Marine Protected Area Networking
Training Handbook

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Coastal Conservation and Education Foundation, Inc.

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Marine Protected Area Networking Training Handbook

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Acronyms

BFAR	Bureau of Fisheries and Aquatic Resources
CCEF	Coastal Conservation and Education Foundation, Inc.
CRM	coastal resource management
CLE	coastal law enforcement
DENR	Department of Environment and Natural Resources
EBFM	ecosystem-based fisheries management
EBM	ecosystem-based management
IUCN	International Union for the Conservation of Nature
LGU	local government unit
MOA	Memorandum of Agreement
MPA	marine protected area
NIPAS	National Integrated Protected Areas System Act
SCCRMC	Southeast Cebu Coastal Resource Management Council
TNC	The Nature Conservancy
WCPA	World Commission on Protected Areas

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While this training handbook is a collective effort of the Coastal Conservation and Education Foundation (CCEF) it is vital to mention the individuals who were at the forefront of the development and formulation spearheaded by CCEF's Training Unit.

Among those from CCEF are Ms. Analeh Patindol, Mr. Kenneth Sotto, Mr. Neil Antoque, Mr. Rommel Kirit and Mr. Pablo Rojas Jr.

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Foreword

Coral reefs and highly dependent coastal communitites in the Philippines are now facing a variety of threats to their survival. Efforts toward sustainable management and use of coral