing	1.8	Artisanal/recreational fishing	1.4	Tourist diving / snorkeling	2.3
Invertebrates for food	2.7	Dynamite fishing	2.3	Coral bleaching	2.2	Invertebrates for curio sales	1.8	Sewage pollution	1.3	Artisanal / recreational fishing	2.2
Crown-of-thorns outbreak	2.7	Aquarium fishing	2.3	Invertebrates for curio sales	2.1	Industrial pollution	1.8	Siltation	1.2*	Coastal development for tourism	2.2
Coastal development for tourism	2.6	Invertebrates for curio sales	2.3	Typhoons	2.1	Typhoons	1.8	Chemical poison fishing	1.2*	Sewage pollution	2.0
Artisanal / recreational fishing	2.6	Local plant poison fishing	2.3	Coastal development for tourism	1.9*	Aquarium fishing	1.6*	Dynamite fishing	1.2*	Crown-of-thorns outbreak	2.0
Tourist diving / snorkeling	2.4	Siltation	2.1	Siltation	1.8*	Coral bleaching	1.6*	Aquarium fishing	1.2*	Dynamite fishing	1.6*
Aquarium fishing	2.2*	Tourist diving / snorkeling	2.1	Aquarium fishing	1.8*	Artisanal / recreational fishing	1.4*	Coastal development for tourism	1.1*	Aquarium fishing	1.5*
Coral bleaching	1.9*	Typhoons	1.9	Industrial pollution	1.6*	Live fish for restaurant	1.3*	Local plant poison fishing	1.1*	Live fish for restaurant	1.4*
Typhoons	1.7*	Industrial pollution	1.6*	Tourist diving / snorkeling	1.6*	Dyanmite fishing	1.1*	Industrial pollution	1.1*	Typhoons	1.3*

\*The mean is significantly different from the pooled mean for all stresses per site at a  $p < 0.05$  level using a two-tailed T-test.

**Table 4.12. Extent of involvement of stakeholders in MPA / network management activities.**

Indonesia			Philippines			Papua New Guinea					
BMCA n=16	KNP n=15	WMNP n=16	SE Cebu MPA Cluster n=15	TRNP n=15	Kimbe Bay MPA n=17						
Stakeholders	Mean	Stakeholders	Mean	Stakeholders	Mean	Stakeholders	Mean				
NGOs	4.5*	National government agencies	4.5*	Local government agencies	4.5*	Local elected politicians	4.3*	NGOs	4.3*	NGOs	4.4*
Local government agencies	4.2*	Local government agencies	3.7*	National government agencies	4.3*	Local government agencies	4.2*	Local government agencies	4.2*	Traditional leaders / elders	4.4*
Local fisher leaders	4.2*	Local fisher leaders	3.5	Law enforcement agencies	3.8	NGOs	4.1	Local elected politicians	4.2*	Local fisher leaders	3.5
Traditional leaders / elders	3.9	NGOs	3.4	NGOs	3.8	Local fisher leaders	3.5	Law enforcement agencies	4.1*	Local government agencies	3.4
Law enforcement agencies	3.5	Traditional leaders / elders	3.4	Local fisher leaders	3.4	Law enforcement agencies	3.4	National government agencies	3.7	Local elected politicians	3.1
National government agencies	3.3	Law enforcement agencies	3.2	Traditional leaders / elders	2.9	Traditional leaders / elders	3.2	Traditional leaders / elders	3.3	Law enforcement agencies	3.1
Business representatives	2.9*	Business representatives	2.8*	Business representatives	2.8	Business representatives	2.3*	National elected politicians	3.1	National government agencies	2.7
Local elected politicians	2.6*	Local elected politicians	2.0*	Local elected politicians	2.1*	Local elected politicians	2.3*	Business representatives	2.8	Business representatives	2.6
National elected politicians	1.7*	National elected politicians	1.5*	National elected politicians	1.8*	National elected politicians	1.6*	Local fisher leaders	2.5*	National elected politicians	2.2*

\*The mean is significantly different from the pooled mean for all stakeholders per site at a  $p < 0.05$  level using a two-tailed T-test.

The level of clarity of rules and extent of implementation within the park are both rated high (mean 4.3) (Table 4.10). Stresses or threats to the core / no-take zones appear to be low for this site (Table 4.11).

### Kimbe Bay Marine Protected Area Network

At present, there is no policy framework for the declaration of MPAs in Papua New Guinea. Kimbe Bay managers have therefore identified its zoning scheme as key areas of interest (AOIs), and TNC team is working with each area to develop a management plan for the communities and families with ownership rights over these areas. Once agreements have been made and a management plan is drafted, it will be passed onto the local

government for endorsement. The Kimbe Bay MPA was launched in June 2007 and TNC has been working from village to village to introduce the plan while working closely with the local government.

According to respondents, the establishment of the Kimbe Bay MPA is accepted by the majority (70%) of stakeholders (Table 4.9). Many perceived it as a good development, and local stakeholders are open to external, technical assistance to implement it. The willingness of stakeholders to participate in activities or volunteer time is only moderate. There is still a great potential for community outreach or organization to improve active participation of stakeholders through the MPA.

### Comparison of the Six Sites

Multistakeholder participation in management activities was observed in all MPA study sites. Results showed that in all sites, except for Papua New Guinea, fishers and local fisher leaders were not that highly involved in network management activities. Participatory methods are likely to strengthen constituent support for MPAs through increased process ownership and heightened consciousness (Pollnac et al. 2001). To see which ones are



Community consultation among local fishers in Hoskins, Kimbe Bay, as part of the MPA establishment process. (Stuart Green)



most active, respondents rated the extent of involvement of listed stakeholders, and Table 4.12 shows that NGOs were consistently rated high by all MPA study sites. The extent of involvement of the various government offices varies, depending on the sites' legal declaration (local or national) and age. The involvement in management of the local government agency was rated highly by all sites, except for Kimbe Bay, where efforts are ongoing for the legal establishment of the MPA. Only traditional leaders / elders and local fisher-leaders are identified to be highly involved in management.

The rating means on Table 4.13 show that the majority of strategies listed in gaining stakeholder adoption of MPA / network are rated highly (mostly between means 3.5 and 4.7). In general, these strategies are related to communication and feedback, trainings, multistakeholder planning and community involvement. Participation improves the likelihood of effective law enforcement at a very localized scale for MPAs and nearshore fisheries management. Even shoreline management can be facilitated when people are educated about what is needed and engaged in self-policing through volunteer groups (White et al. 2005).

On occasions when implementation conflict arises, it is interesting to note that reference to local legislation and community rules / regulations is common for all MPA study sites regardless of legal declarations or cultural backgrounds (Table 4.14). Reference to traditional laws is rated high for culturally diverse areas such as in Indonesia and Papua New Guinea.

As for the existing threats or stress in no-take zones, Indonesian sites appear to have problems with illegal fishing. Chemical fishing is rated high in all Indonesian sites (Table 4.11). Respondents perceived that this is related to problems in the enforcement of laws and

miscommunication among stakeholders. As for Kimbe Bay, siltation is the major concern. In addition, although not reflected on the table, respondents thought that illegal fishing is a common problem also in Kimbe Bay. Existing stresses for Philippine sites are only moderate to very low, according to respondents.

In terms of factors which inhibit management improvement, Table



A workshop meeting in Wakatobi. (WWF-TNC Joint Program Wakatobi)

4.15 shows that lack of financial resources is a common problem for all MPA study sites as well as lack of capacity for all sites, except those in the Philippines.

When asked about the priority strategies for the next one to five years, respondents rated almost all of the listed strategies in Table 4.16 as high (mean 3.6) to very high (mean 4.9). This implies that MPA work is a continuous process and requires a combination of strategies to address the multifaceted nature of implementation. It also suggests that further effort may be required to prioritize interventions.

### Monitoring and Evaluation of the MPA Networks

Questions asked in this section relate to social and biophysical monitoring, evaluation systems for temporal changes, and how the information is used within each MPA / network.

Monitoring and evaluation (M&E) systems in MPA study sites vary according to age / maturity of implementation. In its pre-establishment stage, only baseline biophysical and socioeconomic data have been gathered for Kimbe Bay. Berau and Wakatobi are in the initial implementation stage and are still collecting baseline data. The WWF-TNC Joint Program has been collecting biophysical and socioeconomic data for the Berau MCA and doing monitoring surveys on resource use, spawning aggregations and coral reefs for many years. Unfortunately it appears that the indicators used in the data collection have changed frequently, which prevents long-term analysis and understanding trends. Perception monitoring surveys are also conducted parkwide every two years.

Karimunjawa, Tubataha and the individual sanctuary-members of SE Cebu have been managing their areas for considerable time and have developed their monitoring systems.

For Karimunjawa, the WCS has collected time series data since 2003 on the status of corals and seagrass, biomass of fish and invertebrates, and management effectiveness. There is also long-term research on fishing patterns and surveys on socioeconomic perceptions. The WCS, in partnership with the KNPA, also has a regular biophysical and socioeconomic score chart that is used in publications



Front cover of the WCS KNPA newsletter in Bahasa Indonesia, with park indicators showing change over time including live hard coral cover, invertebrate populations, fish production, catch per unit effort and others. (WCS 2008)

**Table 4.13. Perceived effectiveness of strategies in gaining stakeholders' adoption of the MPA / network.**

Indonesia						Philippines				Papua New Guinea	
BMCA n=16		KNP n=15		WMNP n=16		SE Cebu MPA Cluster n=15		TRNP n=15		Kimbe Bay MPA n=17	
Strategies	Mean	Strategies	Mean	Strategies	Mean	Strategies	Mean	Strategies	Mean	Strategies	Mean
Trainings in MPA management and leadership development	4.3	Public consultations / community meetings	3.9*	Public consultations / community meetings	4.1*	Community surveillance and enforcement of MPA	4.7*	Planning meetings with government	4.2*	Communication activities	3.9*
Information materials	4.2	Trainings in MPA management and leadership development	3.7	Multistakeholder planning workshops	3.7	Research results feedback to stakeholders	4.6*	Public consultations / community meetings	3.9	Research results feedback to stakeholders	3.8*
Public consultations / community meetings	4.0	Community surveillance and enforcement of MPA	3.7	Trainings in MPA management and leadership development	3.7	Multistakeholder planning workshops	4.5	Research results feedback to stakeholders	3.8	Multistakeholder planning workshops	3.8
Participatory biophysical assessments	4.0	Planning meetings with government	3.7	Research results feedback to stakeholders	3.6	Trainings in MPA management and leadership development	4.5	Multistakeholder planning workshops	3.7	Trainings in MPA management and leadership development	3.6
Community surveillance and enforcement of MPA	4.0	Communication activities	3.5	Community surveillance and enforcement of MPA	3.6	Participatory biophysical assessments	4.4	Trainings in MPA management and leadership development	3.6	Information materials	3.6
Communication activities	3.9	Participatory biophysical assessments	3.5	Publications	3.6	Planning meetings with government	4.4	Community surveillance and enforcement of MPA	3.6	Public consultations / community meetings	3.5
Planning meetings with government	3.9	Multistakeholder planning workshops	3.5	Planning meetings with government	3.6	Information materials	4.1	National and international visitors	3.6	National and international visitors	3.5
Multistakeholder planning workshops	3.8	Information materials	3.5	Social assessments / interviews	3.5	Awareness-raising activities	4.1	Publications	3.6	Social assessments / interviews	3.2
Social assessments / interviews	3.7	Social assessments / interviews	3.5	Communication activities	3.4	Public consultations / community meetings	4.0	Information materials	3.5	Participatory biophysical assessments	3.2
Publications	3.7	Awareness-raising activities	3.3	National and international visitors	3.4	Communication activities	3.8	Participatory biophysical assessments	3.4	Publications	2.91
Awareness-raising activities	3.6	Research results feedback to stakeholders	3.3	Participatory biophysical assessments	3.3	Social assessments / interviews	3.8	Social assessments / interviews	3.3	Planning meetings with government	2.86
Research results feedback to stakeholders	3.5	Publications	3.1	Information materials	3.2	National and international visitors	3.4*	Communication activities	3.2	Community surveillance and enforcement of MPA	2.8

\*The mean is significantly different from the pooled mean for all stakeholders per site at a  $p < 0.05$  level using a two-tailed T-test.

**Table 4.14. Policies that help resolve conflicts emerging from MPA / network implementation.**

Indonesia						Philippines				Papua New Guinea	
BMCA n=16		KNP n=15		WMNP n=16		SE Cebu MPA Cluster n=15		TRNP n=15		Kimbe Bay MPA n=17	
Policies	Mean	Policies	Mean	Policies	Mean	Policies	Mean	Policies	Mean	Policies	Mean
Local legislation	4.2	Local legislation	4.3	Traditional laws	4.4	Local legislation	4.5*	Local legislation	4.7*	Local legislation	4.3*
Community rules / regulations	4.0	Community rules / regulations	4.1	Local legislation	4.3	National legislation	3.7	National legislation	4.6*	Community rules / regulations	3.9
National legislation	3.8	Traditional laws	3.9	Community rules / regulations	4.2	Community rules / regulations	2.5	Community rules / regulations	1.9*	Traditional laws	3.6
Traditional laws	3.7	National legislation	3.9	National legislation	3.9	Religious literature	1.7*	Religious literatures	1.2*	Religious literature	2.9
Religious literatures	3.3	Religious literatures	3.1*	Religious literatures	3.4*	Traditional laws	1.4*	Traditional laws	1.1*	National legislation	2.8*

\*The mean is significantly different from the pooled mean for all policies per site at a  $p < 0.05$  level using a two-tailed T-test.

**Table 4.15. Factors that inhibit improvement in MPA / network management.**

Indonesia						Philippines				Papua New Guinea	
BMCA n=16		KNP n=15		WMNP n=16		SE Cebu MPA Cluster n=15		TRNP n=15		Kimbe Bay MPA n=17	
Factors	Mean	Factors	Mean	Factors	Mean	Factors	Mean	Factors	Mean	Factors	Mean
Lack of leadership	4.4*	Lack of financial resources	3.8*	Lack of financial resources	4.0	Lack of financial resources	3.6*	Lack of financial resources	3.8*	Lack of financial resources	4.1*
Lack of capacity	4.0*	Lack of capacity	3.7*	Lack of capacity	4.0	Weak planning and implementation	3.3	Political interventions	2.8	Lack of capacity	3.8*
Weak planning and implementation	4.0	Weak planning and implementation	3.3	Political interventions	3.7	Project implementation difficulties	3.0	Lack of capacity	2.7	Lack of leadership	3.8
Lack of interest	3.8	Lack of leadership	3.1	Weak planning and implementation	3.3	Lack of leadership	2.9	Project implementation difficulties	2.1	Project implementation difficulties	3.3
Political interventions	3.8	Lack of interest	3.0	Lack of interest	3.3	Lack of capacity	2.9	Cultural	1.8	Weak planning and implementation	3.3
Lack of financial resources	3.6	Project implementation difficulties	2.9	Cultural	3.3	Political interventions	2.9	Lack of leadership	1.7	Lack of interest	3.0
Cultural	3.0*	Political interventions	2.8	Project implementation difficulties	3.3	Lack of interest	2.5	Lack of interest	1.6	Cultural	2.7
Project implementation difficulties	2.8*	Unwillingness to adopt the MPA / network concept	2.7	Unwillingness to adopt the MPA / network concept	3.3	Unwillingness to adopt the MPA / network concept	2.5	Weak planning and implementation	1.4*	Political interventions	2.7
Unwillingness to adopt the MPA / network concept	2.6*	Cultural	2.4*	Lack of leadership	3.0	Cultural	1.8*	Unwillingness to adopt the MPA / network concept	1.1*	Unwillingness to adopt the MPA / network concept	2.2*

\*The mean is significantly different from the pooled mean for all factors per site at a  $p < 0.05$  level using a two-tailed T-test.



**Table 4.16. Relative importance of strategies in the next five years.**

Indonesia				Philippines				Papua New Guinea			
BMCA n=16		KNP n=15		WMNP n=16		SE Cebu MPA Cluster n=15		TRNP n=15		Kimbe Bay MPA n=17	
Strategies	Mean	Strategies	Mean	Strategies	Mean	Strategies	Mean	Strategies	Mean	Strategies	Mean
Management Board capacity development	4.6	Coastal law enforcement and compliance	4.4	Policy work	4.5	Coastal law enforcement and compliance	4.8*	Management planning	4.9*	Information materials development	4.8*
Enhancing political will	4.5	Education and awareness-raising	4.3	Management planning	4.5	Biophysical M&E and documentation	4.7*	Sustainable financing	4.9*	Education and awareness-raising	4.7*
Coastal law enforcement and compliance	4.5	Livelihood activity options	4.3	Coastal law enforcement and compliance	4.4	Sustainable financing	4.6	M&E of management and documentation	4.7*	Scientific research	4.4
Sustainable financing	4.5	Management Board capacity development	4.2	Education and awareness-raising	4.3	M&E of management and documentation	4.6	Information materials development	4.6	Management planning	4.4
M&E of management and documentation	4.5	Policy work	4.1	Biophysical M&E and documentation	4.3	Management planning	4.6	Education and awareness-raising	4.6	Sustainable financing	4.4
Biophysical M&E and documentation	4.5	Management planning	4.1	Doing and learning approach	4.3	Management Board capacity development	4.5	Information management systems	4.6	Adopting integrated coastal management approach	4.4
Management planning	4.4	M&E of management and documentation	4.1	Information management systems	4.3	Livelihood activity options	4.5	Coastal law enforcement and compliance	4.5	M&E of management and documentation	4.4
Policy work	4.4	Biophysical M&E and documentation	4.1	Management Board capacity development	4.2	Adopting integrated coastal management approach	4.4	Biophysical M&E and documentation	4.4	Biophysical M&E and documentation	4.4
Scientific research	4.3	Adopting integrated coastal management	4.1	Adopting integrated coastal management	4.2	Doing and learning approach	4.2	Enhancing political will	4.4	Policy work	4.4
Education and awareness-raising	4.3	Sustainable financing	4.1	M&E of management and documentation	4.2	Enhancing political will	4.1	Livelihood activity options	4.4	Enhancing political will	4.4
Livelihood activity options	4.2	Information management systems	3.9	Livelihood activity options	4.2	Scientific research	4.1	Management Board capacity development	4.4	Doing and learning approach	4.4
Adopting integrated coastal management approach	4.1	Doing and learning approach	3.8	Enhancing political will	4.1	Policy work	4.1	Scientific research	4.3	Coastal law enforcement and compliance	4.3
Doing and learning approach	4.1	Information materials development	3.7	Sustainable financing	4.0	Education and awareness-raising	4.0	Adopting integrated coastal management approach	4.3	Information management systems	4.3
Information materials development	4.0	Enhancing political will	3.6	Information materials development	3.9	Information materials development	3.9	Policy work	4.1	Management Board capacity development	4.1
Information management systems	3.9	Scientific research	3.6	Scientific research	3.4*	No-take zone expansion	3.9	Doing and learning approach	4.1	Livelihood activity options	4.0
No-take zone expansion	3.4*	No-take zone expansion	3.2*	No-take zone expansion	3.1*	Information management systems	3.9*	No-take zone expansion	2.3*	No-take zone expansion	3.1*

\*The mean is significantly different from the pooled mean for all strategies per site at a  $p < 0.05$  level using a two-tailed T-test.

meant for local stakeholders. This tracks simple indicators and their changes (positive and negative) every time a newsletter is published, which provides feedback to local communities and readers of the newsletter in the park.

For Tubbataha, the CCEF has been collecting time series data since 1984 on the status of corals, reef fish and biomass, and invertebrates. The WWF and other groups also conduct monitoring studies of sea turtles, cetaceans and seabirds.

For Cebu, the 22 MPAs within the cluster conduct annual coral and fish monitoring activities independently of each other, with the help of the CCEF, LGUs and the MPA management groups as well as of fishers and local dive resorts. They monitor management effectiveness using the MPA rating system. The WCS is modifying this rating system and intends to adopt the same system for the KNP.

The dissemination of information materials in local language is one of the most effective strategies to raise awareness of the status of marine ecology and new policies. Table 4.17 shows that such materials are available, according to majority of respondents from Berau, Karimunjawa and SE Cebu.

In terms of use of scientific data for the assessment of management and policies, Karimunjawa and Tubbataha show an exceptionally high rating for this practice. Scientific

data are commonly used as basis for developing and / or refining management plans, prioritizing programs or activities, allocating budget, and making recommendations of policies to improve MPA implementation. Data feedback could be done in various ways depending on communication objectives and

**Table 4.17. Rating on the use of science and dissemination of information to raise awareness of the MPA / network study sites.**

Questions:

- Are MPA information materials available in the local language?
- Is science used to assess management and policies?

MPA Network	Questions	Percentage		
		Yes	No	Don't know / no answer
BMCA	a	63	25	13
	b	38	0	63
KNP	a	60	40	0
	b	93	7	0
WMNP	a	38	38	24
	b	19	0	81
SE Cebu MPA Cluster	a	73	13	14
	b	53	20	27
TRNP	a	40	53	7
	b	80	0	20
Kimbe Bay MPA	a	18	47	35
	b	53	12	35

**Table 4.18. Perceived extent of benefits of stakeholders from the MPA / network.**

Indonesia				Philippines				Papua New Guinea			
BMCA n=16		KNP n=15		WMNP n=16		SE Cebu MPA Cluster n=15		TRNP n=15		Kimbe Bay MPA n=17	
Stakeholders	Mean	Stakeholders	Mean	Stakeholders	Mean	Stakeholders	Mean	Stakeholders	Mean	Stakeholders	Mean
Local government agencies	4.2*	Local government agencies	4.1*	Community / people's organizations	4.3*	Local fishers	4.3*	NGOs	4.5	NGOs	4.2*
Local fishers	4.2*	National government agencies	4.1*	Local government agencies	4.0*	Reserve / sanctuary members	4.1*	Tourism business	4.3*	Women	3.7
NGOs	4.0*	Tourism business	3.7*	Traditional leaders / elders	4.0*	NGOs	4.0*	Local government agencies	3.9*	Local fishers	3.6
Indigenous people	4.0	NGOs	3.7	NGOs	4.0*	Local government agencies	3.9	National government agencies	3.8*	Local elected officials	3.6
Community / people's organizations	3.8	Community / people's organizations	3.7	Indigenous people	4.0	Local elected officials	3.8	Local elected officials	3.8*	Tourism business	3.5
Youth	3.8	Traditional leaders / elders	3.6	Local fishers	4.0	Traditional leaders / elders	3.8	Community / people's organizations	3.8*	Traditional leaders / elders	3.5
Tourism business	3.6	Indigenous people	3.5	Tourism business	4.0	Community / people's organizations	3.7	Local fishers	3.8	Indigenous people	3.5
Women	3.2	Local fishers	3.4	National government agencies	3.7	Tourism business	3.7	National elected officials	3.3	Local government agencies	3.3
Transient fishers	3.0	Local elected politicians	3.4	Women	3.3	Youth	3.5	Nontourism business	3.0	Youth	3.3

\*The mean is significantly different from the pooled mean for all stakeholders per site at a  $p < 0.05$  level using a two-tailed T-test.

target audience. Among the most common strategies are publications, information materials, reporting to MPA boards / councils and government, and community presentations.

To determine who among the stakeholders are benefiting from the MPA establishment, respondents rated the extent of benefits for each stakeholder group type. Based on the rating means contained in Table 4.18, NGOs and the government are consistently rated high for all sites except for Kimbe Bay. Local fishers, which are one of the target beneficiaries of an MPA, are also rated consistently high among sites.

As a followup, respondents were asked to identify the positive socioeconomic outcomes from the MPA. Education



Fishing village in Komodo National Marine Park, Indonesia. (Alan White)

and skills development were the two strategies perceived to provide the greatest benefit from the MPA / network (Table 4.19).

**Table 4.19. Perceived extent of socioeconomic benefits from the MPA / network.**

Indonesia						Philippines				Papua New Guinea	
BMCA n=16		KMNP n=15		WMNP n=16		SE Cebu MPA Cluster n=15		TRNP n=15		Kimbe Bay MPA n=17	
Strategies	Mean	Strategies	Mean	Strategies	Mean	Strategies	Mean	Strategies	Mean	Strategies	Mean
Education	4.2*	Education	3.9*	Education	4.0*	Education	4.0*	Increased community pride	4.3*	Skills development	4.0*
Skills development	3.9	Opened tourism business	3.8	Opened tourism business	3.7	Skills development	3.9*	Skills development	3.9*	Increased fish catch	3.9*
Opened tourism business	3.8	Increased fish catch	3.5	Increased fish catch	3.5	Increased community pride	3.8*	Increased fish catch	3.9*	Education	3.7*
Youth development	3.7	Sensitivity to ethnic groups	3.4	Sensitivity to ethnic groups	3.4	Increased fish catch	3.8*	Increased community unity	3.8*	Sensitivity to ethnic groups	3.4
Livelihood programs	3.7	Increased community pride	3.3	Increased community unity	3.3	Opened tourism business	3.5	Opened tourism business	3.5	Increased community pride	3.4
Increased fish catch	3.7	Youth development	3.3	Increased community pride	3.3	Increased community unity	3.3	Livelihood programs	3.5	Increased community unity	3.3
Increased community pride	3.6	Opened nontourism business	3.2	Skills development	3.2	Increased household income	3.2	Increased household income	3.1	Opened tourism business	3.2
Outreach programs	3.6	Increased community unity	3.1	Outreach programs	3.2	Women empowerment	2.8	Sensitivity to ethnic groups	3.0	Increased household income	2.9
Women empowerment	3.5	Outreach programs	3.1	Livelihood programs	3.1	Youth development	2.8	Education	2.9	Women empowerment	2.7
Increased community unity	3.5	Increased household income	3.0	Increased household income	3.1	Livelihood programs	2.7	Youth development	2.8	Youth development	2.7
Increased household income	3.5	Women empowerment	2.9	Youth development	3.1	Opened nontourism business	2.4*	Women empowerment	2.7	Outreach programs	2.6
Sensitivity to ethnic groups	3.2	Increased fish catch	2.8*	Opened nontourism business	3.1	Sensitivity to ethnic groups	2.0	Opened nontourism business	2.1*	Opened nontourism business	2.3*
Opened nontourism business	3.2	Sensitivity to ethnic groups	2.8*	Women empowerment	2.7	Outreach programs	1.9*	Outreach programs	1.7*	Livelihood programs	2.1*

\*The mean is significantly different from the pooled mean for all strategies per site at a  $p < 0.05$  level using a two-tailed T-test.



### MPAs in the National and International Contexts

Currently, a mere 0.5% of the global ocean is within protected area systems, and most of that is within the first few miles of the territorial seas (CBD 2005). As a response to this, recently many international agreements and protocols have been ratified to encourage nations to enhance the conservation and sustainable management of marine biodiversity. One strategy that has been adopted is to suggest targets for the development of MPA networks by 2012. The Fifth World Parks Congress recommended that at least 20-30% of each habitat be included in strictly protected MPAs. The Convention on Biological Diversity suggested a target of 10% of Exclusive Economic Zones be strictly protected by 2010. The countries of the study sites all signed support for the agreements / protocols mentioned. However, their respective national government's commitment to action is expected to influence MPA development accordingly.

This portion of the survey asked respondents their perception of these progress related to international targets.

#### Indonesia

Indonesia has set its own target of 10 million ha of MPAs by 2010, and doubling it to 20 million ha by 2020. Respondents were asked if they are aware of this, and it appears that for all three sites, the majority is aware of the country's targets for marine management (Table 4.20). They were asked to provide their opinion on how close their existing initiatives are to the targets. The mean for all Indonesian sites is roughly halfway to the target (Table 4.21). The general perception is that achievement of the full targets will be difficult. However, they do see more MPAs spreading throughout the country, and the majority thinks that social networks are needed and could help in management of MPAs. In general, progress toward international or national MPA targets reflects the relatively centralized governance context of Indonesia.

#### Philippines

The Philippines has several Republic Acts to comply to international agreements which set the stage for a sound policy environment. One is the Philippine Fisheries Code (Republic Act 8550) that recommends at least 15%, where applicable, of the total municipal marine waters be placed in fishery reserves (White et al. 2002).

Respondents were asked if they are aware of the country's target for MPAs, and it appears that for both sites surveyed, only a few were aware (Table 4.20). When asked how well the country is doing towards achieving its targets, respondents said that it is still far from the target (Table 4.21). The general sentiment of

respondents was that it will be difficult to achieve the implementation of a national MPA plan. However, they believed MPAs will continue to spread throughout the country, as a matter of necessity. Regarding whether social networks are needed and could help in MPA management, the majority in SE Cebu MPA Cluster said they are necessary, while those in the TRNP felt that they are of low importance. In general, progress toward international or national MPA targets reflects the decentralized governance context of the Philippines.

**Table 4.20. MPAs / networks in the national and international contexts:**

- a. Government has a conscious effort to achieve marine conservation targets according to international protocols.
- b. MPAs spreading in the coming years.
- c. Is there a need to establish social networks?

MPA Network	Aspects / Questions	Percentage		
		Yes	No	Don't know / no answer
BMCA	a	75	0	25
	b	81	0	19
	c	81	0	19
KNP	a	53	0	47
	b	73	7	20
	c	67	20	13
WMNP	a	50	0	50
	b	50	0	50
	c	50	6	44
SE Cebu MPA Cluster	a	20	47	33
	b	73	7	20
	c	60	20	20
TRNP	a	7	13	80
	b	87	0	13
	c	27	0	73
Kimbe Bay MPA	a	41	24	35
	b	0	88	12
	c	59	18	24

**Table 4.21. General perceptions of national marine conservation targets:**

- A. How far is the country from achieving the said targets?  
1 - very far from target    3 - halfway to the target    5 - has accomplished the target
- B. The target is:  
1 - impossible to achieve    3 - difficult to achieve    5 - very easy to achieve

MPA Network	General Perceptions	n	Mean	Rating
BMCA	A	14	3.4	Above halfway to the target
	B	13	3.2	Slightly below difficult to achieve
KNP	A	11	3.1	Halfway to the target
	B	15	3.1	Difficult to achieve
WMNP	A	8	2.4	Far from the target
	B	10	2.9	Difficult to achieve
SE Cebu MPA Cluster	A	4	1.8	Far from the target
	B	13	3.1	Difficult to achieve
TRNP	A	3	2.0	Far from the target
	B	3	3.7	Easy from the target
Kimbe Bay MPA	A	6	2.7	Halfway to the target
	B	12	3.0	Difficult to achieve

## Papua New Guinea

In Papua New Guinea, about 41% of respondents said that the country has a conscious effort to achieve marine conservation targets following international treaties (Table 4.20). However, it appears that the absence of a national policy is a limiting factor. As to how close the country is in achieving the targets, the perception is that it is less than halfway to these (Table 4.21). The general feeling of respondents was that it is going to be difficult to achieve nationwide targets. The majority (88%) perceived that MPAs will not spread in the country in coming years. The majority (59%) however suggested that social networks of MPA practitioners are needed and could help in management. In general, the lack of progress toward international or national MPA targets reflects the lack of a national government policy that supports MPA establishment and implementation.

The experience of these three countries demonstrates the contrasts in MPA progress as affected by their respective national MPA policy and implementation framework.



Island fishing boats and children during a rapid ecological assessment in Manus Province, North Bismarck Sea, Papua New Guinea. (Louise Goggin)

## SUMMARY

Each MPA network is in a different phase of implementation, with some in existence for more than a decade since declaration (e.g., Karimunjawa, Wakatobi and Tubbataha) whereas others are only beginning (e.g., Kimbe Bay, Berau and SE Cebu). Likewise, some of the areas cover a small geographic range while others cover a much larger area, especially the Indonesian MPAs. The location and size appear to be highly influenced by social factors such as population density and proximity to developed coasts.

In general, during the planning phase, the MPA networks were well thought out (depending on their capacity and limitations). Each study site identified its objectives, with fisheries and habitat management emerging as the two most important management objectives. All the MPA study sites integrated local / traditional knowledge in the design and implementation plan.

There seems to be stronger implementation in sites where management councils and implementation tasks are shared among several agencies as opposed to those with single management entities. Having a good management framework and organized committees for the MPA is critical, as shown by the Philippine sites. Budget for MPA / network operations is a major concern for all of the study sites.

M&E seems to be highly site-specific and differs among each MPA network. Of the study sites, Karimunjawa, Tubbataha and SE Cebu appear to have strong programs for M&E. As each network matures, so should the evaluation process and its feedback into the management cycle.

The national and international contexts of the MPA networks highlight the need for the national level to have a clear plan and direction, even in countries where decentralization is a policy. In the case of Papua New Guinea, a declaration of clear MPA national policy and framework would greatly assist MPA advancement.

# CHAPTER 5

## Analysis of the Results of the MPA Learning Partnership Field Surveys

This chapter focuses on the variables that have the most important influence in the successful development of a functional MPA network. To identify the management factors that influence the objectives and outcomes of MPA networks, correlation and regression analyses were used. Both are capable of identifying patterns among various variables using consolidated rating scores. This was conducted for the whole data set, irrespective of history, country or background.



Doing coral reef health research during a rapid ecological assessment in Manus Province, North Bismarck Sea, Papua New Guinea. (Louise Goggin)

### Correlation and Regression Analyses

The following results are from several sets of correlation analyses using the Spearman two-tail test and stepwise linear regression analysis.

#### Factors that influenced improved fish catch, critical habitats and marine diversity

Three ecological indicators were analyzed: increased fish catch, improved critical habitats and improved marine diversity. The increase in fish catch variable is positively correlated with 12 management strategies, presented in Table 5.1. This information suggests that when the following management strategies are in place, fish catch is likely to increase (it is not, however, necessarily a causal relationship). The correlation coefficient  $r$  represents the linear relationship between two variables. The value of  $r$  can range from  $-1$  to  $+1$  and is independent of the units of measurement. A value of  $r$  near  $0$  indicates little correlation between attributes; a value near  $+1$  or  $-1$  indicates a high level of correlation (IBM 2008).



To evaluate the significant factors correlated with increased fish catch, we ran a regression analysis. From the regressions, three factors were identified to have a strong, predictive relationship with increased fish catch: sustainable financing for management, clarity of MPA / network rules and enforcement by community enforcers.

Thus, among the three significant factors, clarity of MPA / network rules is the strongest predictor of increased fish catch as indicated by its *Beta value* and *t statistic*.

The regression data show that sustainable financing, clarity of MPA / network rules and enforcement by community enforcers together explain 54% (see adjusted  $R^2$  of regression data) of the variance in increased fish catch for this sample, which is considered high for social research. This implies that increases in these three measures will most likely result in increase in fish catch according to the dataset.

Another ecological indicator tested was improved critical habitats in no-take zones. Seven independent variables were significantly correlated to this ecological indicator (Table 5.2). These variables could be grouped in

two themes: (1) local capacity-building strategies to include skills development and trainings in MPA management and leadership development; and (2) multistakeholder participation to include involvement in management of local elected politicians, stakeholders' participation in activities, participatory biophysical assessments and enforcement by community enforcers.

Regression analysis identified two variables having a strong predictive relationship with critical habitats, one from each theme: local skills development and involvement in management of local elected politicians. These independent variables account for 42% of the variance in critical habitat improvement for this sample. Local skills development is an important strategy to gain active participation of local, qualified partners for management and enforcement. The involvement of local politicians in management could improve political will in support of the MPA / network, resulting in improved protection of critical habitats.

**Table 5.1. Significant factors to increased fish catch.**

Dependent Variable: increased fish catch	Correlation Coefficient (r)	Regression Analysis		
		Standardized Coefficient (Beta <sup>1</sup> )	t	p
Independent Variables:				
Sustainable financing for management (standardized)	.412(**)	0.385	3.11	0.004
Clarity of MPA / network rules (standardized)	.382(**)	0.412	3.65	0.001
Enforcement by community enforcers (standardized)	.487(**)	0.340	2.744	0.01
Local skills development	.375(**)	~	~	~
Multistakeholder planning workshops	.333(**)	~	~	~
Communication activities (e.g., film showings, photo exhibits)	.327(**)	~	~	~
Involvement in management of traditional leaders / elders	.313(*)	~	~	~
Involvement in management of local elected politicians	.310(*)	~	~	~
Stakeholders' participation in activities	.290(*)	~	~	~
Involvement in management of police and law enforcement agencies	.284(*)	~	~	~
Trainings in MPA management and leadership development	.282(*)	~	~	~
Participatory biophysical assessments	.278(*)	~	~	~

\*\*Correlation is significant at the .01 level (2-tailed).

\*Correlation is significant at the .05 level (2-tailed).

Regression data<sup>2</sup>: R = .762 R<sup>2</sup> = .581 Adj. R<sup>2</sup> = .543 F<sup>3</sup> = 15.261 p < 0.001 N = 37

<sup>1</sup> Regression coefficient, *Beta*, is the average amount the dependent variable increases when the independent variable increases one unit and other independent variables are held constant. T-value is the observed value of the t-statistic that is used to test the hypothesis that two attributes are correlated. The t-value can range between -infinity and +infinity. A t-value near 0 is evidence for the null hypothesis that there is no correlation between the attributes. A t-value far from 0 (either positive or negative) is evidence for the alternative hypothesis that there is correlation between the attributes. P-value is the probability, when the null hypothesis is true, that the absolute value of the T-statistic would equal or exceed the observed value (t-value). A small p-value is evidence that the null hypothesis is false and the attributes are, in fact, correlated (IBM 2008). A p of 5% or less is the generally accepted point at which to reject the null hypothesis (StatSoft 2008).

<sup>2</sup> The coefficient of determination  $R^2$  is a statistical measure of *goodness-of-fit*. It measures how good the estimated regression line approximates the real data points. The higher  $R^2$ , the more confidence one can have in the equation. An  $R^2$  of 1.0 indicates that the regression line perfectly fits the data. *Adjusted R<sup>2</sup>* is a modification of  $R^2$  that adjusts for the number of terms in a model.  $R^2$  always increases when a new term is added to a model, but adjusted  $R^2$  increases only if the new term improves the model more than would be expected by chance.

<sup>3</sup> F test is used to test the significance of R,  $R^2$  and the regression model as a whole. The larger the F statistic, the more useful is the model. If probability (F) < .05, then the model is considered significantly better than would be expected by chance and the null hypothesis of no linear relationship is rejected.

**Table 5.2. Significantly correlated factors to improved critical habitats in no-take zones.**

Dependent Variable: improved critical habitats in no-take zones	Correlation Coefficient (r)	Regression Analysis		
		Standardized Coefficient (Beta)	t	p
Independent Variables:				
<b>Local skills development</b> (standardized)	.540(**)	0.509	3.915	0.000
<b>Involvement in management of local elected politicians</b> (standardized)	.386(**)	0.296	2.276	0.029
Enforcement by community enforcers	.518(**)	~	~	~
Stakeholders' participation in activities	.456(**)	~	~	~
Participatory biophysical assessments	.403(**)	~	~	~
Clarity of MPA / network rules	.394(**)	~	~	~
Trainings in MPA management and leadership development	.322(*)	~	~	~

\*\*Correlation is significant at the .01 level (2-tailed).

\*Correlation is significant at the .05 level (2-tailed).

Regression data: R = .673 R<sup>2</sup> = .453 Adj. R<sup>2</sup> = .424 F = 15.328 p < 0.001 N=40

Another ecological indicator tested was improved marine diversity in no-take zones. Ten variables resulted as significantly correlated to marine diversity (Table 5.3). Many of these variables are associated with law enforcement, a few are related to capacity to manage and participation of stakeholders. These results imply that improved marine diversity requires a combination of management approaches operating together.

Of the ten correlated independent variables, sustainable financing for management and management capacity of MPA / network group / board were identified as the best predictors of improved biodiversity inside no-take zones, as determined by the regression analysis. These variables account for 71% of the variance in marine biodiversity

improvement for this sample, which is very high, indicating a very strong relationship.

Using only correlation analysis, other ecological indicators such as fish size and number of juvenile fish and threatened species, were tested against policy and enforcement factors. Results show that all three are positively correlated with MPA / network rules implementation (Table 5.4). National and local MPA laws and regulations are positively correlated to fish size. This result validates the importance of a good legal framework. Effective management requires that the national and local legal and institutional structures be mutually reinforcing (White et al. 2005). This could facilitate good enforcement of MPA regulations that could bring positive ecological change.

**Table 5.3. Significantly correlated factors to improved marine diversity in no-take zones.**

Dependent Variable: improved marine diversity in no-take zones	Correlation Coefficient (r)	Regression Analysis		
		Standardized Coefficient (Beta)	t	p
Independent Variables:				
<b>Sustainable financing for management</b> (standardized)	.398(**)	0.693	4.052	0.004
<b>Management capacity of MPA network group / board</b> (standardized)	.431(*)	0.499	2.914	0.019
Buffer zone enforcement	.706(**)	~	~	~
Stakeholders' participation in activities	.434(**)	~	~	~
Involvement in management of local elected politicians	.426(**)	~	~	~
MPA / network rules implementation	.395(**)	~	~	~
Management capacity of MPA group/s (in individual MPAs)	.335(*)	~	~	~
Local MPA legislation	.318(*)	~	~	~
Clarity of MPA / network rules	.286(*)	~	~	~
Trainings in MPA management and leadership development	.282(*)	~	~	~

\*\*Correlation is significant at the .01 level (2-tailed).

\*Correlation is significant at the .05 level (2-tailed).

Regression data: R = .875 R<sup>2</sup> = .766 Adj. R<sup>2</sup> = .708 F = 13.119 p < 0.003 N = 11

**Table 5.4. Correlation between ecological indicators and law enforcement factors.**

Results in No-take Zones		National MPA Legislation	Local MPA Legislation	Core Zone Enforcement	Buffer Zone Enforcement	MPA / Network Rules Implementation
<b>Size of fish</b>	Correlation coefficient	.351(*)	.359(*)	.432(**)	0.448	.457(**)
	Sig. (2-tailed)	0.016	0.013	0.002	0.054	0.001
	N	47	47	47	19	49
<b>No. of juvenile fish</b>	Correlation coefficient	0.185	.371(*)	.430(**)	.590(*)	.482(**)
	Sig. (2-tailed)	0.235	0.014	0.004	0.016	0.001
	N	43	43	43	16	45
<b>No. of threatened species</b>	Correlation coefficient	.321(*)	0.235	0.263	.497(*)	.415(**)
	Sig. (2-tailed)	0.026	0.112	0.071	0.026	0.003
	N	48	47	48	20	50

\*\* Correlation is significant at the .01 level (2-tailed).

\* Correlation is significant at the .05 level (2-tailed).

### Correlation among Stakeholders Benefiting from the MPA and Various Management Factors

One way to evaluate MPA effectiveness is to assess the extent to which it is able to provide benefits to target stakeholders. The correlation between stakeholders benefiting from various MPA factors was evaluated. Certain factors were correlated with benefits to stakeholders. Benefits to local fishers were positively correlated with buffer zone implementation and management capacity of network group / board (Table 5.5). This may be due to improved MPA enforcement. Buffer zones often allow only traditional and passive fishing, and limited fishing to local fishers. Thus, enforcement of these policies was seen as beneficial to local fishers. In addition, a functional network group was perceived to mean improved MPA implementation and enforcement due to the collective effort of member MPAs. Good MPA enforcement results in fisheries protection.

The benefit to local government was positively influenced by management capacity of individual MPA groups. This was logical because a competent MPA group could help the local government with community-level implementation.

### Factors that influenced involvement by local fishers and community enforcers

An analysis was conducted to identify the strategies or activities that encourage participation of more stakeholders in management. Results in the correlation analysis suggest that the most effective strategies for multistakeholder participation are: public consultations or community meetings; planning meetings with government; multistakeholder planning workshops; and trainings in MPA management and leadership development. When these



TNC staff document sea turtle nesting on the beach of Sangalaki Island in the Derawan Island chain off East Kalimantan, Indonesia. (Mark Godfrey/TNC)

activities are conducted, the participation of national and local government agencies, local elected politicians, traditional leaders / elders, local fisher leaders, national enforcement agencies, community enforcers and NGOs is expected to increase.

For further analysis, the responses of local fishers and community enforcers were isolated and analyzed. Seven variables were identified as significantly correlated with involvement in management of local fisher leaders. Several of the significant variables are associated with communication strategies such as awareness raising, public consultations and community meetings, feedback of research results to stakeholders, integration of indigenous knowledge, multistakeholder planning workshop and planning meeting with government. Of these independent variables, multistakeholder planning workshop and integration of indigenous knowledge were identified as having a predictive relationship with involvement of local fisher leaders in management (Table 5.6). These



**Table 5.5. Correlation of stakeholders benefiting from MPA implementation and various MPA factors.**

Stakeholders/ Beneficiaries		Management Capacity of MPA Groups (in Individual MPAs)	Management Capacity of Network Group	Activeness of Network Group	National MPA Legislation	Local MPA Legislation	MPA / Network Rules Implementation	Buffer Zone Enforcement	Providing Livelihood Activities
<b>National elected politicians</b>	Correlation coefficient	-0.013	-0.131	0.125	0.07	0.228	0.101	-0.489	0.197
	Sig. (2-tailed)	0.931	0.581	0.6	0.644	0.136	0.519	0.055	0.189
	N	45	20	20	46	44	43	16	46
<b>Local government agencies</b>	Correlation coefficient	.387(**)	0.359	0.03	0.222	0.234	0.147	0.063	0.175
	Sig. (2-tailed)	0.004	0.072	0.884	0.103	0.092	0.298	0.793	0.2
	N	54	26	26	55	53	52	20	55
<b>Local elected politicians</b>	Correlation coefficient	0.126	0.339	.449(*)	0.127	.316(*)	.298(*)	-0.327	0.219
	Sig. (2-tailed)	0.392	0.114	0.031	0.383	0.031	0.044	0.201	0.13
	N	48	23	23	49	47	46	17	49
<b>Traditional leaders / elders</b>	Correlation coefficient	0.194	0.335	.544(**)	0.19	0.311	0.132	0.459	0.287
	Sig. (2-tailed)	0.25	0.088	0.004	0.252	0.058	0.431	0.064	0.076
	N	37	27	26	38	38	38	17	39
<b>Indigenous people</b>	Correlation coefficient	0.179	-0.061	0.232	0.232	0.132	-0.106	0.409	.390(*)
	Sig. (2-tailed)	0.335	0.816	0.386	0.201	0.463	0.584	0.187	0.027
	N	31	17	16	32	33	29	12	32
<b>Local fishers</b>	Correlation coefficient	.007	.437(*)	0.256	0.091	0.228	0.17	.561(*)	0.194
	Sig. (2-tailed)	0.602	0.018	0.189	0.503	0.095	0.213	0.01	0.143
	N	57	29	28	56	55	55	20	58
<b>People's organizations</b>	Correlation coefficient	0.121	0.103	0.088	0.038	0.163	0.259	.500(*)	0.024
	Sig. (2-tailed)	0.399	0.623	0.684	0.794	0.262	0.072	0.049	0.867
	N	51	25	24	50	49	49	16	52
<b>Tourism business</b>	Correlation coefficient	0.094	0.307	.414(*)	.290(*)	.399(**)	.276(*)	0.239	.294(*)
	Sig. (2-tailed)	0.494	0.105	0.029	0.033	0.003	0.045	0.31	0.028
	N	55	29	28	54	53	53	20	56

\*\* Correlation is significant at the .01 level (2-tailed).

\* Correlation is significant at the .05 level (2-tailed).

independent variables account for only 26% of the variance in involvement by local fisher leaders for this sample. This result emphasizes the power of two-way communication as a strategy to gain support. Use of indigenous knowledge is most important in Indonesia and Papua New Guinea.

The enforcement by community enforcers variable was tested with several management strategies. Seven significantly correlated variables were identified. These variables could be grouped in two main themes. One is local capacity building which includes local skills development, trainings in MPA management and leadership development, and participatory biophysical assessments.

The other theme is communication strategies which include public consultations and community meetings, multistakeholder planning workshops, feedback of research results to stakeholders and increased fish catch. Of the seven variables, local skills development, participatory biophysical assessments and increased fish catch have a predictive relationship with enforcement by community enforcers (Table 5.7). These independent variables account for 40% of the variance in enforcement by community enforcers for this sample. As such, these variables, when carried out and observed would, on average, encourage active enforcement by community enforcers.

**Table 5.6. Significantly correlated factors to involvement by local fisher leaders in management.**

Dependent Variable: involvement by local fisher leaders in management	Correlation Coefficient (r)	Regression Analysis		
		Standardized Coefficient (Beta)	t	p
<b>Independent Variables:</b>				
<b>Multistakeholder planning workshops</b> (score standardized)	.360(**)	0.366	3.18	0.002
<b>Integration of indigenous knowledge</b> (score standardized)	.390(**)	0.341	2.965	0.004
Awareness-raising activities	.354(**)	~	~	~
Public consultations / community meetings	.340(**)	~	~	~
Research results feedback to stakeholders	.308(**)	~	~	~
Trainings in MPA management and leadership development	.278(*)	~	~	~
Planning meetings with government	.252(*)	~	~	~

\*\*Correlation is significant at the .01 level (2-tailed).

\*Correlation is significant at the .05 level (2-tailed).

Regression data: R = .537 R<sup>2</sup> = .289 Adj. R<sup>2</sup> = .263 F = 11.157 p < 0.001 N = 58

**Table 5.7. Significantly correlated factors to enforcement by community enforcers.**

Dependent Variable: enforcement by community enforcers	Correlation Coefficient (r)	Regression Analysis		
		Standardized Coefficient (Beta)	t	p
<b>Independent Variables:</b>				
<b>Local skills development</b> (score standardized)	.512(**)	0.265	2.007	0.051
<b>Participatory biophysical assessments</b> (score standardized)	.416(**)	0.332	2.685	0.01
<b>Increased fish catch</b> (score standardized)	.487(**)	0.336	2.675	0.011
Research results feedback to stakeholders	.383(**)	~	~	~
Public consultations / community meetings	.357(**)	~	~	~
Trainings in MPA management and leadership development	.353(**)	~	~	~
Multistakeholder planning workshops	.351(**)	~	~	~

\*\*Correlation is significant at the .01 level (2-tailed).

\*Correlation is significant at the .05 level (2-tailed).

Regression data: R = .665 R<sup>2</sup> = .442 Adj. R<sup>2</sup> = .401 F = 10.821 p < 0.001 N = 45

Without constituency support, rates of compliance will likely be low and achieving long-term conservation goals will even be more dubious or costly. Matching the appropriate management (model) to the context requires at the very least a comprehensive understanding of constituency interests, institutional capacities, economic tradeoffs and legal contexts (Christie et al. 2003).

#### Factors that influenced positive social outcomes

In addition to the ecological benefits of MPAs, another important outcome of implementing MPAs is positive social change. Three social indicators were tested with various management factors to identify those which affect positive change.

Table 5.8 shows that skills development, business opportunities, supplemental / alternative livelihood, outreach programs and sustainable financing for management are positively correlated with increased household income. Additionally, increased community unity and increased community pride are positively correlated to skills development, management capacity of MPA management groups, tourism business opportunities and local political support, while increased community pride is similarly correlated with skills development, capacity development of MPA management group or board, sustainable financing for management, and local and national political support. These strategies are important to note especially if social support is still lacking. Perceived increased economic benefits of management also increase stakeholder support for management (White et al. 2005).



Drying silversides, Komodo National Park, Indonesia. (Alan White)

Increased household income was tested with several social management strategies, and six significantly correlated variables were identified (Table 5.9). Most of these resulting variables could be described as strategies directly addressed to help people’s livelihood and well-being which include opening of business opportunities (both tourism and nontourism-related), provision of supplemental / alternative livelihood programs, local skills development and conducting outreach programs. Of the six variables, opening of tourism business opportunities and local skills development have a predictive relationship with increased household income. These independent variables account for 32% of the variance in increased household income for this sample.

**Table 5.8. Correlation of positive social outcomes and some management strategies.**

Positive Social Outcomes		Skills Development	Capacity Development of Management Group/Board	Opened Tourism Business Opportunities	Opened Nontourism Business Opportunities	Supplemental/ Alternative Livelihood Programs Provided	Outreach Programs Conducted	Sustainable Financing for Management	Extent of Support of Local Politicians	Extent of Support of National Politicians
Increased household income	Correlation coefficient	.345(**)	0.222	.485(**)	.281(*)	.266(*)	.249(*)	.251(*)	0.087	-0.109
	Sig. (2-tailed)	0.004	0.078	0	0.025	0.031	0.049	0.045	0.56	0.47
	N	67	64	65	64	66	63	64	47	46
Increased unity within the community	Correlation coefficient	.456(**)	.249(*)	.250(*)	0.091	0.209	0.149	0.182	.448(**)	0.252
	Sig. (2-tailed)	0	0.032	0.033	0.45	0.076	0.217	0.122	0.001	0.064
	N	76	74	73	72	73	70	74	55	55
Increased community pride	Correlation coefficient	.537(**)	.257(*)	.319(**)	-0.033	.296(*)	-0.038	.241(*)	.489(**)	.379(**)
	Sig. (2-tailed)	0	0.028	0.006	0.787	0.012	0.756	0.04	0	0.005
	N	75	73	72	71	72	69	73	54	54

\*\* Correlation is significant at the .01 level (2-tailed).

\* Correlation is significant at the .05 level (2-tailed).

**Table 5.9. Significantly correlated factors to increased household income.**

Independent Variables:	Correlation Coefficient (r)	Regression Analysis		
		Standardized Coefficient (Beta)	t	p
Dependent Variable: increased household income				
Opened tourism business opportunities (score standardized)	.485(**)	0.463	4.137	0.000
Local skills development (score standardized)	.345(**)	0.275	2.459	0.017
Sustainable financing for management	.251(*)	~	~	~
Opened nontourism business opportunities	.281(*)	~	~	~
Supplemental / alternative livelihood programs provided	.266(*)	~	~	~
Outreach programs conducted	.249(*)	~	~	~

\*\*Correlation is significant at the .01 level (2-tailed).

\*Correlation is significant at the .05 level (2-tailed).

Regression data: R = .587 R<sup>2</sup> = .344 Adj. R<sup>2</sup> = .321 F = 14.452 p < 0.001 N = 58





In Derawan Fishing Village, East Kalimantan, the involvement of local fishers and their communities in the management of MPA networks is vital to success. The results of the survey show that local fishers' involvement came out lower than that of other stakeholders. (WWF-TNC Joint Program Berau)

## Summary

Although the analysis of the survey is based on a relatively small set of data, the results suggest that there are key themes that are very important to ensure MPA and MPA network effectiveness. These results hinge on a perception from different respondents, so results are related to the number and type of respondents. The social aspects are significantly related to management effectiveness while science-based factors are seen to affect social and governance aspects that influence management effectiveness. This result is logical in that while science has weighed in to ensure relatively good designs for MPAs, observed ecological change encourages social support and guides governance systems to achieve MPA success. Some highly significant ( $p < 0.01$ ) variables were found to be related to the various hypotheses presented.

The results show that some of the factors highlighted are important for long-term success of the MPA and / or network. These factors are increased household income and increased fish catch around the MPA, which are at the core of why local stakeholders get involved in MPA networks. The results from the analyses verify that the social aspects of MPA management are critical to the MPAs' success, and there is a correlation between increasing benefits to stakeholders and MPA management improvement in all three country contexts.

Some of the significant factors may be useful in designing and implementing MPAs and MPA networks in the future. The important correlations from this chapter are integrated into and discussed further in chapter 7's best practices of MPA networks section.

# CHAPTER 6

## Results of the Workshops Conducted under the MPA Learning Partnership

### Introduction

This chapter summarizes the results of two workshops that were conducted as part of the Marine Protected Area Networks Learning Partnership (MPA Learning Partnership) and identifies the strategies needed to move MPA networks forward both in the Coral Triangle region and globally as a whole.

The first workshop was held in Tagaytay, Philippines, on 21-23 May 2008, with 45 participants, representing different MPAs and networks. The purpose of the workshop was to share the preliminary results of the field survey among the learning group members, experts and partners in the region; and to discuss and validate the results. Case studies of the MPA Learning Partnership study sites, as well as several other sites not covered in the study, were presented to better understand the design and implementation of MPA networks in the region.



Participants brainstorming in the Florida workshop to refine results from the Tagaytay workshop. (Stuart Green)

The second workshop, participated in by 25 scientists and managers of MPA networks, was held at the end of the 11th International Coral Reef Symposium in Florida, USA, on 12 July 2008. This workshop was designed to discuss the priorities, challenges and next steps on MPA networks.

During the two workshops, priority management strategies and gaps and challenges for MPA networks under the themes of: (1) science and ecology; (2) social resilience, institutional arrangements and governance; and (3) sustainable finance were discussed. Focused discussions and small workshops were conducted to elicit diverse opinions and experience of participants.

## Analysis of Science and Ecological Strategies in MPA Networks

In MPA networks, there is a need to better understand how the different systems and species are interacting within the different zones and boundaries. At the Philippine workshop, a brief presentation of the current state of knowledge of science and ecological strategies in MPA network planning was presented by Luz Baskiñas of the WWF Philippines which was based on a literature review of the topic. There is considerably robust literature on the scientific and ecological considerations for MPA networks (see Table 6.1).

**Table 6.1. Scientific and ecological criteria for MPA networks (modified from Roberts 2003).**

1. Biogeographic representation
2. Habitat representation and heterogeneity
3. Human threats
4. Natural catastrophes
5. Size (export functions, viability, management)
6. Connectivity
7. Vulnerable habitats
8. Vulnerable life stages
9. Species or populations of special concern
10. Exploitable species
11. Ecosystem linkages
12. Ecological services for humans
13. Ecosystem services
14. Adjacency of terrestrial managed areas
15. Disturbance

Based on presentations and discussions on MPA networks, participants were asked to identify the most critical ecological and scientific strategies and the gaps and challenges for each. The five broad categories of strategies included (Table 6.2): (1) resource assessments; (2) threats / impacts assessments; (3) monitoring; (4) MPA planning and design; and (5) understanding and applying connectivity science.

At the Florida workshop, participants reviewed the outputs of the Tagaytay workshop and recognized two recurring themes in the strategies and gaps identified above:

1. **Scientific information that would be good to have when planning an MPA network** – The main strategies for MPA networks and individual MPAs are similar, but some need to be implemented differently (especially connectivity, planning and monitoring). For similar strategies, the guiding principles help to inform and facilitate the science to address the goals of the MPA network. These principles then assist in informing the planning process (to ensure that the science doesn't hold back the early implementation of the MPA network). Throughout this process, there is a need to involve and network local managers (who interact with local stakeholders) and, where

available, scientific institutions and marine labs for validation of the scientific strategies.

2. **Organize the science to meet the needs of the different scales for MPA networks** – The group agreed that MPA network implementation changes the way and the scale that science is gathered compared to single MPAs. Ideally, there is a large amount of information gathered and available for the development of MPA, and therefore information should be very well organized and prioritized. Rules of thumb for implementation are essential as are clear objectives and goals for the MPA network establishment and implementation.

The group identified the following strategies that need to be addressed in MPA networks, and a mechanism, such as the Learning Partnership, to examine these in more detail:

- ◆ Define clear, scientific and measurable objectives that are agreed upon by all stakeholders (at the various scales required).
- ◆ Have more systematic assessment of threats (environmental impact assessment), tools and strategic ecological assessments within the networks.
- ◆ Conduct resilience monitoring.
- ◆ Respond to threats not addressed in MPAs (such as oil spills, large disturbances).
- ◆ Prioritize impacts / stakeholders outside MPAs (e.g., chemical pollution, large commercial fishing fleets and increasing prices on the world markets).

## Analysis of Social Resilience, Institutional Arrangements and Governance

At the Tagatay workshop, there was a brief presentation on the current state of knowledge of social resilience, institutional arrangements and governance which drew from the assessment of social resilience conducted in the first part of the MPA Learning Partnership Project, and from related concepts and contexts from published literature, field site documentations and other sources. The literature review included research on such current knowledge as applied to MPAs and MPA networks. Below are highlights of the review presented by Dr. Giselle Samonte-Tan:

- ◆ Most challenges to MPA implementation are social.
- ◆ The community needs to be resilient and to coexist with the ecosystem, not suffer from bad practices.
- ◆ Social resilience is the ability of the community to deal with change, through learning, reorganizing, self-organizing and combining knowledge.
- ◆ It's important to recognize diversity of communities and be flexible. Adaptive management and evaluation of actions are needed.

The resource person shared several frameworks, including Figure 6.1, for the assessment of social resilience.



**Table 6.2. Ecology-based science strategies and challenges as identified in MPA Learning Partnership Project Workshops.**

Strategies	Gaps and Challenges
<i>Resource assessments</i>	
<ul style="list-style-type: none"> <li>- Assess fisheries, habitats, focal species, spawning aggregation sites, etc.</li> <li>- Couple scientific research with traditional knowledge.</li> </ul>	<ul style="list-style-type: none"> <li>- Understanding the habitat associations of key ecological commercial species</li> <li>- Communicating information to the ground / community level</li> <li>- Balancing social and natural sciences during implementation</li> <li>- Funding limitations to achieve ambitious research objectives</li> </ul>
<i>Threats/impacts assessment</i>	
<ul style="list-style-type: none"> <li>- Human disturbances</li> <li>- Natural disturbances</li> <li>- Disturbance vulnerability and how to integrate resilience into MPA planning</li> </ul>	<ul style="list-style-type: none"> <li>- More sharing of lessons from past projects</li> <li>- More evaluation of the resilience of ecosystems, communities and livelihoods</li> <li>- How to identify critical information needed for adaptive management</li> </ul>
<i>Monitoring</i>	
<ul style="list-style-type: none"> <li>- Conduct regular biophysical (fish, corals, seagrass, seabirds, etc.) and social (marine resource uses and benefits) monitoring.</li> <li>- Establish a set of indicators to see temporal changes in habitats / species.</li> <li>- Use a protocol that is simple yet adaptive.</li> <li>- Ensure data are shared and used for management (and not just collected for their sake).</li> </ul>	<ul style="list-style-type: none"> <li>- Monitoring is often expensive and complicated</li> <li>- How to identify indicators that are usable</li> <li>- Prioritization of what is important in assessment surveys / monitoring</li> <li>- Capacity of human resources at national and local government levels</li> <li>- More user-friendly scientific tools to engage many stakeholders</li> <li>- Establishment of long-term monitoring designs</li> </ul>
<i>MPA planning and design</i>	
<ul style="list-style-type: none"> <li>- Use ecological planning tools such as MARXAN in the design process.</li> <li>- Develop criteria for MPA networks design.</li> <li>- Consider climate change adaptations into the MPA design.</li> </ul>	<ul style="list-style-type: none"> <li>- MARXAN and other planning tools are often quite complex and difficult to communicate with stakeholders</li> <li>- What to look for when designing for climate change and how to implement climate change adaptation strategies in the MPA design</li> <li>- How to implement adaptive management mechanisms</li> <li>- How to develop “open and closed season” designs and implement them at a local level</li> <li>- Political will from the government</li> </ul>
<i>Understanding and incorporating connectivity science</i>	
<ul style="list-style-type: none"> <li>- Based on genetics, habitats, oceanography, species-specific life histories, larval dispersal, resilience, adaptation to climate change</li> <li>- Watershed-based and land-marine interactions</li> </ul>	<ul style="list-style-type: none"> <li>- Lack of research capacity (skills and funds)</li> <li>- Lack of application of scientific findings (often not feasible and not practical)</li> </ul>

Based on the presentation and previous discussions on MPA networks, the workshop participants identified strategies and corresponding challenges / gaps for social resilience, institutional arrangements and governance aspects (Table 6.3). The themes covered were: (1) community participation; (2) research and situational analysis; (3) governance and institutional arrangements; and (4) crosscutting themes.

Participants in the Florida workshop identified four key themes to expand upon within the Coral Triangle countries.

1. Education and outreach

- Use global venues for education and outreach to provide the opportunity for global exchanges of MPA network / partners.
- Develop regional chapters of MPA practitioners to distill ideas / concepts to a manageable and affordable scale.
- Develop a communication strategy for education and awareness strategy, which the MPA Learning

Partnership Project can coordinate through common audiences and common venues.

- Use the Internet to facilitate regular global and regional exchanges among practitioners.

2. Governance

- Create a link between the MPA Learning Partnership and the Coral Triangle Initiative Secretariat to share the experiences and lessons of the group.
- Establish a coordination body to undertake partnership initiatives.

3. Capacity building

- Channel capacity building through universities. This may be a way to help institutionalize the MPA manager certification programs for CTI.

4. Human interaction

- Map the trade of endangered species within the Coral Triangle region from the supply countries to the demand countries (Europe, North America, Asia, etc.)

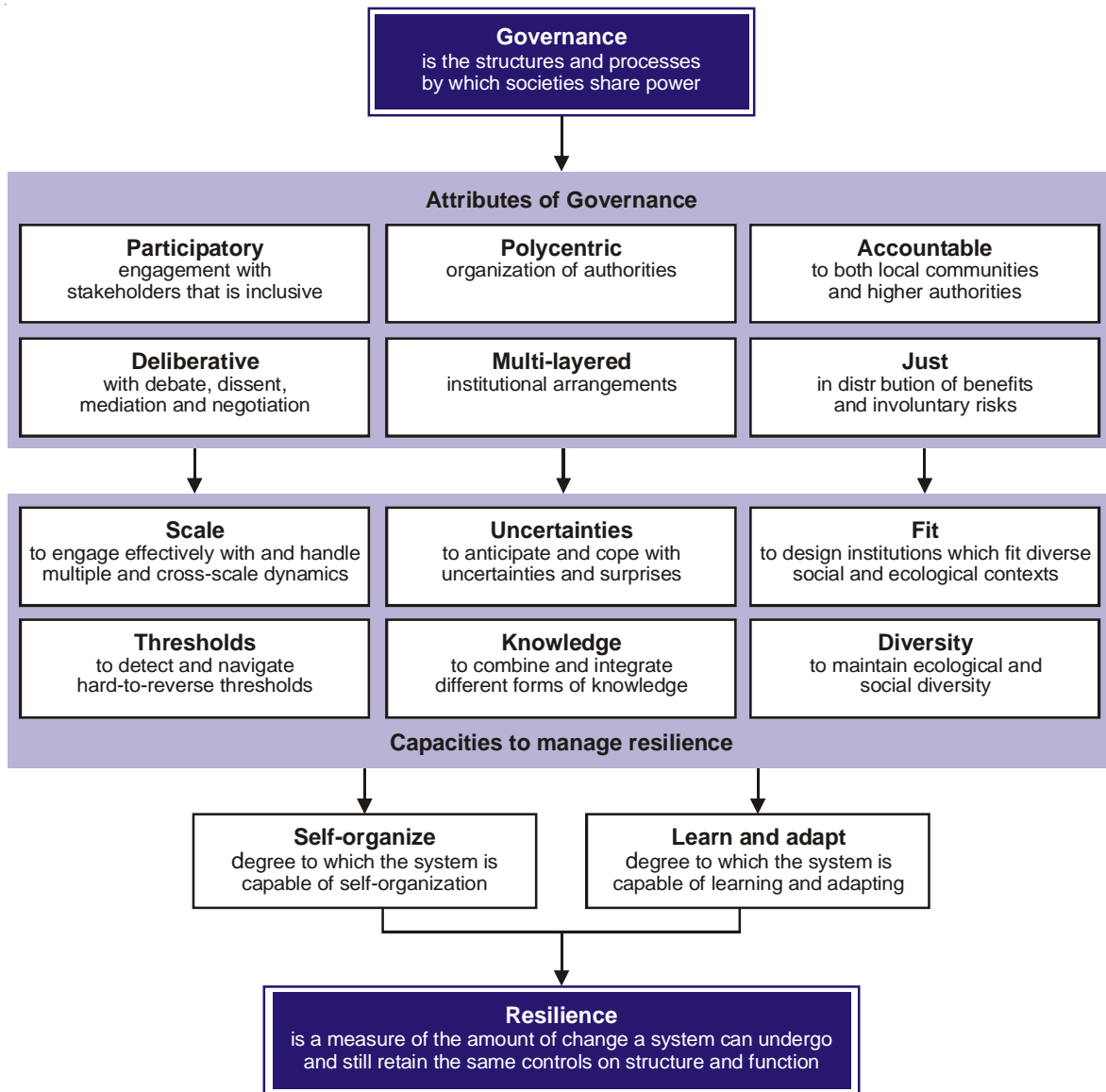


Figure 6.1. Associations among selected attributes of governance and the capacity to manage resilience (Lebel et al. 2006).

**Social resilience** – the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental changes (Adger 2000).

**Institutional arrangements** – composite of laws, customs and organizations, and management strategies established by society to allocate scarce resources and competing values (Sorensen and McCreary 1990).

**Governance** – consists of policies, strategies, institutional arrangements, legislation, information and education, financing mechanisms and capacity development. It involves the delineation of roles and responsibilities of the various agencies and stakeholder groups involved in management (Figure 6.1).

**Table 6.3. Social resilience strategies and challenges in MPA networks.**

Strategies	Challenges/Gaps
<i>Overarching and crosscutting</i>	
<ul style="list-style-type: none"> <li>- Ensure consistent communication and dissemination of information to all parties involved.</li> <li>- Ensure feedback mechanisms.</li> <li>- Educate the electorate in choosing the right leader.</li> <li>- Build capacity and constituency.</li> <li>- Have effective communication between governments and nongovernment organizations (NGOs) in the light of sustaining interest in and support for MPAs.</li> </ul>	<ul style="list-style-type: none"> <li>- Weak economic situation limits capacity of communities to adapt.</li> <li>- Negative perception that MPAs benefit NGOs more than other sectors</li> <li>- Sustainable financing mechanisms for MPA network</li> <li>- Lack of economic options and successful alternative livelihoods</li> <li>- Occupational mobility is reduced by children working, instead of going to school.</li> </ul>
<i>Community participation</i>	
<ul style="list-style-type: none"> <li>- Identify local conservation “champions”.</li> <li>- Actively involve academia in all phases.</li> <li>- Identify community structure and traditional rights.</li> <li>- Delineate clear division of roles and responsibilities among participating groups.</li> <li>- Involve multistakeholders (when appropriate).</li> <li>- Ensure constant communication and community awareness that includes consultation, feedback mechanisms and dissemination of information to all involved.</li> <li>- Effectively promote MPA by showing its benefits to community and government.</li> </ul>	<ul style="list-style-type: none"> <li>- Changes in and fast turnover of political leadership</li> <li>- How to disseminate examples of good leadership and showcase success</li> <li>- Poverty of fishery communities contributes to their inability to accept MPAs.</li> <li>- Personalities can impede conservation work (particularly in small governance systems).</li> <li>- Ways for community collaboration in the management</li> </ul>
<i>Research and situational analysis</i>	
<ul style="list-style-type: none"> <li>- Identify resource use patterns and trade patterns.</li> <li>- Consider that all assisting parties are not permanent (some groups / NGOs will finish their work and leave).</li> <li>- Realize that participatory and nonparticipatory methods can each have a role.</li> <li>- Emphasize need for valuation studies (increased awareness to guide management decisions).</li> <li>- Document MPA planning, designing and establishment processes to capture lessons learned.</li> <li>- Do scenario planning using available tools.</li> <li>- Adopt customary rules and regulations.</li> </ul>	<ul style="list-style-type: none"> <li>- Insufficient use of traditional knowledge of MPA planning</li> <li>- Lack of MPA case studies to derive lessons from</li> <li>- Use of traditional approaches to management</li> <li>- Lack of integration of local religions and cultural practices</li> <li>- Understanding, working in areas with high cultural diversity</li> <li>- Considering cultural norms that may undermine enforcement</li> </ul>
<i>Governance / institutional arrangements</i>	
<ul style="list-style-type: none"> <li>- Have flexibility in designing the institutional arrangements for managing MPAs.</li> <li>- Develop interagency collaboration to handle implementation challenges and issues.</li> <li>- Develop upward and downward accountability and transparency.</li> <li>- Foster bridges between local government and local communities.</li> <li>- Overlay institutional networks on MPA networks.</li> <li>- Develop a mechanism for bringing forward the MPA work in case of change in leadership.</li> <li>- Use existing institutions or community structures (e.g., traditional leadership).</li> <li>- Develop legislation that supports / enables networking.</li> </ul>	<ul style="list-style-type: none"> <li>- Weak institutions with a lack of awareness, funding and capacity</li> <li>- Lack of coordination and mechanisms among various levels of government and often confusion on roles and responsibilities of agencies</li> <li>- Lack of investment in understanding governance</li> <li>- Lack of social networks</li> <li>- Weak law enforcement</li> <li>- How to develop institutional mechanisms that allow for local coordination with higher governance levels and institutions</li> <li>- Potential conflict of interest among single MPAs</li> <li>- Lack of empowerment for MPA constituents</li> </ul>



## Analysis of Sustainable Finance Strategies

**"MPA financial sustainability can be defined as the ability to secure sufficient, stable and long-term financial resources, and to allocate them in a timely manner and in an appropriate form, to cover the full costs of MPAs and to ensure that MPAs are managed effectively and efficiently with respect to conservation and other objectives."**

- Emerton et al. (2006)

For this session at the Tagatay workshop, a presentation of current knowledge of sustainable financing was made by John Claussen of CCIF. It was noted that establishing successful networks of MPAs requires an understanding of three important sets of parameters: the biophysical and scientific; the cultural and policy; and the operational and financial requirements necessary to achieve the objectives of the network. The MPA Learning Partnership process included looking at the state of financing across the networks.

Understanding financial sustainability first requires agreeing on a common definition. For MPAs it is about more than money; it involves optimal designs of MPA management plans and mobilizing and managing funds to address and achieve objectives. Fund raising is a means to an end, not an end in itself. In addition, sustainability requires funds be managed and administered in a way that promotes cost efficiency and management effectiveness, long-term planning and security, and provides incentives and opportunities for managers to generate and retain funds at MPA level.

Integrating finance into MPA management planning, and ensuring human capacity to use financial tools, is a key requirement for improving sustainability (see Figure 6.2). As such, understanding and building the financial and business planning capacity necessary to succeed is essential within MPAs and across networks.



A presentation during the workshop in Tagatay. (Anna Meneses)

Based on the "Sustainable financing of MPA networks" presentation, and the discussions on MPA networks, participants were asked to identify the issues most critical to effectively and sustainably finance MPAs and to identify gaps and challenges for each (Table 6.4). Participants generally recognized that current MPA finance mechanisms fall within three main sources: (1) partnerships / donors; (2) user fees (including payment for ecosystem services); and (3) government. Within these three categories, participants identified several specific mechanisms for addressing sustainable financing (Table 6.5).

In addition, based upon the current sources of financial support, participants discussed other financing interventions to improve the success of MPA network planning, implementation and evaluation (Table 6.6). Strategies that were identified include: financial portfolio diversification, mobilization of private sector, and incorporation of sustainable financial strategies at the start of the MPA planning process.

MPAs will only function as conservation tools if they are designed and managed effectively and financed in perpetuity. The fact is that most MPAs have little self-generated funds, and therefore securing long-term investments is required for success. It was clear to the participants that effectively managing and financing functional MPAs and networks require understanding all aspects of MPA management in detail, and the costs associated with them. Similarly, securing long-term financing commitments requires that these management

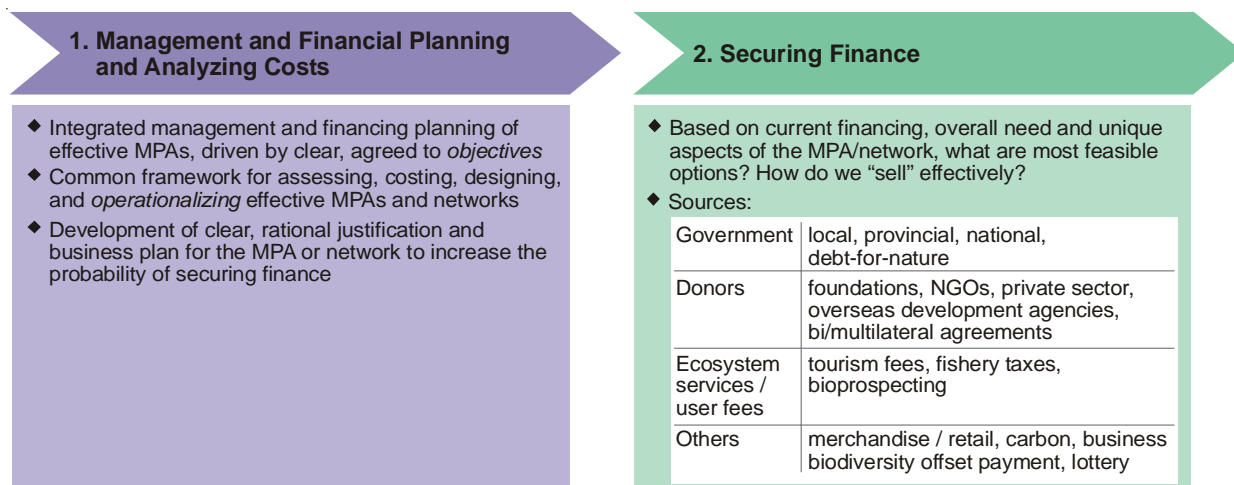


Figure 6.2. CCIF model / approach for sustainable finance.

costs be clearly documented and communicated to funders. It is critical that a rational business framework be used to determine these costs and that sustainable financial planning is effectively integrated with MPA management planning.

The Florida workshop participants also gave the following strategies to supplement those identified at the Tagaytay workshop:

- ◆ Develop a long-term approach to business planning (>10-year plans).
- ◆ Use a business framework to articulate conservation agenda (issue, needs, strategies) for communication to stakeholders (including funders / investors).
- ◆ Acknowledge the importance of finance in any organization managing MPAs and networks.
- ◆ Focus sustainable finance programs on true needs of local management and source funds locally first before exploring external options.
- ◆ Link business plan with management needs.
- ◆ Compensate losers and use revenues locally (to reduce leakage).
- ◆ Include finance people (and not just ecologists) in the management team of the MPA network.

**Table 6.4. Key gaps and challenges to effectively integrate financial planning into management.**

Valuation of resources is important. There is little capacity to conduct such valuations.
Understanding microcredit / finance opportunities to improve livelihoods and reduce costs associated with MPA management
Identification of implementation and recurring costs of MPA management
National policy on MPAs does not ensure flow of funds to MPA management. National funds can be delayed and hence, interrupt the flow of finances to MPA management.
Systems to collect and manage MPA visitor fees are difficult to design and can be controversial.
There is inadequate capacity to formulate business/financial plans.
Management objectives are often not prioritized to develop a realistic / suitable financial plan.
It is difficult to capture user fees from the private sector to fund local MPA management.
Institutionalization of various responsibilities for MPA management (e.g., local government, environmental agencies, enforcement agencies, etc.)
Initial activities of MPA are often covered by external, short-term projects which do not address the financial sustainability / management of MPA.
Financial strategies are often a low priority in relation to other management functions and / or activities.
Oftentimes, the funds for MPA are donor-driven, which can result in lack of funding source to less attractive sites.
Funding requirements depend on the success or failure of management, and there is often pressure to focus activities on those areas that have (high) monetary value.
Financial planning is a detailed activity that takes a great amount of time and effort to facilitate in multisectoral / participatory manner.

**Table 6.5. Current sources and mechanisms of finance for MPAs.**

<i>Partnerships / donors</i>
- Private sector / public-private
- Collaboration with universities for monitoring and research
- NGOs
- Mechanisms for stakeholders to share cost of MPA management
- Fishery cooperative (financing through revolving funds)
- Community-labor-time counterparts
- Bilateral (e.g., United States Agency for International Development) and multilateral (e.g., Asian Development Bank, Global Environment Facility, World Bank) agreements
- Private foundations
<i>User fees</i>
- User and license fees
- Development of tourism-based activities that will generate funds from access fees
- Lease fees
- Fines and penalties
<i>Government</i>
- Government (local and national) in-kind contributions for community and LGU
- National government financial allotment

**Table 6.6. Strategies to strengthen financing for MPAs / networks.**

<i>Incorporate financial sustainability plans at the start of planning process.</i>
- Build capacity for financial planning.
- Create fiscal / MPA management plan.
- Incorporate financial sustainability plans at the start of project planning.
<i>Use user fees to meet management expenses.</i>
- Link fees generated to specific issues.
<i>Conduct valuation studies.</i>
- Build capacity.
- Integrate results into management planning and policies.
<i>Diversify sources of fund. A diverse portfolio could include funding from:</i>
- private individuals,
- business sector,
- payment for environmental services and
- environmental taxes.
<i>Ensure appropriate use of funds.</i>
- Ensure flow of funds to directly support MPA management.
- Develop more cost-efficient management plans integrated with community-based management plans.
<i>Leverage fund.</i>
- Fund leveraging as a network (e.g., locally managed marine areas).
- Leverage funds from matching grants.
<i>Improve MPA governance.</i>
- Use national government policy to support MPA establishment and management.
<i>Develop partnership with the private sector.</i>
- Adopt a reef program.
- Use incentive sponsorship.



Tagaytay workshop participants. (TNC)

## Summary

The workshops and technical advisers addressed some key strategies and gaps under the three themes of science and ecology: social resilience, institutional arrangements, and governance and sustainable financing. The discussions also facilitated other questions to be addressed in the near future as the use of MPA networks as a conservation and management strategy increases. Workshop participants saw the need for more venues where experiences in developing MPA networks as a management tool may be shared.



Idea cards presented during the workshop in Tagaytay. (Anna Meneses)



# CHAPTER 7

## A Framework of Best Practices in Marine Protected Area Networks

### Introduction

This chapter consolidates the different lessons learned from the MPA Learning Partnership Project study sites. At the inception of the project, the main goal was to increase collaborative lesson sharing among major conservation organizations that are working towards scaling up efforts from site to system or network level. One of the main objectives of the Learning Partnership was to identify types of networks and best practices. This chapter examines the scaling up process and aims to keep the guidance simple and not too prescriptive.



TNC staff talking to Baekakea Community School children about the benefits of the Kimbe Bay MPA network, Bialla, West New Britain. (Freda Paiva)

### Types of MPA Networks

There has been a great deal of discussion on how individual MPAs can scale up to MPA networks. The scope of networking depends on existing resources, such as:

- ◆ technical knowledge among planners and those guiding implementation;
- ◆ overall management capacity and strengths of people involved;
- ◆ available funds for operations; and
- ◆ countries' history, policies and plans in relation to marine management, including traditional management.

The MPAs visited were consistent with two basic approaches to MPAs. The first adheres to the classic definition of the “park” model for MPA establishment, whereby a government agency declares an area off limits for some or all activities. The second is the “community-based” model, whereby coastal communities assume many of the responsibilities for implementing, monitoring and enforcing rules for the protection of marine areas (White et al. 1994; Christie et al. 2003).

The Kimbe Bay network is a hybrid of both approaches, having identified large areas, while working with the community to develop localized management systems within the priority areas of interest. The Southeast Cebu is composed of a collection of community-based projects that have made a genuine effort to combine their resources to work towards efficiencies of scale in coastal law enforcement and policy at the municipal “cluster” level. Conversely, Tubbataha has no local community representatives within the park boundaries, making management easier. However, links with historical resource users from nearby Cagayancillo Islands are still maintained and a portion of the parks revenue is shared between the park and the Cagayancillo government.

During the MPA Learning Partnership, three main types of MPA networks were observed:

1. Scientifically planned MPA networks for which basic fisheries and habitat data are collected and criteria are set whereby scientists and stakeholders are consulted on the best “fit” to achieve specific objectives, and management is implemented by a park authority
2. Social MPA networks of managers and implementers who work together and share experiences among each other as a peer group to improve management practices
3. MPA management networks where smaller community MPAs work together to share resources and resolve common problems in adjacent geographic areas.

The focus of networking is often driven by existing local management priorities and concerns. In the WCPA-IUCN (2008) publication on best practices in establishing MPA networks, the following were identified:

1. clearly defined goals and objectives;
2. presence of legal authority and long-term political commitment;
3. incorporation of stakeholders;
4. use of best available science and precautionary approach;
5. in context of integrated management frameworks; and
6. use of adaptive management measures.

## Good Practices of MPA Networks

*“What is the right tactic for implementation? What is the best workplan in reference to design?”*

- assisting nongovernment organizations (NGOs)

MPA networks are still a relatively new endeavor. There is no prescribed “roadmap” to follow, and each location, country and region is unique. Throughout the field visits and survey, many best practices were observed, which when combined with the results of the survey, help build a framework. These practices can also be applied to MPAs that are not necessarily part of a network. This section is based on the premise that individual MPAs need to be effectively managed before they can be scaled up to a network. Best practices, therefore, apply to both MPAs and MPA networks.

The following sections discuss the different phases of MPA network establishment: design and planning, implementation, monitoring and evaluation, social MPA networks, and national and international policy best practices. The sections include quotes from the survey (as available) followed by possible management activities or guidelines based on analysis of data, as well as team and workshop suggestions and observations.

### Design and Planning Phase

#### Involve stakeholders

*“It is better when there is a two-way communication with the community rather than just merely informing it of changes or new policies. Communities (the resource users) should be consulted and made aware of the planned network design during the planning stage and not after the design has been completed.”*

- main fishers' association officer (similar opinion shared by assisting NGO and dive resort operator)

There will often be opposition to MPA networks, and this opposition has to be responded to and considered in the design in a manner that demonstrates that such resistance is taken seriously. MPAs mean change and humans generally resist change that disrupts the status quo, unless they have an interest and full understanding of it. Economic sectors may be affected by MPAs, and sometimes livelihoods that have been active through generations are affected by the declaration of an MPA. Stakeholders will tend to fight hard to ensure their livelihoods and incomes are not lost, even if the livelihood activity is declared as illegal (e.g., turtle collection, muro-ami fishing, live reef fish collection, etc.).

#### *Guidelines and rules of thumb*

- ♦ Ideally as many individuals as possible should be consulted during the design phase before legal declaration.

- ◆ Stakeholders will sometimes oppose an MPA because they are not well-informed. They can be vocal and potentially active opponents to an MPA once established.
- ◆ The foundations of the MPA are often good rationale for its existence and to raise awareness.
- ◆ Participation level can be viewed as a scale from simply sharing information (lowest) to consultation, joint decision making, and working together and self-determination (highest). As MPA networks develop, the level of participation should increase incrementally, as appropriate to the site.
- ◆ Small groups of very vocal opposing stakeholders could stall MPA implementation. It is best to interact with such groups initially but if their attitude remains to be a problem, it may be best to target further work with this group. If there is resistance, even after educational programs, practitioners need to be prepared to admit that MPAs may not be appropriate in that context.
- ◆ Involve local politicians and private sector representatives at the beginning for support and to help bring public interest on MPA.
- ◆ Make different managers and stakeholders the champions of MPA. Ensure second liners and facilitators stay neutral, and be aware that there is a high turnover rate of political appointments.

### Consider secondary stakeholders

**"Involve more stakeholders (women, youth, religious groups, resort owners, tourism operators even the illegal fishers in the planning process)."**

- assisting NGO, government staff, park management and private sector representatives



Community members in West New Britain participating in the community-based planning process for the proposed AOI. (Freda Paiva)

### Guidelines and rules of thumb

- ◆ MPAs affect not only fishers and government officials. Other marine resource users should also be consulted or informed or engaged in the planning process.
- ◆ Groups with access to, or jurisdiction over, mineral resources and oil and gas should also be consulted.

- ◆ Governments have many departments and agencies, so it is important to interact with multiple departments at local, regional and national levels and not just rely on one or two departments.
- ◆ Marginalized groups, such as women, youth and the poor, play a special role in resource management and development processes and require special attention given their social position.

### Conduct resource assessment prior to establishment

**"Conduct the preparatory process slowly to avoid missing out important criteria. Social acceptance is the primordial consideration. A more comprehensive public consultation process is needed. Conservation awareness workshops and trainings need to be conducted to get a higher level of awareness before initiating the planning process."**

- main assisting NGO and local government

### Guidelines and rules of thumb

- ◆ Collect resource assessment data for key ecological areas within an MPA or network.
- ◆ Include local resource users and managers in the collection of the data as possible.
- ◆ Validate the data with local resource users and stakeholders.
- ◆ Publish and widely disseminate the resource assessment data in local languages.
- ◆ Produce a resource or coastal environmental profile for education and awareness purposes.

### Use rules of thumb for the science

**"Planning and designing MPA networks with scientists only is a lot easier and better. In discussions of local stakeholders and scientists, it can be a little disheartening for locals to hear that the scientists haven't got the science down to a tee yet."**

- assisting NGO

### Guidelines and rules of thumb

- ◆ Make sure that the science is the best available, and agreement has been reached among the scientists before working with the local stakeholders.
- ◆ Science may be lacking or incomplete, thus, use rules of thumb and refine as the work progresses.
- ◆ Focus scientific research on management issues and problems, and ensure results lead to management responses.
- ◆ Indigenous knowledge combined with science gives a strong basis for planning.

### Establish a management council during the design phase

**"Government agencies and departments should have common goals and direction which are needed for better coordination."**

- assisting NGO



**Guidelines and rules of thumb**

- ◆ Conduct multistakeholder planning workshops as they can be one of the most potent implementation strategies.
- ◆ Create an ad-hoc management committee as the building block for a management council during the design phase, even if it is just a technical working group.
- ◆ The ad-hoc committee can facilitate the consultation process and take ownership of the planning process. This will help considerably at later stages and identify leaders and champions of the MPA network early in the process.
- ◆ Include different government, civil society and nongovernment members in the management council. This will ensure that policy overlaps and jurisdictional issues will quickly begin to dissolve.
- ◆ Financial support from all sectors, in cash or kind, should be encouraged from the planning phase.
- ◆ Involve traditional leaders and elders, police and law enforcers in management to provide practical insights regarding field implementation for planning considerations.

**Evaluate availability of long-term financing prior to MPA establishment**

**"(Because of lack of funds for operations), there should be a sustainable financing plan."**

- main assisting NGO, municipality / district government  
and provincial government

In all of the sites visited, it was clear that they are underfunded given the job being undertaken and the large geographical areas covered. There is a need for significantly more funding if MPA networks are going to succeed. Reaching the international goals for MPA networks within the next ten years is a huge task. It will not be possible without at least a large increase in investment and considerably more capacity within the implementing bodies and governments. If available funding is only modest, progress can be made as long as goals are realistic.

**Guidelines and rules of thumb**

- ◆ Financing considerations should be included during the planning phase and not just as an afterthought.
- ◆ Management objectives of the MPA should be matched with the amount of funding that is realistically available and within the time span of that funding.
- ◆ Develop cofinancing and leverage funds from the beginning and ensure all sectors are investing from MPA inception.
- ◆ Set realistic goals for the MPA network (be a little ambitious, but realistic).



Fish landing area on the edges of Wakatobi. (Stuart Green)

**Balance conservation and socioeconomic development**

**"There is difficulty in finding a balance between development and conservation."**

- provincial government

- ◆ MPAs should not only focus on biodiversity conservation but be balanced with socioeconomic development because a strong (resilient) community is needed to support the ecological goals of the MPA. Ecological and social investments need to be balanced.
- ◆ Develop skills at the local level where management takes place. Conduct trainings in MPA management and leadership development.
- ◆ Develop mechanisms to facilitate equitable sharing of MPA benefits.
- ◆ Create monitoring mechanisms to ensure that socioeconomic and governance information is collected on a regular basis and fed back to decisionmakers and resource users.

**Develop alternative livelihood and skills**

**"There should be an improved assessment of actual community needs to develop the appropriate alternative livelihood as opposed to top-down projects that are not very helpful."**

- main assisting NGO, municipality / district government  
and local NGO

**Guidelines and rules of thumb**

- ◆ False expectations that the MPA will lead to increased livelihood opportunities should be avoided. If livelihood expectations are not met, this will have impacts on the management of the MPA.
- ◆ In developing an alternative livelihood program, the intrinsic culture, talent and interest of the community should be considered.
- ◆ Livelihood programs should be carried out by experienced businesspersons and not be limited to just free handouts.

- ◆ MPAs do not directly equate to increased tourism. Factors such as the comparative quality of the resources, safety and security, and access to tourism-generating markets, are critical to successful tourism / livelihood programs. An assessment of tourism potential is required before formulating a tourism plan and investment needs.
- ◆ Increased tourism also does not necessarily equate to increased local incomes of those stakeholders directly affected by the MPA. Plans and commitment to ensure equitable distribution of benefits are important.
- ◆ Develop capacity of the community to provide services for tourism-related activities (e.g., service industries, tour guiding, boat services, food, etc.).
- ◆ Consider nontourism business opportunities related to the MPA establishment (e.g., MPA members given business opportunities, like employment as law enforcement personnel, food processing, etc.).
- ◆ User fee system needs to be planned and implemented well. When managed carefully, it will be able to cover some of the management costs.
- ◆ Other programs that assist with education, health and other priorities of communities are effective.

### MPA Implementation Phase

"The planning part is the easy bit, the implementation part is hard."

- main assisting NGO

### Policy and social arrangements

"It is quite difficult to put places under certain management regimes as per an ideal scientifically based plan, when you need to consider social and economic considerations of people living in the area."

- main assisting NGO

#### *Guidelines and rules of thumb*

- ◆ Assess biological, social and management effectiveness information in a balanced and integrated manner.
- ◆ Ensure adequate policy support at both the local and national government levels. A mixture of both is important. Religious and family clan decisionmakers are also influential in supporting policy, particularly in Indonesia and Papua New Guinea.
- ◆ Ensure adequate institutional support (national government agencies, local government units, academe, local business sector, civic organizations, local NGOs, etc.).
- ◆ Navigation routes and shipping lanes should be considered when designing the MPA.
- ◆ Ensure multisectoral collaboration (external assisting NGOs, tourism sector, fishers, other

resource users, etc.) in a strategic manner with core sectors involved.

- ◆ Ensure community empowerment and good community relations with residents living near the MPA.

### Management council

"There needs to have a better role definition among the implementers (i.e., local government, national park staff and local community)."

- external assisting NGO

#### *Guidelines and rules of thumb*

- ◆ Consider different tiers of a management council, including a large general assembly which meets annually, an executive committee which is small and easy to convene, and a management office which becomes the management arm of the council (see Tubbataha and Southeast Cebu management systems as examples).
- ◆ Clearly define the roles of the different agencies and organizations represented within the management council. A reliable chairperson will be critical.
- ◆ Rotate the chair if national and local governments have similar jurisdictions.
- ◆ Use cross-visits as a potent tool to build teamwork and share experiences.
- ◆ Start with small activities and small wins while focusing on "low hanging fruit" as the management council begins to develop a workplan.
- ◆ NGOs have a delicate balancing act to play and need to be careful in their joint role of facilitating and assisting the capacity of boards, while also being a member of the board.
- ◆ Identify a centralized office or physical presence of the network where people are welcome to visit, preferably within or close to the MPA.

### Building conflict resolution capacity

"No conflict resolution mechanisms for park staff and the community are required to discuss problems. MPA networks attract problems, misunderstandings and conflicts, so be prepared!"

- main assisting NGO

#### *Guidelines and rules of thumb*

- ◆ Conflicts are likely to emerge and need to be planned for well in advance.
- ◆ Ensure there are systems and processes in place to oversee potential conflicts and for making decisions and ensuring consistent implementation for all concerned (management councils).
- ◆ Use conflicts as opportunities from which to learn, and don't avoid them. Address them and learn from the process.

### Balance social, ecological and manageability criteria for declaration of no-take zones

"The ideal core zone was not declared due to low social acceptance (by the majority) as the area is their fishing ground."

- main assisting NGO, municipality / district government, deputized community enforcer and dive resort operator

#### *Guidelines and rules of thumb*

- ◆ Ensure a balance between social and ecological criteria in selection of no-take zones.
- ◆ Manageability is an important criterion. Declaring no-take zones 25 km away from the nearest local village because of social criteria will make enforcement and management difficult.
- ◆ Local stakeholders make the most vigilant managers of the resource if involved and given a role in the protection and management of the no-take zones and maintenance of the buffer zones.
- ◆ Clear and easy-to-understand MPA network rules lead to more effective management.

### Outreach and communication programs

"It was a little bit hurried, it may have been better to take a little more time in order to disseminate information more. A much more comprehensive education and awareness outreach program is needed as part of the larger consultation process."

- main assisting NGO and fishers' association member

#### *Guidelines and rules of thumb*

- ◆ Outreach is an ongoing process.
- ◆ Have a clear communications plan which focuses on key issues, identifies primary stakeholders and uses a variety of mechanisms to communicate the messages.
- ◆ Sometimes champions and leaders can be the best communication medium and much more effective than posters and pictures.
- ◆ Have fun and celebrate successes with stakeholders at each step of the planning and implementation process.
- ◆ Generate pride and involve the next generation.
- ◆ Local film showings and village nights are very effective tool for creating awareness, as is showing genuine interest in local people.

### Coastal law enforcement

"There are not enough financial resources for coastal law enforcement trainings, operations, logistics and maintenance."

- assisting NGO, municipality / district government, provincial government and national enforcement agency

#### *Guidelines and rules of thumb*

- ◆ Multiple approaches for coastal law enforcement are required for effective implementation and protection.
- ◆ Establish multi-agency task forces for implementation of the no-take zones.
- ◆ Educate and involve local communities on the enforcement process to develop their vigilance.
- ◆ Capacitate and involve the whole law enforcement continuum, from enforcers who arrest to prosecutors and judges, too.
- ◆ There is a need for enforcement assets and financial resources.
- ◆ Develop an incentive system that encourages consistent law enforcement.

### Monitoring and Evaluation of the MPA Network

"There is a need to inspire decisionmakers by showing them that MPAs can provide benefits to the government and community."

- main assisting NGO

#### *Guidelines and rules of thumb*

- ◆ A biophysical and socioeconomic governance profile gives a sound basis for a management plan.
- ◆ Try to answer the question "for what need and for whom?" when considering baseline data activities.
- ◆ Ensure baseline data are collected and consolidated into a simple format and disseminated to stakeholders in local language and using local communication mediums (radios, comics, etc.).
- ◆ Include local stakeholders in the actual collection of baseline information where possible.
- ◆ Standardize the baseline data collection techniques so as not to lose the ability to compare data over time and discern trends. Use simple but robust methods.
- ◆ Include the management council in monitoring and evaluation activities and be open to discussions on management effectiveness as these will benefit everyone to be honest about the situation, and to learn and apply adaptive management.
- ◆ Case studies, research and documentation help educate and build sustainability.
- ◆ Consider using standard and widely employed methods so that data can be shared with the country and internationally (e.g., ReefCheck, SocMon).

### Management effectiveness

"It is best to focus on one manageable site first and get the management working; this makes it a showcase for management before expansion of the area. The design should also take into consideration the scope versus the human capacity / resources."

- main assisting NGO



**Guidelines and rules of thumb**

- ◆ Conduct regular (1-2 annually) audits of the management effectiveness using one of the various tools available (such as Pomeroy et al. 2004).
- ◆ Involve the local management team and ideally include biophysical data and interviews with local residents to get their feedback.
- ◆ Begin to scale up management once MPA effectiveness benchmarks are achieved in each site.
- ◆ A national database or centralized system about MPAs in each country would be very helpful, especially if it carries key information and management effectiveness ratings.

**More sharing of lessons learned (from both successes and failures)**

"We need more honesty from NGOs; the only way to learn from each other is by using clear metrics and case studies. We need to give numbers and simple graphs - the trend can be up or down, it doesn't matter! We need to be a lot more honest in presenting our work, learning from our mistakes and sharing to the wider group to bring MPAs in the country and region as a whole to a much higher level."

- main assisting NGO

Most failures are not discussed in detail, but the lessons learned from them could enrich MPA network experience considerably. There is also the need for more research and work on MPA networks and publication of experiences in the coming years. Some failures can provide guidance on how to establish a network.

**Building institutional memory and capacity at local and national levels**

"Government thinks that MPAs are an NGO thing only and do not trust NGOs enough. NGOs have failed to sell the idea to the government. There is a need to improve the capacity of national parks to manage MPAs, the capacity of the judiciary to make informed decisions on environmental law and the capacity of the community for livelihood activities on ecotourism."

- NGO

**Guidelines and rules of thumb**

- ◆ Create or capacitate local institutions that will be able to carry on the work after other outside groups have left.
- ◆ Build up local institutional memory in one or two local organizations to ensure individuals and organizations in the future will have a good history of the interventions in an area.
- ◆ Hire and train local staff members who can remain at the site after projects are finished, NGOs leave and the funding runs out.
- ◆ Offer training courses and promote attendance to conferences for local organizations.
- ◆ Help with student scholarships and thesis programs for local residents.
- ◆ Identify community leaders and develop their skills along with second liners.

**Social MPA networks**

"The benefit of the social MPA network is in the exchange of management experiences and best practices, peer learning, cross-learning and building skills capacity of local conservation practitioners who have the same goals as the network. Working together is useful because we all share a common ecosystem with common problems and issues. It is helpful to join forces with neighboring governments for law enforcement to share resources and human resource."

- government and NGO

The Locally Managed Marine Areas network in Papua New Guinea has considerable experience and the MPA Support Network in the Philippines is setting the stage for how MPA social networks can develop. Beyond these, there does appear to be considerable potential and demand for such networks at local, regional, national and international levels. The beginning of the Coral Triangle Initiative brings much potential to support MPA networks at the national and regional levels within the Coral Triangle.

The use of social networks for sharing experiences and lessons learned at this early stage of MPA network development is essential. There is a large amount of information that should be shared on the different strategies and approaches going on within the different MPA networks. A social network could have local, regional and international chapters. Indonesia and Papua New Guinea study sites exhibit a sophisticated approach in ecological network design, while Philippine study sites demonstrate an effective social and operational management system. There are considerable opportunities for further learning and possibilities for sharing within and among these evolving MPA networks.



WWF-TNC Joint Program meeting with the District Government, Berau. (Nina Dwisasanti)

## National and International Policies

**"Because marine ecosystems are very vulnerable to ongoing development, we should create more no-take zones before development gets quicker."**

- main assisting NGO

It is of crucial importance to have a national policy for the implementation of MPAs that sets targets to effectively plan and prioritize protection of key marine ecological areas for economic reasons. Coastal and marine areas have significant economic value. Healthy coastal and marine ecosystems can provide sustainable supply of goods—such as fish and related products, seaweeds, algae and salt—and services – such as shoreline protection, maintaining water quality, sustaining biodiversity, transportation and recreation (World Bank 2005). Failure to effectively manage these resources would result in significant economic losses.

As observed in this study, a clear national MPA policy facilitates the creation of large and more MPAs throughout the country with political and operational support.

Indonesia has a very clear national policy and target for MPA networks. The key sites for declaration were identified as early as 20 years ago. This has followed with the country's leadership of the Coral Triangle Initiative. Indonesia provides a strong example in this regard to its neighboring countries.

*"Since the Seventh Conference of the Parties in 2004, the Government of Indonesia has added 14 new protected areas covering a total of 2 million ha. Indonesia plans to increase its MPA system to 10 million ha by 2010 from the current total of 6.7 million ha."*

- His Excellency Dr. Susilo Bambang Yudhoyono, President of the Republic of Indonesia at the meeting of the Convention on Biological Diversity, Brazil, 20-31 March 2006.

Papua New Guinea has an unclear national policy environment for MPAs, as most of its marine tenure is owned and managed by the various tribes in the country.

The Philippines has a more decentralized situation with a large number of small MPAs declared around the country which are complemented with large nationally declared but rarely functioning marine parks. There are few clear and well publicized national targets at present.

TNC extension staff with female turtle as it returns to the sea, Kimbe Bay, West New Britain. (Pamela Huxley)

## Summary

A series of best practices have been highlighted based on the field experience of the staff, the statistical analyses of the results and the outputs of the workshops. While there is always more to learn and lessons to extract from experience, these guidelines and insights provide a good start for a framework and basis for MPA network establishment. However, each MPA network will be unique. Different cultures, policies and institutional arrangements will mean that there will be nuances among sites. General lessons cannot always be applied everywhere but they can provide a possible roadmap that can be tested and amended to the local situation.

Design and Planning	Implementation
◆ Involve stakeholders	◆ Policy and social arrangements
◆ Consider secondary stakeholders	◆ Management council
◆ Conduct resource assessment (involving local resource users)	◆ Build conflict resolution capacity
◆ Use rules of thumb for science	◆ Balance social, ecological and manageability criteria for declaration of no-take zones
◆ Establish management council	◆ Outreach and communication programs
◆ Evaluate financing availability	◆ Coastal law enforcement
◆ Balance conservation and socioeconomic development	◆ Monitoring and evaluation of the MPA network
◆ Develop alternative livelihood and skills	◆ Management effectiveness
	◆ More sharing of lessons learned
	◆ Build institutional memory and capacity at local and national levels
	◆ Social MPA networks
	◆ National and international policies

Figure 7.1. A framework of best practices in MPA networks.





# CHAPTER 8

## Conclusions and Future Directions for Marine Protected Area Networks

### Introduction

This chapter addresses questions that pertain to gaps and challenges between knowledge and practice in the establishment of MPA networks. It highlights areas where there are substantial gaps between theory and reality of creating functional MPA networks, both by region and theme. In addition, the next steps for continuing the MPA Learning Partnership are suggested.



A reef monitoring volunteer diving in Tubbataha. (Pamela Huxley)

### Major Gaps between Knowledge and Practice in the Establishment of MPA Networks

During the workshops conducted in the Philippines and in the USA, participants identified management gaps per region and gaps in knowledge of the three themes identified in Chapter 6. The results of the discussion in the Philippine workshop are summarized in Table 8.1.



**Table 8.1. Summary of MPA management gaps, challenges and priority next steps of the study sites by country.**

	Indonesia <sup>1</sup>	Philippines <sup>2</sup>	Pacific Islands <sup>3</sup>
<b>Gaps and challenges</b>	<ul style="list-style-type: none"> <li>- High dependency of local community on resources</li> <li>- Conflicting stakeholders' interest</li> <li>- Destructive fishing practices</li> <li>- Sustainable financing</li> <li>- Capacity for implementation of comprehensive plans</li> <li>- Weak local legislative support</li> <li>- Lack of stakeholder commitment and community involvement</li> </ul>	<ul style="list-style-type: none"> <li>- Application of emerging science in MPA network design</li> <li>- Sustainable financing</li> <li>- Additional infrastructure and human resource</li> <li>- Lack of intergovernment policy for coordination</li> <li>- Need to establish procedures for administrative and fiscal accountability</li> </ul>	<ul style="list-style-type: none"> <li>- National legislation and policy</li> <li>- Governance systems</li> <li>- Sustainable financing</li> <li>- Alternative livelihood</li> </ul>
<b>Next steps</b>	<ul style="list-style-type: none"> <li>- Finalize park zonation and management plan (Berau)</li> <li>- Collaborative management</li> <li>- Sustainable financing plan</li> <li>- Awareness raising</li> <li>- Networking - expert exchange between MPAs, cross-visits, etc.</li> <li>- Sharing of experience in management effectiveness and implementation</li> <li>- Development of economic strategies (e.g., ecotourism, alternative livelihood, microcredit system, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>- Network for exchanges among MPA managers and to expand area coverage</li> <li>- Capacity building for ecosystem-based management</li> <li>- MPA management effectiveness</li> <li>- Intensify information and education efforts</li> <li>- Develop more scientific basis for MPA establishment (SE Cebu)</li> <li>- Increase size of MPAs (SE Cebu)</li> <li>- Infrastructure: embedment moorings, ranger station, etc.</li> <li>- Enforcement equipment and personnel</li> <li>- Financial sustainability mechanisms</li> <li>- Develop national targets</li> </ul>	<ul style="list-style-type: none"> <li>- National legislation / policy and government support</li> <li>- Capacity building for management</li> <li>- Sustainable financing</li> <li>- Community engagement and full participation</li> <li>- Private sector participation</li> <li>- Alternative livelihood development</li> </ul>

<sup>1</sup> Summary for BMCA, KNP and WMNP

<sup>2</sup> Summary for SE Cebu MPA Cluster and TRNP

<sup>3</sup> Summary for Kimbe Bay MPA, Fiji LMMA and Palau MMA

Identified gaps by management theme were discussed in both workshops. It was agreed that designing MPAs and MPA networks requires an understanding of three key parameters: (1) natural science and ecology; (2) social resilience, institutional arrangements and governance; and (3) sustainable financing. Many outstanding questions and challenges exist under each of the three themes, the answers to which are basic to the planning and development of MPAs and networks. These questions and challenges reflect a growing awareness and in-depth knowledge about what it takes to make MPAs work. The practitioners, in asking these questions, are also grappling with answers that are emerging as reflected in this publication. The identified gaps by theme are as follows:

### 1. Natural science and ecology

- ◆ How to design an MPA that is resilient to climate change
- ◆ How to consider and apply connectivity issues in MPA and network design
- ◆ How to evaluate ecosystem services beyond fisheries benefits

- ◆ How to carry out effective and comparable biophysical monitoring and data management
- ◆ What are the general rules of thumb to use in the absence of scientific data?
- ◆ How to make science understandable and easily communicated to local stakeholders

### 2. Social resilience, institutional arrangements and governance

- ◆ What are the changes and dynamics in countries where devolution is taking place and how does this affect MPA networks?
- ◆ How can socioeconomic benefits be better distributed throughout the community?
- ◆ How to incorporate conflict resolution in a more holistic manner in all MPA networks
- ◆ How to increase investments in creating social networks, allowing leaders and MPA managers to share experience
- ◆ How to clarify timing and phases for the MPA planning and implementation process, e.g., what is the evolving roadmap for MPA networks?

- ◆ How to design alternative livelihoods that work without creating unrealistic expectations
- ◆ How to balance implementing long-term management strategies with short-term actions
- ◆ How to set up effective coastal law enforcement systems
- ◆ How to capacitate management councils
- ◆ How to know what levels of policy and institutional support are needed
- ◆ How to amplify MPA network benefits to inhabitants and stakeholders
- ◆ The need for a social tool which runs in parallel to Marxan (Leslie et al. 2003) for designing a robust social program for MPA network declaration
- ◆ How to balance the size of MPAs and expectations at the community level regarding what they really can achieve given their size

### 3. Sustainable financing

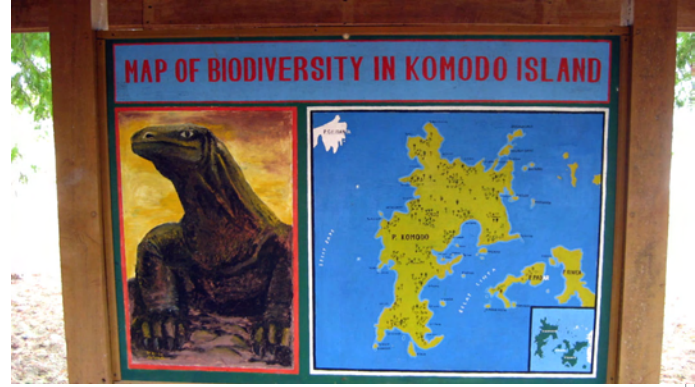
- ◆ The need to evaluate the temporal component of sustainable financing
- ◆ How do endowments work, and are they effective mechanisms in the long run?
- ◆ How to fully integrate financial considerations into MPA network design from conception through implementation
- ◆ How to maximize financial benefits to local stakeholders

## The MPA Learning Partnership – Moving Forward

Based on the workshops conducted and the fieldwork, there was an overwhelming response from the different participants to continue the MPA Learning Partnership. During both workshops, participants offered suggestions on ways the partnership could continue, especially in the context of the Coral Triangle Initiative (CTI), which recently started. Suggestions on how to continue the partnership and what it could achieve are outlined below.

### Education and outreach

- ◆ Develop regional chapters of MPA practitioners and take ideas and concepts down to smaller, manageable and affordable scales.
- ◆ Use the Internet to facilitate global and regional exchanges among practitioners using the World Commission on Protected Areas web portal as an access and exchange mechanism.
- ◆ Locate and utilize free, online social networking tools that could easily be inserted into various websites and be used by national staff.
- ◆ Build on the realization of the MPA Learning Partnership that people learn best through face-to-



Signboards, an important communication tool for both visitors and local inhabitants, need to be written in both English and the local dialect. (Alan White)

face interactions and that understanding the target audience is important; practitioners in field sites do not generally learn through Internet as well as through real meetings.

- ◆ Use existing global venues (e.g., meetings, conferences, etc.) for education and outreach to provide opportunity for exchanges of MPA networks / partners.

### Governance

- ◆ Create a link between the MPA Learning Partnership and the Secretariat of the CTI to share experiences and lessons through developing institutional mechanism of the CTI.
- ◆ Establish a Coral Triangle coordination body to undertake partnership initiatives.
- ◆ Consider how to take the lessons from the Coral Triangle to other regions in the world through the work of large nongovernment organizations (NGOs) in other regional projects (e.g., East Africa, Caribbean) and examine ways to affiliate with institutions on a multicountry scale.

### Capacity building

- ◆ Explore and develop a mechanism whereby local universities play a key role in building capacity in local governments and NGOs and help facilitate interaction and exchange among other institutions. Universities could provide the training facilities to help institutionalize the planned MPA manager certification program for CTI.
- ◆ Sponsor regular forums to encourage more and better interactions among scientists and managers.
- ◆ Given the role of the MPA Learning Partnership in uniting the four large NGOs (CI, WWF, TNC and WCS) and in stimulating some of the efforts in creating the CTI, continue the sharing process.
- ◆ There is a need to identify a coordinating organization that will be able to push forward the initiative and continue the partnership in an appropriate form.

## MPA Networks – Moving Forward

When discussing MPAs and MPA networks, it is important to note that there was a time when the entire ocean was a *de facto* MPA. The number of animals taken from the ocean was limited by geography and technology. Certain parts of the ocean were off limits, not because there were enforced boundaries, but because they were unreachable by coastal people venturing out in wind-driven or human-powered boats (Lubchenco and Grorud-Colvert 1997).

The conclusion that fishing is responsible for the deterioration of ocean life can no longer be avoided. Since that time it has become clear that if extractive activities occur without management, in the long term the resources will become degraded and the services humans receive will be significantly reduced. MPAs are one tool for marine management, but not a last resort when all else fails (Roberts 2007). MPAs are thought of as something new, but the creation of refuges has long been recognized in the South Pacific, Papua New Guinea and even in Hawaii where some areas were “rested” from fishing until such time that fish were needed for local celebrations. Such protection was not to save pretty fish from the hook and trawl but to benefit fisheries (Roberts 2007).

## Summary of the Survey Results – Key Predictors

The findings of the survey highlighted the relationship between the effectiveness of the MPAs and on- the-ground work and successes with the local inhabitants. Ensuring that local stakeholders derive benefits from MPA-related activities appears to have great gains for the implementation of MPA networks. For example, the introduction of new

skills was found to predict a highly significant positive impact on household incomes, leading to the perception that it increased unity and pride within the community. The opening of tourism business opportunities also correlated to increased household income. However, not all places are suitable for marine tourism. Expectations that an MPA network establishment leads to flocks of tourists visiting an area need to be dispelled. Tourism development should be tackled by industry representatives and persons with considerable experience in it.

The results reveal that the leadership role that NGOs and national government take may have led to local communities being less involved in management and decisionmaking. Effective management will only be achieved when fishers and local stakeholders take an active role in MPA management. This again highlights the difficult balancing act that NGOs and implementing agencies have to perform to jumpstart the MPA, but still maintain ownership of the local resource users and officials.

The results show that some of the factors highlighted are important for long-term success of the MPA and / or network. These factors are increased household income and increased fish catch around the MPA, which appear to be at the core of why local stakeholders get involved in MPA networks. The results from the analyses verify that the social aspects of MPA management are critical to the MPAs’ success, and there is a definite correlation between increasing benefits to stakeholders and MPA management improvement in all three country contexts. The most important predictors found during the statistical analysis are presented in Table 8.2 summarized from Chapter 5.

**Table 8.2. The best predictors as determined by regression analysis for the key indicators of management success.**

Indicator of Management Success	Highly Significant Factors
Increased fish catch	Sustainable financing for management** Clarity of MPA / network rules** Enforcement by community enforcers**
Improved critical habitats in no-take zones	Local skills development** Involvement in management by local elected politicians**
Improved marine diversity in no-take zones	Sustainable financing for management** Management capacity for MPA network / board*
Involvement of local fisher leaders in management	Multistakeholder planning workshops** Integration of indigenous knowledge**
Enforcement by community enforcers	Local skills development** Participatory biophysical assessments** Increased fish catch**
Significantly correlated factors to increased household income	Opened tourism business opportunities** Local skills development**

\*\* Correlation is significant at the .01 level (two- tailed).

\* Correlation is significant at the .05 level (two-tailed).



## Scaling Up

There is general consensus that MPA networks are more desirable than individual MPAs (Ballantine 1997; Salm et al. 2000; Allison et al. 2003; Roberts et al. 2003b; White et al. 2006; WCPA / IUCN 2007). For example, a single reserve is unlikely to reduce overall mortality for a species because of migration during different life stages (Gerber and Heppell 2004). Planned networks can provide important spatial links to maintain ecosystem processes and connectivity, as well as improve resilience in the case of a localized catastrophe, such as an oil spill (Stewart et al. 2003). Due to these factors, networks can help ensure long-term sustainability of populations better than single sites alone (NRC 2001). Designing and implementing networks of MPAs is a big first step towards an ecosystem-based approach to meeting the multiple goals of coastal and ocean management, as well as an opportunity to provide for more inclusive representation of stakeholders (NRC 2000).



Selling tuna in Komodo National Park. Tuna species migrate over large areas, so MPAs generally cannot cover their entire life cycle. (Alan White)

Although there has been considerable work through the Locally Managed Marine Areas (LMMA) in some of the Pacific islands (Fiji, Papua New Guinea and other areas), in Indonesia and in the Philippines, there is still considerable potential for their development. Kimbe Bay and Papua New Guinea as a whole, for instance, have a very strong LMMA network with regular quarterly and annual national meetings among members. This has helped managers to share experiences and planning approaches. In the Philippines, despite the proliferation of MPAs, only recently has an MPA network begun. The MPA Support Network is working with managers and implementers and has begun the development of awarding criteria based on the MPA database and self-evaluation tool. In Indonesia, national park heads meet

annually for discussions on management and have their own social network.

Most MPA networks still have relatively recent history, and there are great opportunities to share experiences for continual improvement of MPAs. Bringing together managers of the MPAs for sharing and peer learning would bring considerable benefits. This could be an important building block to scale individual MPAs up to MPA networks. This could begin to lay the foundations of larger countrywide MPA networks, which are planned nationally but implemented locally. A comprehensive capacity-building program targeted at MPA managers and implementers will be useful.

A common question that often arises in relation to well-designed MPA networks is what should be done with individual MPAs that were established before network thinking and planning was prevalent (Stewart et al. 2003). The dilemma is that since networks are rarely considered at the start of MPA designation, optimal networks based on the best scientific design and modeling, may not include all or part of the MPAs that were established prior to this knowledge. But the consensus in response to this problem is that networks can and should be designed in an evolving manner with each additional MPA contributing to the larger protection regime (Roberts 2001). In a world where we are not close to protecting a large enough portion of critical habitats overall, we must honor every area that is effectively protected. And, going forward, we can continue to improve strategies for new MPA placement so that they add increasingly strategic value to networks of MPAs building up the size and management effectiveness simultaneously.

## Managing MPA Expectations and Success

Another problem associated with MPAs and networks is the high expectations that MPAs have created in all of the sites visited. In this regard, a major lesson is that clear objectives and setting of expectations at the beginning is vital. Small MPAs of 5 ha will not be able to significantly increase fish biomass or provide larval and fish export to surrounding areas, but they do offer the opportunity for communities and government agencies to engage in management and learn from experience. If management is successful, they can then scale up to larger MPAs and into a network later on. Likewise a 1-million ha MPA will also not achieve significant fish biomass buildup in the short term until management is in place and social aspects have been addressed. There is no right or wrong model, but objectives and expectations must be clear from the beginning. Overly ambitious MPAs with no clear long-term funding may have problems achieving their management objectives over time. MPA networks allow this learning to take place to scale up as the policy environment, social considerations of those affected and management needs are addressed.

Another important finding of the MPA Learning Partnership is that tracking MPA networks on legally declared size alone is not a very useful indicator of success. In contrast, MPA and network management effectiveness in the field is a very important indicator. At sites where management effectiveness is being tracked (in the Philippines and Indonesia), there is increased confidence that the MPAs and networks are contributing to their objectives. While success rates in these countries are still low (e.g., approximately 25% in the Philippines and Indonesia) (CCEF 2007; Mous 2008; PhilReefs 2008), the fact that management effectiveness is measured and used as a planning tool to improve management is a sign that the science and practice of guiding MPAs are maturing.

The overall assessment of an MPA needs to incorporate the social and economic perceptions. A particular MPA may be both a biological “success” – resulting in increased fish abundance and diversity and improved habitat – and a social “failure” – lacking broad participation in management, sharing of economic benefits and conflict resolution mechanism (Christie et al. 2003). Short-term biological gains will likely disappear unless social issues are addressed (Pollnac et al. 2001). Such social failures leave considerable problems behind and erode the ability of coastal societies to fully endorse and make MPAs sustainable and beneficial over time. Thus, a major lesson is that planning and implementing MPAs and networks with a full vision for the social and economic realities of management area, will substantially increase the chances of creating sustainable networks of MPAs.

### **Financing MPA Networks**

In addition to the social and ecological aspects of designing and implementing effective MPA networks, financial aspects of management are equally important. This pertains to financing to sustain MPA management as well as to address livelihood considerations of inhabitants. Thus, a balance of these important factors – ecology and science, social management, resilience, institutions, governance and sustainable financing of MPA networks – is essential for success. Experiences from MPA regions reveal a strong link between social success and biological success (Christie 2004). When the third factor, sustainable finance, is added, the three interrelated factors, if approached and implemented in an appropriate manner for a given situation, should lead to MPA network success. But the often unsaid dimension in finding this balance and making it add up to a functioning system, is that it must be done in response to the mix of factors that comprise the given location. This is the “art” of putting it all together effectively.

When designing MPA networks, finding the balance of ecological, social and management / financial considerations must be addressed from inception to monitoring and evaluation. A fourth factor which came out during the field surveys of this study and that requires further research is an “ease of management” factor which relates to the clarity of the rules, awareness and involvement of local residents and enforcement. It was elaborated on and was apparent in the sites with the most successful management. An example is the Tubbataha Reefs Natural Park that evolved over 15 years to a simplified management system that enables effective protection. A critical decision in the planning stage was the adoption of one no-take zone for all critical habitat areas in the park jurisdiction.

### **MPA Networks in the Broader Management Regime**

A realization from the MPA Learning Partnership discussions was that MPA networks alone will not solve marine problems of the Coral Triangle or any other region in the world. Management needs to be in place beyond core and buffer zones of MPAs and networks. Thus, MPAs and related systems will need to form nested layers as part of a comprehensive integrated coastal (and marine) management approach (Christie and White 1997; White et al. 2005; 2008). Integrated management regimes, where they are evolving, are paying dividends in more effective management that go beyond what MPAs can deliver, especially in terms of shoreline and coastal habitat management, improved water quality and often for fisheries (Green et al. 2005).

In the context of coastal regions of Asia, “fishing communities are best understood as dependent not on a single resource but on a whole ecosystem” (Bailey and Pomeroy 1996). This broad understanding of tropical coastal resources is the key to stability for households and communities in Southeast Asia’s coastal areas. A similar analogy may apply for MPAs such that they cannot be considered as independent but rather as networked, one by one, to cover whole marine systems. In countries like the Philippines, Indonesia and Papua New Guinea, where LMMA and community-based MPAs are established, social networking for management effectiveness should be a key direction for MPA development. Fitting these networks in with larger MPAs to provide the biodiversity and ecosystem-wide benefits to protect fisheries is another ongoing step. Nevertheless, it will be difficult in those countries with large and growing populations and heavy reliance on coastal resources which is why fully integrated approaches are essential (White et al. 2005).



## The Coral Triangle Initiative

Moving forward, initiatives such as the CTI can open up large opportunities to begin looking at this mega ecosystem as one whole unit. This area is the center of the world's marine biodiversity (Hoeksema 2007), and from here emanates the largest number of species of different taxonomic groups. Although boundaries are still being established, it is important to recognize that the protection of this region of the world is essential for the marine ecosystem at large. Within this context, it is also likely to be more resilient than other areas of the globe, positioning it to be more able to buffer climate change and other human-induced changes. MPAs appear to be at a critical point in their history. Over the next few years, success is vital for MPAs worldwide. There are many success stories, but there is still much work to do to prove themselves on the ground with local stakeholders and contributing to positive human welfare as a whole. If success becomes the norm rather than the exception in each country, then MPA networks should evolve into country and regionwide networks.

The CTI offers an opportunity to look at a larger region from a variety of scales and layers of nested management systems. Despite this large scale, it is important to emphasize that work and activities will need to focus on the ground level. Furthermore, it is vital to recognize that humans are the most critical part of the equation. MPAs are not set up to manage the fish stocks and reefs as they can do very well on their own, but rather MPAs are established to manage the people and activities within their jurisdiction and to ensure that we can continue fishing, living and benefiting socially and financially from the resources.



The next generation of Hoskins inhabitants, Kimbe Bay, Papua New Guinea. (Stuart Green)





## BIBLIOGRAPHY

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- Abesamis, R.A. and G.R. Russ. 2005. Density-dependent spillover from a marine reserve: long-term evidence. *Ecol. Appl.* 15(5): 15.
- Abesamis, N.P., A. Claus, C. Corrigan and G. Samonte-Tan. 2006. Social resilience: a literature review on building resilience into human marine communities in and around MPA networks. Conservation International, Arlington, USA.
- Adger, W.N. 2000. Social and ecological resilience: are they related? *Progr. Human Geogr.* 24(3): 347-364.
- Agardy, T. and F. Staub. 2006. Marine protected areas and MPA networks. National Science Foundation, United States Fish and Wildlife Service, USA.
- Agardy, T. and L. Wolfe. 2002. Institutional options for integrated management of a North American marine protected areas network. Commission for Environmental Cooperation, Montréal, Québec, Canada.
- Airame, S., J.E. Dugan, K.D. Lafferty, H. Leslie, D.A. McArdle and R.R. Warner. 2003. Applying ecological criteria to marine reserve design: a case study from the California Channel Islands. *Ecol. Appl.* 13 (Supplement): 15.
- Aitsi, J. and A. Sapul. 2006. An identification and verification of leatherback turtle nesting beaches in Kimbe Bay, West New Britain Province, Papua New Guinea. A local knowledge survey field report (21 November–2 December 2005). Report prepared by The Nature Conservancy, Kimbe Bay, Papua New Guinea.
- Alcala, A.C. and G.R. Russ. 2006. No-take marine reserves and reef fisheries management in the Philippines: a new people power revolution. *Ambio* 53(5): 9.
- Aliño, P.M., H.O. Arceo, N. Palomar and A. Uychiaoco. 2000. Challenges and opportunities for community participation for the management of marine protected areas (MPAs) in the Philippines. Paper presented at the 9th International Coral Reef Symposium, 23-27 October 2000, Bali, Indonesia.
- Allison, G.W., J. Lubchenco and H.P. Possingham. 1998. Marine reserves are necessary but not sufficient for marine conservation. *Ecol. Appl.* 8:13.
- Allison, G.W., S.D. Gaines, J. Lubchenco and H.P. Possingham. 2003. Ensuring persistence of marine reserves: catastrophes require adopting an insurance factor. *Ecol. Appl.* 13: S8–S24.
- Almany, G.R., M.L. Berumen, S.R. Thorrold, S. Planes and G.P. Jones. 2007. Local replenishment of coral reef fish populations in a marine reserve. *Science* 316: 2.
- Anderson, D. 1997. Turning back the harmful red tide. *Nature* 388: 1.
- Anderson, E.C. 2006. Marine reserves monitoring. *Alolkoy: News from the Channel Islands National Marine Sanctuary* 18: 24.
- Arceo, H.O., P.M. Aliño and R.O.M. Gonzales. 2008. Where are we now with marine protected areas?, p. 145-151. *In* Coral Reef Information Network of the Philippines (PhilReefs) Reefs through time: initiating the state of the coasts reports. PhilReefs, MPA Support Network, Marine Environment and Resources Foundation and Marine Science Institute, University of the Philippines, Quezon City, Philippines. 152 p.
- Arquiza Y., and A. T. White. 2000. Tales from Tubbataha: natural history, resource use, and conservation of the Tubbataha Reefs, Palawan, Philippines. Second ed. Sulu Fund for Marine Conservation Foundation and Bookmark, Manila, Philippines.
- Arrivillaga, A. and N. Windevoxhel. 2006. Building a resilient network of MPAs in the Mesoamerican Reef. Mesoamerican Reef Program, The Nature Conservancy, Hawaii, USA. (Unpublished).
- Aswani, S., S. Albert, A. Sabetian and T. Furusawa. 2007. Customary management as precautionary and adaptive principles for protecting coral reefs in Oceania. *Coral Reefs* 26(4): 1009-1021.
- Bailey, C. and C. Pomeroy. 1996. Resource dependency and development options in coastal South East Asia. *Soc. Nat. Resour.* 9: 191–199.
- Ballantine, W.J. 1997. The design and monitoring of marine reserves: design principles for systems of “no-take” marine reserves. Paper presented as a keynote address at the Workshop on the Design and Monitoring of Marine Reserves, February 1997, Fisheries Center, University of British Columbia, Vancouver, Canada. Retrieved on 17 June 2008 from <http://www.marine-reserves.org/nz/papers/design.pdf>.
- Ball, I.R. and H.P. Possingham. 2000. Spexan manual, version 3.1. Adelaide University, South Australia, Australia. Retrieved on 18 July 2008 from <http://www.ecology.uq.edu.au/marxan.htm>.
- Bartholomew, A., J.A. Bohnsack, S.G. Smith, J.S. Ault, D.E. Harper and D.B. McClellan. 2007. Influence of marine reserve size and boundary length on the initial response of exploited reef fishes in the Florida Keys National Marine Sanctuary, USA. *Landscape Ecol.* 23 (Supplement 1).

- BEAPA (Bureau of East Asian and Pacific Affairs). 2008. Papua New Guinea profile. Office of Electronic Information, Bureau of Public Affairs, US State Department, USA. Retrieved on 17 June 2008 from [www.state.gov/r/pa/ei/bgn/2797.htm](http://www.state.gov/r/pa/ei/bgn/2797.htm).
- Becker, B.J., L.A. Levin, F.J. Fodrie and P.A. McMillan. 2007. Complex larval connectivity patterns among marine invertebrate populations. *Proceedings of the National Academy of Science of the United States of America* 104(9): 5.
- Bellwood, D.R., T.P. Hughes, C. Folke and M. Nystrom. 2004. Confronting the coral reef crisis. *Nature* 429: 6.
- Bengen, D.G and I.M. Dutton. 2004. Interactions between mangroves and fisheries in Indonesia, p. 632-653. *In* T.G. Northcote and G.F. Hartman (eds.) *Fishes and forestry – worldwide watershed interactions and management*. Blackwell Scientific, Oxford, UK.
- Bennett, G., J. Fry, A.M. González and S. Zilberman. 2005. Understanding and acceptance of conservation: analyzing perceptions of local communities in the Berau marine protected area. Indonesia Final Capstone Report. Elliott School of International Affairs, International Development Studies, George Washington University. Retrieved on 25 July 2008 from <http://www.gwu.edu/~oid/capstone/capstone%20papers/indonesia06.pdf>.
- Bohnsack, J. 1990. The potential of marine fishery reserves for reef fish management in the US South Atlantic. NOAA Tech. Memo. NMFS-SEFC 40.
- Borrini-Feyerabend, G. 2007. The IUCN protected area matrix: a tool towards effective protected area systems. IUCN World Commission on Protected Areas Task Force, IUCN Protected Areas Categories, Andalusia, Spain.
- Botsford, L.W., A. Hastings and S.D. Gaines. 2001. Dependence of sustainability on the configuration of marine reserves and larval dispersal distance. *Ecol. Lett.* 4: 7.
- Botsford, L.W., F. Micheli and A. Hastings. 2003. Principles for the design of marine reserves. *Ecol. Appl.* 13 (Supplement): 7.
- BPS-Statistics Indonesia. 2003. 2000 census SUSENAS (National Social and Economic Survey) of demographics. Retrieved on 15 May 2005 from <http://www.bp.go.id/index.shtml>.
- Brand, F.S. and K. Jax. 2007. Focusing the meaning(s) of resilience: resilience as a descriptive concept and a boundary object. *Ecol. Soc.* 12(1): 23. Retrieved on 20 June 2008 from <http://www.ecologyandsociety.org/vol12/iss1/art23/>.
- Brown, K. 2006. Adaptive institutions for coral reef conservation. *In* I.M. Cote and J.D. Reynolds (eds.) *Coral reef conservation*. Cambridge University Press, New York, USA.
- Bunce, L., P. Townsley, R. Pomeroy and R. Pollnac (with contributions by H. Cesar, E. Nicholson and P. Wiley). 2000. *In* Socioeconomic manual for coral reef management. Global Coral Reef Monitoring Network, Townsville, Australia.
- Campos, W.L., P.D. Beldia, C.L. Villanoy and M.M. Canto. 2008. Investigating biodiversity corridors in the Sulu Sea: distribution and dispersal of fish larvae. Paper presented at the 11th International Coral Reef Symposium, 7-11 July 2008, Florida, USA.
- Carr, M.H., J.E. Neigel, J.A. Estes, S. Andelman, R.R. Warner and J.L. Largier. 2003. Comparing marine and terrestrial ecosystems: implications for the design of coastal marine reserves. *Ecol. Appl.* 13(1): 18.
- CBD (Convention on Biological Diversity). 2006. Proceedings of the 10th Meeting of the Subsidiary Body on Scientific, Technical and Technological Advice, 7-11 February 2005, Bangkok, Thailand.
- CCEF (Coastal Conservation and Education Foundation) and Partners. 2007. 2007 marine protected coast, reef and management database. CCEF, Cebu City, Philippines.
- CDFG (California Department of Fish and Game). 2007. California Marine Life Protection Act: master plan for marine protected areas. Retrieved on 1 July 2008 from <http://www.dfg.ca.gov/mlpa/masterplan.asp>.
- CDFG (California Department of Fish and Game). 2008. The first five years of monitoring the Channel Islands Marine Protected Network. Paper presented at the California Islands Symposium, 7-8 February 2008, Oxnard, California. Retrieved on 17 June 2008 from [http://www.dfg.ca.gov/marine/channel\\_islands/specialsession.asp#handouts](http://www.dfg.ca.gov/marine/channel_islands/specialsession.asp#handouts).
- Chan, W.Y. 2002. The views of the indigenous fishers of the Wakatobi Marine National Park of Sulawesi, on fish resources and conservation efforts. M.S. thesis. Coastal and Ocean Policy, University of Plymouth in collaboration with Operation Wallacea, Lincolnshire, UK.
- Christie, P. 2004. MPAs as biological successes and social failures in Southeast Asia. *In* J.B. Shipley (ed.) *Aquatic protected areas as fisheries management tools: design, use, and evaluation of these fully protected areas*. American Fisheries Society, Maryland, USA.
- Christie, P. and A.T. White. 1997. Trends in development of coastal area management in tropical countries: from central to community orientation. *Coast. Manage.* 25: 155-181.
- Christie, P. and A.T. White. 2007. Best practices for improved governance of coral reef marine protected areas. *Coral Reefs* 26(4).
- Christie, P., A. White and E. Deguit. 2002. Starting point or solution? Community-based marine protected areas in the Philippines. *J. Environ. Manage.* 66(4): 441-454.
- Christie, P., D.L. Fluharty, A.T. White, L. Eisma-Osorio and W. Jatulan. 2007. Assessing the feasibility of ecosystem-based fisheries management in tropical context. *Mar. Policy* 31(3): 11.



- Christie, P., K. Lowry, A. White, E. Oracion, L. Sievanen, R.S. Pomeroy, R. Pollnac, J. Patlis and R.-L.V. Eisma. 2005. Key findings from a multidisciplinary examination of integrated coastal management process sustainability. *Ocean Coast. Manage.* 48: 16.
- Christie, P., B.J. McCay, M.L. Miller, C. Lowe, A.T. White, R. Stoffle, D.L. Fluharty, L.T. McManus, R. Chuenpagdee, C. Pomeroy, D.O. Suman, B.G. Blount, D. Huppert, R.L.V. Eisma, E. Oracion, K. Lowry and R.B. Pollnac. 2003. Towards developing a complete understanding: a social science research agenda for marine protected areas. *Fisheries* 28(12): 22-26.
- Cicin-Sain, B. and S. Belfiore. 2005. Linking marine protected areas to integrated coastal and ocean management: a review of theory and practice. *Ocean Coast. Manage.* 48: 19.
- CINMS (Channel Islands National Marine Sanctuary). 2007. Final environmental impact statement for the establishment of marine reserves and marine conservation areas. National Ocean Service and National Marine Sanctuary Program 256, National Oceanic and Atmospheric Administration, Department of Commerce. Retrieved on 17 June 2008 from <http://channelislands.noaa.gov/marineres/PDF/FEIS.pdf>.
- Cinner, J.E., M.J. Marnane, T.R. McClanahan and G.R. Almany. 2005. Periodic closures as adaptive coral reef management in the Indo-Pacific. *Ecol. Soc.* 11(3): 31.
- Corrales, L. 2005. Manual for the rapid evaluation of management effectiveness in marine protected areas of Mesoamerica. Tech. Doc. No. 17: 54. PROARCA, The Nature Conservancy, Hawaii, USA.
- Cowen, R.K., C.B. Paris and A. Srinivasan. 2006. Scaling of connectivity in marine populations. *Science* 311: 6.
- Cowen, R.K., M. Lwiza, S. Sponaugle, C.B. Paris and D.B. Olson. 2000. Connectivity of marine populations: open or closed? *Science* 287: 2.
- Creative Research Systems. 2008. Correlation: the survey system. Retrieved on 17 June 2008 from <http://www.surveysystem.com/correlation.htm>.
- Crowder, L.B., S.J. Lyman, W.F. Figueira and J. Priddy. 2000. Source-sink population dynamics and the problem of siting marine reserves. *Bull. Mar. Sci.* 66(3): 22.
- CTI (Coral Triangle Initiative) Secretariat. 2008. CTI fact sheet. CTI Regional Secretariat within the Government of Indonesia, Indonesia.
- Davis, G.E. 2005. Science and society: marine reserve design for the California Channel Islands. *Conserv. Biol.* 19(6): 6.
- Day, J.C., and D. Laffoley. 2006. Self-assessment checklist for building networks of MPAs. World Commission on Protected Areas, International Union for Conservation of Nature, USA.
- Dayton, P., E. Sala, M. Tegner and S.F. Thrush. 2000. Marine protected areas: parks, baselines, and fishery enhancement. *Bull. Mar. Sci.* 66: 17.
- Dobbs, K., L. Fernandes, S. Slegers, B. Jago, L. Thompson, J. Hall, J. Day, D. Cameron, J. Tanzer, F. Macdonald, H. Marsh and R. Coles. 2007. Incorporating dugong habitats into the marine protected area design for the Great Barrier Reef Marine Park, Queensland, Australia. *Ocean Coast. Manage.* 51(4): 7.
- Dolar, L.L. and A.C. Alcalá, 1993. Notes on the ichthyoplankton and marine mammals of the Sulu Sea, Philippines. *Silliman J.* 36(2): 43-57.
- Dygico, M. 2007. Tubbataha Reefs: a marine protected area that works. World Wildlife Fund- Philippines, Quezon City, Philippines.
- Earthtrends. 2003. Papua New Guinea country profile. Retrieved on 1 July 2008 from [http://earthtrends.wri.org/pdf\\_library/country\\_profiles/coa\\_cou\\_598.pdf](http://earthtrends.wri.org/pdf_library/country_profiles/coa_cou_598.pdf).
- Eisma-Osorio, R.L., R.C. Amolo and A.T. White. (In press). Southeast Cebu case study: ecosystem-based fisheries management in the Philippines. *Coast. Manage.*
- Elliott, G., B. Mitchell, B. Wiltshire, I.A. Manan and S. Wismer. 2001. Community participation in marine protected area management: Wakatobi National Park, Sulawesi, Indonesia. *Coast. Manage.* 29(4): 295-316.
- Emerton, L., J. Bishop and L. Thomas. 2006. Sustainable financing of protected areas: a global review of challenges and options. World Conservation Union, Gland, Switzerland, and Cambridge, UK.
- Evans, R.D., G.R. Russ and J.P. Kritzer. 2008. Batch fecundity of *Lutjanus carponotatus* (Lutjanidae) and implications of no-take marine reserves on the Great Barrier Reef, Australia. *Coral Reefs* 27: 11.
- FAO (Food and Agriculture Organization). 2004. The state of the world fisheries and aquaculture 2004. FAO, Rome, Italy.
- FAO (Food and Agriculture Organization). 2006. The state of the world fisheries and aquaculture 2006. FAO, Rome, Italy.
- Fernandes, L., J. Day, A. Lewis, S. Slegers, B. Kerrigan, D. Breen, D. Cameron, B. Jago, J. Hall, D. Lowe, J. Innes, J. Tanzer, V. Chadwick, L. Thompson, K. Gorman, M. Simmons, B. Barnett, K. Sampson, G. De'ath, B. Mapstone, H. Marsh, H. Possingham, I. Ball, T. Ward, K. Dobbs, J. Aumend, D. Slater and K. Stapleton. 2005. Establishing representative no-take areas in the Great Barrier Reef: large-scale implementation of theory on marine protected areas. *Conserv. Biol.* 19(6): 12.
- Folke, C., S. Carpenter, T. Elmqvist, L. Gunderson, C.S. Holling and B. Walker. 2002. Resilience and sustainable development: building adaptive capacity in a world of transformations. *Ambio* 31(5): 4.

- Galal, N., R.F.G. Ormond and O. Hassan. 2002. Effect of network of no-take reserves in increasing catch per unit effort and stocks of exploited reef fish at Nabq, South Sinai, Egypt. *Mar. Freshwat. Res.* 53(2): 6.
- Garson, D. 2008. Multiple regression. Retrieved on 1 July 2008 from <http://www2.chass.ncsu.edu/garson/PA765/regress.htm>.
- Gell, F.R. and C.M. Roberts. 2003. Benefits beyond boundaries: the fishery effects of marine reserves. *Trends Ecol. Evol.* 18(9): 7.
- Gerber, L.R. and S.S. Heppell. 2004. The use of demographic sensitivity analysis in marine species conservation planning. *Biol. Conserv.* 120(1): 121-128.
- Golbuu, Y., A. Bauman, J. Kuartei and S. Victor. 2005. The state of coral reef ecosystems of Palau. *In* J. Waddell (ed.) *The state of coral reef ecosystems of the United States and Pacific freely associated states*. NOAA / NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team, Maryland, USA.
- Golbuu, Y., S. Victor, L. Penland, D. Idip Jr., C. Emaurois, K. Okaji, H. Yukihira, A. Iwase and R.V. Woesik. 2007. Palau's coral reefs show differential habitat recovery following the 1998-bleaching event. *Coral Reefs* 26: 14.
- Govan, H., W. Aalbersberg, A. Tawake and J. Parks. 2008. *Locally-managed marine areas: a guide for practitioners*. Locally Managed Marine Area Network, Indonesia.
- Granek, E.F. 2007. *Linkages between mangrove forests and coral reefs: quantifying disturbance effects and energy flow between systems*. Department of Zoology, Oregon State University, USA. Dissertation. 192 p.
- Green, A.L. and P.J. Mous. 2006. Delineating the Coral Triangle, its ecoregions and functional seascapes. Report based on an Expert Workshop held at TNC Coral Triangle Center, April-May 2003, Bali, Indonesia, and on Expert Consultations, June-August 2005. Report from The Nature Conservancy, Coral Triangle Center, Bali, Indonesia and the Global Marine Initiative, Indo-Pacific Resource Centre, Brisbane, Australia.
- Green, A., P. Lokani, S. Sheppard, J. Almany, S. Keu, J. Aitsi, J.W. Karvon, R. Hamilton and G. Lipsett-Moore. 2007. Scientific design of a resilient network of marine protected areas. Kimbe Bay, West New Britain, Papua New Guinea. TNC Pacific Island Countries Rep. No. 2/07. TNC Indo-Pacific Resource Centre, South Brisbane, Australia.
- Green, S.J., J. Flores, R. Martinez and A.T. White. 2004. *The fisheries of Central Visayas: status and trends*. Coastal Resource Management Project, Department of Environment and Natural Resources and Bureau of Fisheries and Aquatic Resources-Department of Agriculture, Cebu City, Philippines.
- Gubrium, J.F. and J.A. Holstein. 2002. *Handbook of interview research: context and method*. Sage Publications, California, USA.
- Halim, A. and P. Mous. 2006. Community perceptions of marine protected area management in Indonesia. TNC Report. Bali, Indonesia.
- Halpern, B. 2003. The impact of marine reserves: do reserves work and does reserve size matter? *Ecol. Appl.* 13(1) (Supplement): 21.
- Halpern, B.S. and R.R. Warner. 2002. Marine reserves have rapid and lasting effects. *Ecol. Lett.* 5: 5.
- Halpern, B.S., H.M. Regan, H.P. Possingham and M.A. McCarthy. 2006. Accounting for uncertainty in marine reserve design. *Ecol. Lett.* 9: 9.
- Hedge Fund Data. Retrieved on 17 May 2008 from [http://www.hedgefund-index.com/d\\_rsquared.asp](http://www.hedgefund-index.com/d_rsquared.asp).
- Hinchley, D., G. Lipsett-Moore, S. Sheppard, F.U. Sengebau, E. Verheij and S. Austin. 2007. Biodiversity planning for Palau's protected areas network: an ecoregional assessment. TNC Pacific Island Countries Rep. No. 1/07. TNC Indo-Pacific Resource Centre, South Brisbane, Australia.
- Hoeksema, B. 2007. Chapter 5: Delineation of the Indo-Malayan centre of maximum marine biodiversity: the Coral Triangle, p. 117-118. *In* W. Renema (ed.) *Biogeography, time, and place: distributions, barriers, and islands*. Springer, Dordrecht, Netherlands.
- Holling, C.S. 1973. Resilience and stability of ecological systems. *Annu. Rev. Ecol. Syst.* 4: 23.
- Hopley, D. and Suharsono. 2000. *The status of coral reefs in Eastern Indonesia*. Australian Institute of Marine Science, Australia.
- Hughes, T.P., D.R. Bellwood, C. Folke, R.S. Steneck and J. Wilson. 2005. New paradigms for supporting resilience of marine ecosystems. *Trends Ecol. Evol.* 20: 6.
- Hyrenbach, K.D., K.A. Forney and P.K. Dayton. 2000. Marine protected areas and ocean basin management. *Aquat. Conserv.: Mar. Freshwat. Ecosyst.* 10: 22.
- IBM Corporation. 2008. US Government. Retrieved on 12 May 2008 from <http://publib.boulder.ibm.com/infocenter/db2luw/v8/index.jsp?topic=/com.ibm.db2.udb.doc/admin/c0006909>
- IUCN (International Union for Conservation of Nature). 1994. *Guidelines for protected areas management categories*. IUCN, Gland, Switzerland, and Cambridge, UK.
- IUCN (International Union for Conservation of Nature). 2005. *Benefits beyond boundaries*. Proceedings of the 5th IUCN World Parks Congress, Gland, Switzerland. Also retrieved on 17 June 2008 from <http://www.iucn.org/themes/wcpa/wpc2003/pdfs/outputs/recommendations/approved/english/html/r22.htm>.
- IUCN (International Union for Conservation of Nature). 2008. *Establishing marine protected area networks: making it happen*. IUCN-World Commission on Protected Areas, National Oceanic and Atmospheric Administration and The Nature Conservancy, Washington, DC, USA. 118 p.

- IUCN-WCPA (International Union for Conservation of Nature-World Commission on Protected Areas). 2008. Guidelines for applying protected area management categories. Third draft of revised guidelines. WCPA 99. IUCN-WCPA, Gland, Switzerland.
- Jacinto, G.S., P.M. Aliño, C.L. Villanoy, L. Talaue-McManus and E.D. Gomez. 2000. The Philippines, p. 405-423. *In* C.R.C. Sheppard (ed.) *Seas of the millennium: an environmental evaluation*. Pergamon, Amsterdam, Netherlands.
- Jameson, S.C., M.H. Tupper and J.M. Ridley. 2002. The three screen doors: can marine "protected" areas be effective? *Mar. Pollut. Bull.* 44: 6.
- JHU (John Hopkins University). 2003. Indonesia, COREMAP. Bloomberg School of Public Health, Center for Communication Programs. Retrieved on 5 May 2008 from <http://www.jhuccp.org/asia/indonesia/coremap.shtml>.
- Johannes, R.E. 2001. Ignore fishers' knowledge and miss the boat. *Fish Fisher.* 1: 257-271.
- Jones, G.P., M. Srinivasan and G.R. Almany. 2007. Population connectivity and conservation of marine biodiversity. *Oceanography* 20(3): 12.
- Jones, P.J.S. 2006. Collective action problems posed by no-take zones. *Mar. Policy* 30: 13.
- Kelleher, G.E. 1999. Guidelines for marine protected areas. IUCN, Gland, Switzerland, and Cambridge, UK.
- Kenchington, R. and C. Bleakley. 1994. Identifying priorities for marine protected areas in the Insular Pacific. *Mar. Pollut. Bull.* 29 (1-3): 3-9.
- Keulartz, J. and H.A.E. Zwart. 2004. Boundaries, barriers, and bridges philosophical fieldwork in Derawan. Retrieved on 15 May 2008 from <http://www.filosofie.science.ru.nl/derawanrep>.
- Kinlan, B.P. and S.D. Gaine. 2003. Propagule dispersal in marine and terrestrial environments: a community perspective. *Ecol.* 84(8): 14.
- Knowlton, N. and J.B.C. Jackson. 2008. Shifting baselines, local impacts and global change on coral reefs. *PLoS Biol.* 6(2):6.
- Koczberski, G., G.N. Curry, J. Warku and C. Kwam. 2006. Village-based marine resource use and rural livelihoods: Kimbe Bay, West New Britain, Papua New Guinea. TNC Pacific Island Countries Rep. No. 5/06. TNC Indo-Pacific Resource Centre, South Brisbane, Australia.
- Lebel, L., J.M. Anderies, B. Campbell, C. Folke, S. Hatfield-Dodds, T.P. Hughes and J. Wilson. 2006. Governance and the capacity to manage resilience in regional social-ecological systems. *Ecol. Soc.* 11(1): 19. Also retrieved on 15 May 2008 from <http://www.ecologyandsociety.org/vol11/iss1/art19/>.
- Ledesma, M.C., M.P. Dygico and A.M. Songco. 2006. The status of benthic and fish communities in Tubbataha Reef National Marine Park in the last 10 years (1997 to 2006). World Wide Fund for Nature-Philippines, Tubbataha Project and Tubbataha Management Office, Puerto Princesa City, Palawan, Philippines. 74 p. (Unpublished).
- Ledlie, M.N., N.A.J. Graham, J.C. Bythell, S.K. Wilson, S. Jennings, N.V.C. Polunin and J. Hardcastle. 2007. Phase shifts and the role of herbivory in the resilience of coral reefs. *Coral Reefs* 26: 13.
- Leis, J.M. 2006. Are larvae of demersal fishes plankton or nekton? *Adv. Mar. Biol.* 51: 63.
- Leis, J.M. and B.M. Carson-Ewart. 2003. Orientation of pelagic larvae of coral-reef fishes in the ocean. *Mar. Ecol. Progr. Ser.* 252: 15.
- Leisher, C., P.v. Beukering and L.M. Scherf. 2007. Nature's investment bank: how marine protected areas contribute to poverty reduction. Report to TNC, Hawaii, USA.
- Leslie, H.M. 2005. A synthesis of marine conservation planning approaches. *Conserv. Biol.* 19(6): 13.
- Leslie, H., M. Ruckelshaus, I.R. Ball, S. Andelman and H.P. Possingham. 2003. Using siting algorithms in the design of marine reserve networks. *Ecol. Appl.* 13(1): S185-S198.
- Lipsett-Moore, G. 2006. Kimbe Bay MPA network. Guidelines for a community-based planning process. Draft Internal TNC Work. Doc. Vers. 2.
- Louisa, J., L.E. Wood, L. Fish, J. Laughren and D. Pauly. 2008. Assessing progress towards global marine protection targets: shortfalls in information and action. *Oryx* 42: 340-351.
- Lubchenco, J. and K. Grorud-Colvert. 1997. Marine protected areas help safeguard aquatic life. Retrieved on 16 August 2008 from [http://www.geotimes.org/apr07/article.html?id=feature\\_aquatic.html#authors](http://www.geotimes.org/apr07/article.html?id=feature_aquatic.html#authors).
- Lundquist, C.J. and E.F. Granek. 2005. Strategies for successful marine conservation: integrating socioeconomic, political, and scientific factors. *Conserv. Biol.* 19(6): 7.
- Lutchman, I. 2005. Marine protected areas: benefits and costs for islands. World Wildlife Fund, Netherlands.
- MacAndrews, C. 1998. Improving the management of Indonesia's national parks: lessons from two case studies. *Bull. Indones. Econ. Stud.* 34(1): 121-137.
- Mangubhai, S. (n.d.). Interim guidelines for the assessment of management effectiveness of marine protected areas in the Western Indian Ocean. Report produced for IUCN and supported by Norwegian Agency for Development Cooperation. 37 p.
- MAPC (Marine Protected Areas Center). 2008. Framework for developing the National System of Marine Protected Areas. Revised draft. National Oceanic and Atmospheric Administration, Maryland, USA.



- Marshall, N.A. and P.A. Marshall. 2007. Conceptualizing and operationalizing social resilience within commercial fisheries in northern Australia. *Ecol. Soc.* 12(1): 14.
- Mascia, M.B. 2004. Social dimensions of marine reserves, p. 164-186. *In* C. Dahlgren and J. Sobel (eds.) *Marine reserves: a guide to science, design, and use*. Island Press, Washington, DC, USA.
- May, D. 2005. Folk taxonomy of reef fish and the value of participatory monitoring in Wakatobi Natural Park, Southeast Sulawesi, Indonesia. Retrieved on 9 October 2008 from <http://spc.int/coastfish/news/trad/18/Traditional18.pdf#page=18>.
- Maypa, A. and R. Diaz. 2008. Data for the SPR Project. Coastal Conservation and Education Foundation, Cebu, Philippines. (Unpublished).
- McClanahan, T.R., J.C. Castilla, A. White and O. Defeo. (In press). Healing small-scale fisheries and enhancing ecological benefits by facilitating complex social-ecological systems. Also retrieved on 9 May 2008 from <http://www.springerlink.com/content/t75kr077712x1x28/fulltext.pdf?page=1>.
- McNeely, J. and K. Miller. 1982. Proceedings of the World Congress on National Parks and Protected Areas, 11-22 October 1982, Bali, Indonesia.
- Meester, G.A., A. Mehrotra, J.S. Ault and E.K. Baker. 2004. Designing marine reserves for fishery management. *Manage. Sci.* 50(8): 12.
- MIC (Micronesians in Island Conservation) Network. 2004. Effective conservation programs scorecard. The Nature Conservancy, Hawaii, Philippines. (Unpublished).
- Miclat, R.I., R.O.M. Gonzales and P.M. Aliño. 2008. Proceedings of the Coastal Zone Philippines 2: Sustainable Financing and Marine Protected Areas Congress. MPA Support Network, Marine Environment and Resources Foundation and Marine Science Institute, University of the Philippines, Quezon City, Philippines. 100 p.
- Ministry of Marine Affairs and Fisheries Directorate General (Marine). Coasts and small islands. Retrieved on 21 July 2008 from [www.cti-secretariat.net](http://www.cti-secretariat.net).
- Mora, C. and P.F. Sale. 2002. Are populations of coral reef fish open or closed? *Trends Ecol. Evol.* 17(9): 6.
- Mous, P.J. 2008. Design of community-managed marine reserves. COREMAP Phase II Tech. Comm.
- Mumby, P.J. 2006. Connectivity of reef fish between mangroves and coral reefs: algorithms for the design of marine reserves at seascape scales. *Biol. Conserv.* 128: 8.
- Mumby, P.J., A. Hastings and H.J. Edwards. 2007. Thresholds and the resilience of Caribbean coral reefs. *Nature* 450: 4.
- Murray, S.N., R.F. Ambrose, J. Bohnsack, L. Botsford, M. Carr, G. Davis, P. Dayton, D. Gotshall, D. Gunderson, M. Hixon, J. Lubchenco, M. Mangel, A. MacCall, D. McArdle, J. Ogden, J. Roughgarden, R. Starr, M. Tegner and M. Yoklavich. 1999. No-take reserve networks: sustaining fishery populations and marine ecosystems. *Fisheries* 24(11): 14.
- NOAA (National Oceanic and Atmospheric Administration). 2005. Social science methods for marine protected areas: an overview for MPA managers and staff. NOAA Coastal Services Center and National Marine Protected Area Center. Retrieved on 21 July 2008 from [www.csc.noaa.gov/mpass](http://www.csc.noaa.gov/mpass).
- NRC (National Research Council). 2000. *Marine protected areas: tools for sustaining ocean ecosystems*. National Academy Press, Washington, DC, USA.
- NSO (National Statistics Office). 2007. National statistics. NSO, Manila, Philippines. Retrieved on 15 July 2008 from [www.census.gov.ph](http://www.census.gov.ph).
- Nystrom, M. and C. Folke. 2001. Spatial resilience of coral reefs. *Ecosystems* 4(5): 12.
- Orr, J.C., V.J. Fabry, O. Aumont, L. Bopp, S. Doney, R. Feely, A. Gnanadesikan, N. Gruber, A. Ishida, F. Joos, R.M. Key, K. Lindsay, E. Maier-Reimer, R. Matear, P. Monfray, A. Mouchet, R.G. Najjar, G.-K. Plattner, K. Rodgers, C.L. Sabine, J. Sarmiento, R. Schlitzer, R. Slater, I. Totterdell, M.-F. Weirig, Y. Yamanaka and A. Yool. 2005. Anthropogenic ocean acidification over the twenty-first century and its impact on calcifying organisms. *Nature* 437: 5.
- Palumbi, S.R. 2003. Population genetics, demographic connectivity, and the design of marine reserves. *Ecol. Appl.* 13(1): 12.
- Palumbi, S.R. 2004. Marine reserves and ocean neighborhoods: the spatial scale of marine populations and their management. *Annu. Rev. Environ. Resour.* 29: 57.
- Pauly, D. 1995. Anecdotes and the shifting baseline syndrome of fisheries. *Trends Ecol. Evol.* 10(10): 1.
- Pet-Soede, L. 2000. How to avoid paper parks: experiences from Southeast Asia. Paper presented at the 9th International Coral Reef Symposium, 23-27 October 2000, Bali, Indonesia.
- Pet-Soede, L. 2006. MPAs in Indonesia: what progress has been made since 1984? *MPA News* 8(1): 3.
- PhilReefs. (Coral Reef Information Network of the Philippines). 2008. Reefs through time: initiating the state of the coasts reports. PhilReefs, MPA Support Network, Marine Environment and Resources Foundation and Marine Science Institute, University of the Philippines, Quezon City, Philippines. 152 p.
- PISCO (Partnership for Interdisciplinary Studies of Coastal Oceans). 2007. The science of marine reserves. Second ed. International vers. Technical Report. PISCO, Oregon State University, Stanford University, University of California Santa Barbara and University of California Santa Cruz, California, USA. Also retrieved on 17 June 2008 from [www.piscoweb.org/recommendations/approved/english/html/r22.htm](http://www.piscoweb.org/recommendations/approved/english/html/r22.htm).

- Pollnac, R.B., B.R. Crawford and M.L.G. Gorospe. 2001. Discovering factors that influence the success of community-based marine protected areas in the Visayas, Philippines. *Ocean Coast. Manage.* 44: 683-710.
- Pomeroy, R.S., J.E. Parks and L.M. Watson. 2004. How is your MPA doing? A guidebook of natural and social indicators for evaluating marine protected area management effectiveness. International Union for Conservation of Nature, Gland, Switzerland, and Cambridge, UK. 215 p.
- Pomeroy, R.S., M.B. Mascia and R.B. Pollnac. 2006. Marine protected areas: the social dimension, p. 149-182. *In* FAO (Food and Agriculture Organization) Expert Workshop on Marine Protected Areas and Fisheries Management: Review of Issues and Considerations. Background Paper 3. FAO, Rome, Italy.
- Possingham, H.P., I.R. Ball and S. Andelman. 2000. Mathematical methods for identifying representative reserve networks, p. 291-305. *In* S. Ferson and M. Burgman (eds.) *Quantitative methods for conservation biology*. Springer-Verlag, New York, USA.
- Princeton University. 2007. Data and statistical services. Retrieved on 17 June 2008 from [http://dss.princeton.edu/online\\_help/analysis/interpreting\\_regression.htm](http://dss.princeton.edu/online_help/analysis/interpreting_regression.htm).
- Pulliam, H.R. and B.J. Danielson. 1991. Sources, sinks, and habitat selection: a landscape perspective on population dynamics. *Am. Nat.* 137: 16.
- Resosudarmo, B.P., editor. 2005. The politics and economics of Indonesia's natural resources. Institute of Southeast Asian Studies, Singapore.
- Roberts, C.M. 1997a. Connectivity and management of Caribbean coral reefs. *Science* 278: 4.
- Roberts, C.M. 1997b. Ecological advice for the global fisheries crisis. *Tree* 12: 35-40.
- Roberts, C.M. 1998. Sources, sinks and the design of marine reserve networks. *Fisheries* 23(7): 3.
- Roberts, C.M. 2007. The unnatural history of the sea. The past and future of humanity and fishing. Island Press, Great Britain.
- Roberts, C.M. and J.P. Hawkins. 1997. How small can a marine reserve be and still be effective? *Coral Reefs* 16:150.
- Roberts, C.M., J.P. Hawkins and W.E.S. Campaign. 2000. Fully-protected marine reserves: a guide. WWF, Washington, DC, USA and Environment Department, University of New York, New York, USA.
- Roberts, C.M., J.A. Bohnsack, F. Gell, J.P. Hawkins and R. Goodridge. 2001. Effects of marine reserves on adjacent fisheries. *Science* 294.
- Roberts, C.M., G. Branch, R.H. Bustamante, J.C. Castilla, J. Dugan, B.S. Halpern, K.D. Lafferty, H. Leslie, J. Lubchenco, D. McArdle, M. Ruckelshaus and R.R. Warner. 2003a. Application of ecological criteria in selecting marine reserves and developing reserve networks. *Ecol. Appl.* 13(1).
- Roberts, C.M., S. Andelman, G. Branch, R.H. Bustamante, J.C. Castilla, J. Dugan, B.S. Halpern, K.D. Lafferty, H. Leslie, J. Lubchenco, D. McArdle, H.P. Possingham, M. Ruckelshaus and R.R. Warner. 2003b. Ecological criteria for evaluating candidate sites for marine reserves. *Ecol. Appl.* 13(1): S199-S214.
- Ruddle, K., E. Hviding and R.E. Johannes. 1992. Marine resources management in the context of customary tenure. *Mar. Resour. Econ.* 7: 249-273.
- Russ, G.R. and A.C. Alcala. 2004. Marine reserves: long-term protection is required for full recovery of predatory fish populations. *Oecologia* 138: 6.
- Salafsky, N., R. Margoluis and K. Redford. 2001. Adaptive management: a tool for conservation practitioners. Retrieved 1 May 2008 from [http://fosonline.org/Site\\_Docs/AdaptiveManagementTool.pdf](http://fosonline.org/Site_Docs/AdaptiveManagementTool.pdf).
- Salm, R.V., S.E. Smith and G. Llewellyn. 2000. Mitigating the impact of coral bleaching through marine protected area design, p. 81-88. *In* H.Z. Schuttenberg (ed.) *Coral bleaching: causes, consequences and response*. Selected papers presented at the 9th International Coral Reef Symposium on Coral Bleaching: Assessing and Linking Ecological and Socioeconomic Impacts, Future Trends and Mitigation Planning. *Coast. Manage. Rep.* 2230.
- Sandwith, T., C. Shine, L. Hamilton and D. Sheppard. 2001. Transboundary protected areas for peace and co-operation. International Union for Conservation of Nature, Gland, Switzerland, and Cambridge, UK. 111 p.
- Sather, C. 1997. The Bajau laut: adaptation, history, and fate in a maritime fishing society of South-eastern Sabah. Oxford University Press, New York, USA.
- Scholz, A., K. Bonzon, R. Fujita, N. Benjamin, N. Woodling, P. Black and C. Steinback. 2004. Participatory socioeconomic analysis: drawing on fishermen's knowledge for marine protected area planning in California. *Mar. Policy* 28: 15.
- SCRFA (Society for the Conservation of Reef Fish Aggregations). 2007. A handbook for the conservation and management of reef fish spawning aggregations. University of Hong Kong, Hong Kong. Also retrieved on 10 July 2008 from <http://www.scrfa.org/server/studying/manual.htm>.
- Shanks, A.L., B.A. Grantham and M.H. Carr. 2003. Propagule dispersal distance and the size and spacing of marine reserves. *Ecol. Appl.* 13 (Supplement): 10.

- Skilbred, J., C. Corrigan, J. Almany, E. McLeod, A. Lombana and H. Fox. 2006. A literature review of current knowledge on the biophysical aspects of marine protected area network design and implementation. Report of the Marine Learning Partnership, Global Conservation Program, The Nature Conservancy, Hawaii, USA.
- Sorensen, J.C. and S.T. McCreary. 1990. Institutional arrangements for managing coastal resources and environment. Renewable Resources Info. Ser. No. 2. US Department of the Interior and National Park Service, Washington DC, USA.
- StatSoft, Inc. 2008. STATISTICA. Retrieved on 27 May 2008 from <http://www.statsoft.com/textbook/stbasic.html#Correlationsc>.
- Staub, F. and M.E. Hatzios. 2004. Score card to assess progress in achieving management effectiveness goals for marine protected areas. World Bank, Washington DC, USA. 30 p.
- Steneck, R.S., M.H. Graham, B.J. Bourque, D. Corbett, J.M. Erlandson, J.A. Estes and M.J. Tegner. 2002. Kelp forest ecosystems: biodiversity, stability, resilience and future. *Environ. Conserv.* 29: 23.
- Stern, M.J. 2006. Measuring conservation effectiveness in the marine environment: a review of evaluation techniques and recommendations for moving forward. Consultant Report to The Nature Conservancy, Hawaii, USA.
- Stewart, R.R., T. Noyce and H.P. Possingham. 2003. Opportunity cost of ad hoc marine reserve design decisions: an example from South Australia. *Mar. Ecol. Progr. Ser.* 253: 13.
- Tan, J.M.L. 1996. A field guide to the whales and dolphins of the Philippines. Bookmark, Makati City, Philippines.
- Tetreault, I. and R.F. Ambrose. 2007. Temperate marine reserves enhance targeted but not untargeted fishes in multiple no-take MPAs. *Ecol. Appl.* 17(8): 17.
- TNC (The Nature Conservancy). 2007. The Derawan Islands: protecting an underwater paradise. Retrieved on 17 June 2008 from <http://www.tnc-seacmpa.org/derawan.htm>.
- TNC (The Nature Conservancy) and WWF (World Wildlife Fund). 2006. Infosheet: Berau declares the establishment of a marine protected area. Retrieved on 15 February 2008 from [http://www.tnc-seacmpa.org/berau\\_mpa.htm](http://www.tnc-seacmpa.org/berau_mpa.htm).
- Tomascik, T., A.J. Mah, A. Nontji and M.K. Moosa. 1997. The ecology of the Indonesian Seas. Parts 1 and 2. EDM I and Periplus, Singapore.
- Treml, E.A., P.N. Halpin, D.L. Urban and L.F. Pratson. 2007. Modelling population connectivity by ocean currents, a graph-theoretic approach for marine conservation. *Landscape Ecol.*: 18.
- Tubbataha PAMB (Protected Area Management Board). 2007. TRNP management plan. Tubbataha PAMB, Palawan, Philippines. (Unpublished).
- Tun, K., L.M. Chou, A. Cabanban, V.S. Tuan, S.K. Suharsono and D. Lane. 2004. Status of coral reefs, coral reef monitoring and management in Southeast Asia, p. 235-276. *In* C.R. Wilkinson (ed.) Status of coral reefs of the world. Vol. 1. Australian Institute for Marine Science, Queensland, Australia.
- Turak, E. and J. Aitsi. 2002. Assessment of coral biodiversity and status of coral reefs of East Kimbe Bay, New Britain, Papua New Guinea. Report to The Nature Conservancy as part of the Eastern Kimbe Bay rapid ecological assessment. TNC, Kimbe Bay, West New Britain, Papua New Guinea.
- Turak, E. and J. Shouhoka. 2003. Coral diversity and status of the coral reefs in the Raja Ampat Islands, Papua province, Indonesia. Final Report to The Nature Conservancy. TNC, Hawaii, USA.
- UNEP-WCMC (United Nations Environment Programme-World Conservation Monitoring Centre). 2008. Establishing national and regional networks of marine protected areas: a review of progress with lessons learned. UNEP-WCMC, Cambridge, UK.
- UP-MSI, ABC, ARCBC, DENR and ASEAN. 2002. Marine protected areas in Southeast Asia. ASEAN Regional Centre for Biodiversity Conservation, Department of Environment and Natural Resources, Laguna, Philippines. 142 p. and 10 maps.
- US IOTWSP (US Indian Ocean Tsunami Warning System Program). 2007. How resilient is your coastal community? A guide for evaluating coastal community resilience to tsunamis and other coastal hazards. US IOTWSP supported by the US Agency for International Development and partners, Bangkok, Thailand. 144 p.
- Verheij, E. and J. Aitaro. 2006. Building a resilient network of protected areas in Palau. The Nature Conservancy Report, Hawaii, USA.
- Veron, J.E.N., et al. 2008. Coral Triangle boundaries. Retrieved on 15 September 2008 from <http://conserveonline.org/workspace/tnc coraltriangle/documents/withkeyword-documents.html>. (Unpublished).
- Warner, R.R. and R.K. Cowen. 2002. Local retention of production in marine populations: evidence, mechanisms, and consequences. *Bull. Mar. Sci.* 70 (Supplement): 4.
- WCPA (World Commission on Protected Areas). 2008. Guidelines for applying protected area management categories. A draft for WCPA. Retrieved on 15 May 2008 from <http://groups.google.com/group/wcpamarine-summit/web/consultation-on-marine-guidance-for-the-iucn-protected-area-categories-system?hl=en>.
- WCPA / IUCN (World Commission on Protected Areas / International Union for Conservation of Nature). 2007. Establishing networks of marine protected areas: a guide for developing national and regional capacity for building MPA networks. Nontechnical summary report. WCPA / IUCN, Cambridge, UK.



- WCS (World Conservation Society). 2008. Report card – program monitoring of Taman Nasional Karimunjawa, 2005-2006. WCS, Bogor, Indonesia.
- Wells, S. and J. Day. 2004. Application of the IUCN protected area management categories in the marine environment. *Parks* 14(3): 10.
- West, J.M. and R.V. Salm. 2003. Resistance and resilience to coral bleaching: implications for coral reef conservation and management. *Conserv. Biol.* 17: 1.
- WFC (WorldFish Center). 2007. Coral reef MPAs of East Asia and Micronesia. WorldFish Center (ReefBase Project), Sea Around Us Project, Japan Wildlife Research Center. CD.
- White, A.T., R.-L. Eisma-Osorio and S.J. Green. 2005. Integrated coastal management and marine protected areas: complementarity in the Philippines. *Ocean Coast. Manage.* 48: 948-971.
- White, A.T., S. Kilarski, A. Cros and A. Green. 2008. Marine protected areas in the Coral Triangle: issues and options analysis to support the Technical Working Group in developing a Coral Triangle Initiative Plan of Action. The Nature Conservancy, Global Marine Team and Asia Pacific Program, Hawaii, USA.
- White, A.T. and A. Cruz-Trinidad. 1998. The values of Philippine coastal resources: why protection and management are critical. Coastal Resource Management Project, Cebu City, Philippines. 96 p.
- White, A.T., A.T. Meneses and M.F. Ovenden. 2004. Management rating system for marine protected areas: an important tool to improve management. Department of Agriculture-Bureau of Fisheries and Aquatic Resources, Cebu City, Philippines.
- White, A.T., C.A. Courtney and A. Salamanca. 2002. Experience with marine protected area planning and management in the Philippines. *Coast. Manage.* 30(1): 1-26.
- White, A.T., P.M. Aliño and A.T. Meneses. 2006. Creating and managing marine protected areas in the Philippines. Fisheries Improved for Sustainable Harvest, Coastal and Community Environment Foundation, and the University of the Philippines Marine Science Institute, Cebu City, Philippines. 83 p.
- White, A.T., L.Z. Hale, Y. Renard and L. Cortesi, editors. 1994. Collaborative and community-based management of coral reefs. Kumarian Press, Connecticut, USA. 130 p.
- White, A.T., A. Maypa, S. Tesch, R. Diaz, E. White and R. Martinez. 2008. Summary field report: coral reef monitoring expedition to Tubbataha Reefs National Marine Park, Sulu Sea, Philippines, 26 March-1 April 2008. Coastal Conservation and Education Foundation, Cebu City, Philippines. Retrieved on 15 July 2008 from [www.coast.ph](http://www.coast.ph).
- Wikipedia. 2008. Correlation. Retrieved on 15 May 2008 from <http://en.wikipedia.org/wiki/Correlation>.
- Wilkinson, C. 2004. Status of coral reefs of the world: 2004. Australian Institute of Science, Queensland, Australia.
- Willis, T., R. Millar and R. Babcock. 2003. Protection of exploited fishes in temperate regions: high density and biomass of snapper *Pagrus auratus* (Sparidae) in northern New Zealand marine reserves. *J. Appl. Ecol.* 40: 13.
- Wiryanan, B., M. Khazali and M. Knight, editors. 2005. *Menuju kawasan konservasi laut Berau, Kalimantan Timur. Status sumberdaya dan proses pengembangannya*. Program Bersama Kelautan Berau Mitra Pesisir / Coastal Resource Management Project II, United States Agency for International Development, World Wildlife Fund and The Nature Conservancy, Jakarta, Indonesia. 127 p.
- Wood, L. 2007. MPA Global: a database of the world's marine protected areas. Sea Around Us Project, United Nations Environment Programme-World Conservation Monitoring Centre and World Wildlife Fund. Retrieved on 15 July 2008 from [www.mpaglobal.org](http://www.mpaglobal.org).
- World Bank. 1992. Conserving biological diversity: a strategy for the Asia Pacific. World Bank Tech. Pap. 193.
- World Bank. 2005. Philippines environment monitor on coastal and marine resource management. World Bank, Washington, DC, USA.
- World Bank. 2006. Scaling up marine management: the role of marine protected areas. International Bank for Reconstruction and Development / World Bank, Washington, DC, USA. 120 p.
- WWF (World Wildlife Fund). 2003. Bismarck Solomon Seas ecoregion. A cradle of marine biodiversity. WWF South Pacific Programme, Suva, Fiji.
- WWF (World Wildlife Fund). 2006. Tubbataha Reefs, a marine protected area that works: a case study on the Philippines. WWF-Philippines, Quezon City, Philippines.
- WWF (World Wildlife Fund). 2007. Marine protected areas: providing a future for fish and people. World Wildlife Fund, Gland, Switzerland.
- Yulianto, I. and Y. Herdiana. 2006. *Laporan monitoring: kajian tingkat kepatuhan (compliance) di Taman Nasional Karimunjawa, 2003-2005*. Wildlife Conservation Society-Marine Program Indonesia, Bogor, Indonesia. 11 p.

# APPENDIX 1

## Scaling-up MPAs to a network: a learning tool

Respondent/s: \_\_\_\_\_ CN#: \_\_\_\_\_

Date: \_\_\_\_\_ Time started: \_\_\_\_\_ Time finished: \_\_\_\_\_

**Notes:**

- ♦ This questionnaire uses an answer key (see p. 101) which respondents can refer to for the standard numerical rating system.
- ♦ Standard numerical rating system:  
*1 = lowest; 2 = low to medium; 3 = medium; 4 = medium to high; 5 = highest*  
*NI = no information / don't know; NA = not applicable*

**I. SITE DESCRIPTION**

This section covers human activities and natural disturbances within the core zone/s of the MPA / network. Please rate the level of impact of the following:

Stresses	Severity of impact (Rate: 1-5 / NI / NA)	If very high / high (level 1 or 2), itemize management actions taken to address it
Dynamite fishing		
Local plant poison fishing		
Chemical poisoning		
General illegal fishing activities		
Commercial fishing		
Aquarium fishing		
Live fish restaurant trade		
Artisanal / recreational fishing		
Harvest of invertebrates for food		
Harvest of invertebrates for curio sales		
Tourist diving / snorkeling damage		
Coastal development for tourism facilities		
Siltation		
Sewage pollution		
Industrial pollution		
Waste (plastics, etc.)		
Typhoons		
Coral bleaching		
Crown-of-thorns outbreak		
Other impacts		

**II. MPA / NETWORK PLANNING AND DESIGN** (up to legal declaration)

1. Does the MPA / network design consider the following objectives?

Objectives	Extent of consideration (Rate: 1-5 / NI / NA)	Briefly describe strategy / approach to achieve objectives
Fisheries		
Habitat conservation		
Resilience		
Economic development (e.g., sustainable livelihoods)		
Social education towards environmental awareness		
Others		

2. To what extent were local stakeholders consulted during the planning of the MPA / network?

<b>Stakeholders</b> (Rate: 1-5 / NI / NA)	<b>Extent of consultation</b>
National government agencies	
National elected officials	
Local government agencies	
Local elected officials	
Traditional leaders / elders	
Indigenous people	
Local fishers	
Local illegal fishers / those using destructive fishing methods and gears	
Transient fishers (from outside the park)	
Business representatives (tourism-related)	
Business representatives (nontourism-related)	
Women	
Youth	
NGOs	
Others	

3. Were there any sectors / stakeholders that were not included in the public consultations?  Yes /  No  
If yes, list who and why were they not included?
4. How well was local traditional / indigenous / historical knowledge (i.e., fish spawning areas, etc.) integrated into the MPA / network design? Rate extent: \_\_\_\_\_  
List traditional knowledge which was integrated and who provided it.
5. Placement of the no-take zones: Rate how well in terms of:
  - ecological considerations \_\_\_\_\_
  - social considerations \_\_\_\_\_
  - manageability considerations \_\_\_\_\_
6. Are there any zones wrongly placed?  Yes /  No If yes, list areas and why.
7. Have any existing key ecological areas been missed out in the MPA / network design?  Yes /  No  
If yes, list areas and why.
8. If the MPA / network planning and design could be redone, what would you suggest to improve the design?
9. Any other comments about the network planning and design?

**III. MPA / NETWORK MANAGEMENT AND IMPLEMENTATION** (since legal establishment)

**A. MPA Management**

1. Which MPA or geographic area within the network are you managing?
2. What is the basis of the MPA?
  - a. legal establishment
  - b. traditional establishment
  - c. community establishment
  - d. combination - specify: \_\_\_\_\_
  - e. verbal establishment
  - f. don't know
3. Who approved it?
4. Is there an established management group for this MPA?  Yes /  No  
If yes, what is name of group? \_\_\_\_\_  
Describe the type of group (i.e., multisectoral, community organization, etc.). \_\_\_\_\_
5. How would you rate the group's management capacity? Rate: \_\_\_\_\_
6. How would you rate the group's capacity to implement? Rate: \_\_\_\_\_



**B. MPA / Network Implementation**

1. How common are these strategies used, and how effective are they at gaining stakeholders' adoption of the MPA / network?

<b>Strategies</b>	<b>How common? (Rate: 1-5 / NI / NA)</b>	<b>Extent of effectiveness (Rate: 1-5 / NI / NA)</b>
Public consultations / community meetings		
Communication activities (i.e., film showings, photo exhibits)		
Information materials (i.e., brochures, posters, etc.)		
Awareness-raising activities (i.e., coastal cleanup, etc.)		
Participatory biophysical assessments		
Social assessments / interviews		
Research / survey results feedback to key stakeholders		
Planning meetings with government officials		
Multistakeholder planning workshops		
Trainings in MPA management skills and leadership development		
Community surveillance and enforcement of MPA		
Publications		
National and international visitors (educational tours, funders' visits)		
Others		

2. Considering all stakeholders / constituencies associated with the MPA / network, what percentage of people:

- support \_\_\_\_\_
- oppose \_\_\_\_\_
- are indifferent \_\_\_\_\_

to the MPA / network? (should add up to 100%)

List stakeholders who oppose and why do/did they oppose it.

3. Are the rules within the MPA / network?

- a. very simple
- b. simple
- c. of average complexity
- d. complicated
- e. very complicated and difficult to understand

4. To what extent are these rules implemented? Rate: \_\_\_\_\_

5. How well are zone/s' rules and regulations enforced within the MPA / network?

<b>Specific zones</b>	<b>Consistency of implementation (Rate: 1-5 / NI / NA)</b>
No-take zone	
No-take zone	
Other zones	
Other zones	

6. Who manages and administers network-wide law enforcement? \_\_\_\_\_

7. Which stakeholders are involved in MPA / network management activities?

<b>Stakeholders</b>	<b>Relative importance of leadership provided to the MPA / network management (Rate: 1-5 / NI / NA)</b>
National government agencies	
National elected officials	
Local government agencies	
Local elected officials	
NGOs	
Traditional leaders / elders	
Local fisher leaders	
Police and law enforcement agencies	
Local business representatives	
Others	

8. Who enforces the rules and regulations?

<b>Enforcement group</b>	<b>Relative involvement in enforcement</b> (Rate: 1-5 / NI / NA)
National government environment staff	
National government police / navy / enforcers	
Local police	
Local government rangers	
Community enforcers	
Others	

9. Describe the level of compliance of each of the stakeholder groups of the network rules and regulations.

<b>Stakeholders</b>	<b>Level of compliance</b> (Rate: 1-5 / NI / NA)
National government agencies	
National elected officials	
Local government agencies	
Local elected officials	
Traditional leaders / elders	
Indigenous people	
Local fishers	
Local illegal fishers / those using destructive fishing methods and gears	
Transient fishers (from outside the park)	
Business representatives (tourism-related)	
Business representatives (nontourism-related)	
Women	
Youth	
NGOs	
Others	

10. Are local materials about the MPA / network objectives and regulations available in the local language/s?  Yes /  No

11. Are boundaries clearly demarcated with physical structures (e.g., buoys, signboards, etc.)?  Yes /  No

12. Is there a physical structure / office that is sited near the MPA / network where people can visit to learn about / discuss MPA / network-related activities / problems?  Yes /  No

13. What are the most common types of problem within the MPA / network?

<b>Problem type</b>	<b>Frequency of problem</b> (Rate: 1-5 / NI / NA)
Illegal and destructive fishing activities	
Intrusion by locals within no-take zones	
Intrusion by outsiders within no-take zones	
Miscommunications between and among stakeholders	
Influential persons prompting selective implementation of laws	
Problems relating to law enforcers and enforcement	
Lack of understanding of the rules and regulations	
Others	

14. What policies help to resolve conflicts emerging in the implementation of the MPA / network?

<b>Policy</b>	<b>Level of assistance in conflicts</b> (Rate: 1-5 / NI / NA)
National legislation	
Local legislation	
Community rules / regulations	
Traditional laws	
Religious literatures	
Others	

15. List the current problems of MPA / network implementation and provide details.

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16. Rate the relative importance of the implementation strategies over the next 1-5 years.

Strategy	Relative importance (Rate: 1-5 / NI / NA)
Public education and awareness-raising activities (i.e., research feedback, film showing, etc.)	
Development of various information materials targeting particular stakeholders (i.e., brochures, flyers, posters, newsletters, etc.)	
Monitoring and evaluation of management and documentation	
Monitoring and evaluation of biophysical changes and documentation (i.e., coral reef assessments)	
Scientific research (e.g., understanding larval flow [sources and sinks] and its relationship with the MPAs	
Information management systems	
Management planning	
Policy work	
Enhancing political will	
Developing capacity of management board	
Taking a “doing and learning” approach (as opposed to waiting and planning out the best situation)	
Adopting an integrated coastal management approach	
Coastal law enforcement and compliance	
Sustainable financing	
Providing livelihood activity options	
Expanding the no-take zones	
Others	

**IV. MPA / NETWORK MONITORING AND EVALUATION** (since implementation began)

**A. Observed Biophysical Outcomes**

1. Rate the change within the core no-take zones.

- |  |       |
|--|-------|
|  | Rate  |
| a. Diversity of marine life  | _____ |
| b. Size of fish  | _____ |
| c. Numbers of juvenile fish  | _____ |
| d. Numbers of threatened species (i.e., turtles, dolphins, groupers, napoleon wrasses, etc.) | _____ |
| e. Critical habitats (corals, mangroves, etc.)   | _____ |

2. Rate the change outside of core no-take zones but within the MPA / network (around the edges of the park /buffer zone)

- |  |       |
|--|-------|
|  | Rate  |
| a. Diversity of marine life  | _____ |
| b. Size of fish caught   | _____ |
| c. Numbers of juvenile fish  | _____ |
| d. Numbers of threatened species (i.e., turtles, dolphins, groupers, napoleon wrasses, etc.) | _____ |
| e. Critical habitats (corals, mangroves, etc.)   | _____ |

3. Has the MPA / network attracted additional outside fishers to the area?

- a. Fishers have moved away
- b. No change
- c. Few fishers
- d. Hundreds of fishers
- e. Thousands of fishers

4. What other changes have taken place in the resources since declaration of the MPA / network? \_\_\_\_\_

5. Is scientific research used to assess the management and policies of the core zones and the network? [ ] Yes / [ ] No  
If yes, describe the research briefly and how it was used. \_\_\_\_\_



**B. Observed Social Outcomes**

- |   |             |
|---|-------------|
|   | <b>Rate</b> |
| 1. Local stakeholders' acceptance of external human and financial support                               | _____       |
| 2. Relationship of local stakeholders and park management   | _____       |
| 3. Stakeholders think the MPA is: (excellent, good, fair, poor or bad)                                  | _____       |
| 4. Stakeholders' willingness to share financial counterpart (always, often, sometimes, rarely or never) | _____       |
| 5. Stakeholders' willingness to share human counterpart   | _____       |
| 6. Stakeholders' awareness of marine conservation   | _____       |
| 7. Stakeholders' participation in marine conservation activities  | _____       |
| 8. Extent of support and backing of local officials   | _____       |
| 9. Extent of support and backing of national officials  | _____       |

**C. Observed MPA / Network Benefits**

1. How much has each stakeholder benefited from the MPA / network?

Stakeholders	Extent of acquired benefits (Rate: 1-5 / NI / NA)
National government agencies	
National elected officials	
Local government agencies	
Local elected officials	
Traditional leaders / elders	
Indigenous people	
Local fishers	
Local illegal fishers / those using destructive fishing methods and gears	
Transient fishers (from outside the park)	
Community / people's organizations	
Reserve / sanctuary members (for social networks)	
Business representatives (tourism-related)	
Business representatives (nontourism-related)	
Women	
Youth	
NGOs	
Others	

2. Indicate the extent of benefits and outcomes according to particular socioeconomic aspects brought about by the MPA/ network.

Benefits and outcomes	Extent of acquired benefits (Rate: 1-5 / NI / NA)
Skills development	
Women empowerment	
Youth development	
Sensitivity to minority / ethnic groups (i.e., facilitates their involvement, assistance provided, etc.)	
Opened business opportunities (tourism-related)	
Opened business opportunities (nontourism-related)	
Supplemental or alternative livelihood programs provided	
Outreach programs conducted (medical, health missions, etc.)	
Education (environmental awareness, fisheries and conservation laws, etc.)	
Increased fish catch	
Increased household income	
Increased unity within the community	
Increased community pride	
Others	

3. What factors are inhibiting the improvement of the MPA / network management?

Inhibiting factors	Level of extent (Rate: 1-5 / NI / NA)
Cultural	
Political interventions	
Lack of leadership	
Weak planning and implementation	
Lack of resources (financial)	
Lack of capacity	
Lack of interest	
Project implementation difficulties	
Unwillingness to adopt the MPA / network concept	
Others	

4. Have there been any key interventions / actions / problems that the questionnaire missed that have had a major influence on the MPA / network management. Describe.

**V. SOCIAL NETWORK OF MPAs**

1. Is an MPA social network formally established?  Yes /  No  
 If yes, does the MPA network have a main steering / practitioners' group?  Yes /  No  
 If yes, what is name of the management group? \_\_\_\_\_ What is its role? \_\_\_\_\_  
 If no, is there an informal group of MPA practitioners who meet?  Yes /  No  
 If yes, what is name of informal group? \_\_\_\_\_ What are the goals of the informal group?  
 \_\_\_\_\_ How would this social network assist in MPA management?  
 \_\_\_\_\_
2. What are the benefits of being a member of the network?  
 \_\_\_\_\_
3. How often does the group meet? \_\_\_\_\_
4. How active is this MPA social network group? Rate: \_\_\_\_\_
5. What is the management capacity of the MPA social network? Rate: \_\_\_\_\_
6. Is there a local / foreign institution assisting with the capacity building of the MPA social network?  Yes /  No  
 If yes, what is its role and describe it. \_\_\_\_\_
7. Has the MPA management stimulated other geographic areas and stakeholders to establish their own network of MPAs?  
 Yes /  No If yes, what areas? \_\_\_\_\_
8. Does the MPA network interact with other nearby or MPA networks outside of the country?  Yes /  No  
 If yes, list networks and ways the MPA network interacts / shares experiences.  
 \_\_\_\_\_
9. What are the major lessons learned in MPA implementation which you would share with other MPA network implementers?  
 \_\_\_\_\_

**VI. THE MPA / NETWORK IN THE INTERNATIONAL / NATIONAL CONTEXT**

1. Considering the Fifth World Parks Congress Recommendation 5.22.1-a: that at least 20-30% of each habitat be included in strictly protected MPAs and the Convention of Biodiversity target of 10% of Exclusive Economic Zones by 2010:
  - a. Is there a conscious effort on the part of the national government to achieve the said targets for your country?  Yes /  No  
 Please elaborate.  
 \_\_\_\_\_
  - b. If yes, rate how near is the country from achieving the said targets? Rate: \_\_\_\_\_  
 Do you think that the MPA core zones and MPAs in general in the country should be smaller or larger? Please elaborate.  
 \_\_\_\_\_

- c. Should there be more or less “no-take zones” in the country? Please elaborate.
- d. Do you think the 20-30% of each habitat target and the 10% of Exclusive Economic Zone target are:
  - i. very easy to achieve
  - ii. easy to achieve
  - iii. difficult to achieve
  - iv. very difficult to achieve
  - v. impossible to achieve
- 2. Do you see MPAs spreading within the country in the coming years? [ ] Yes / [ ] No  
Explain briefly. \_\_\_\_\_
- 3. What are the main problems prohibiting the expansion of MPAs in the country?  
\_\_\_\_\_
- 4. What could speed up MPA establishment in the country?  
\_\_\_\_\_
- 5. Is there a need to establish a social network (if none yet) or other social networks (if one is existing already)? [ ] Yes / [ ] No  
If yes, what stakeholder groups should be included? Please explain.  
\_\_\_\_\_

**ANSWER KEY**

Range	Extent / Capacity / Effectiveness	Abundance	Frequency	Status / Rate	Change
1	Zero / none at all	Absent	Not at all (never)	Poor	Significant decline / total loss
2	Low / not so much	Rare	Rarely (once a year)	Fair	Slight decline
3	Moderate	Scarce	Sometimes (every few months)	Good	No change / status quo
4	High	Somewhat abundant	Most of the time (every month)	Very good	Slight improvement
5	Very high / very much	Abundant	All the time (every week)	Excellent	Significant improvement
DK/NA	----- Don't know ----- Unsure of the answer ----- No information -----				



## APPENDIX 2

## List of participants in the MPA Learning Partnership

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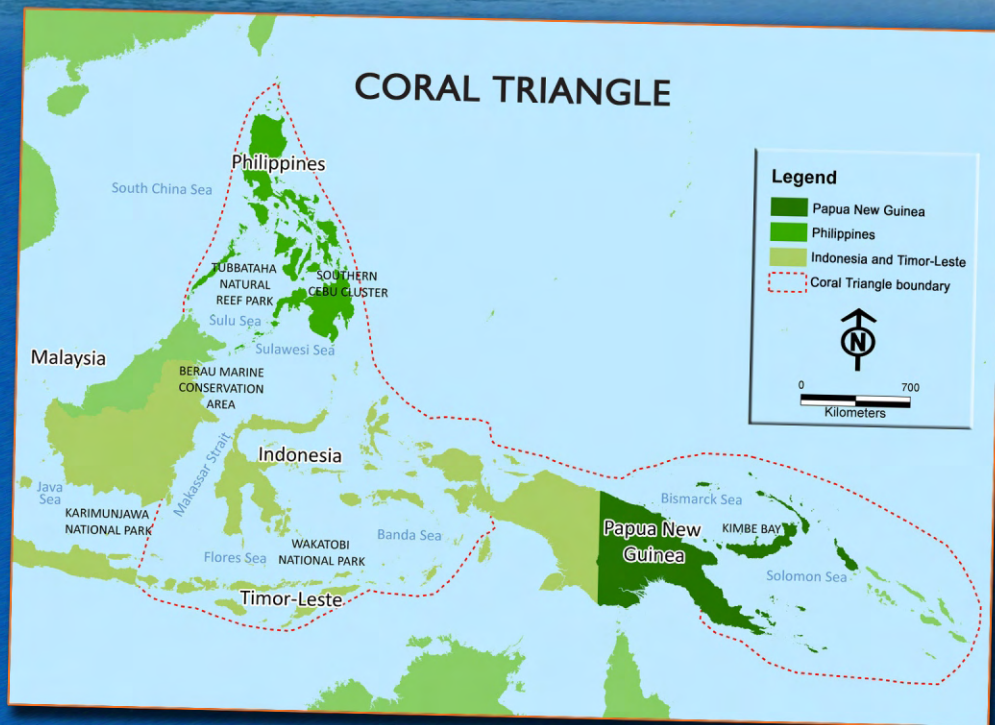
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“The benefit of the social MPA network is in the exchange of management experiences and best practices, peer learning, cross learning and building skills capacity of local conservation practitioners who have the same goals as the network. Working together is useful because we all share a common ecosystem with common problems and issues. It is helpful to join forces with neighboring governments for law enforcement to share resources.”

- Government employee's response during the survey



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MARINE PROTECTED AREAS SUPPORT NETWORK  
**MSN**



CCIF  
Conservation and Community Investment Forum



**upvfi**  
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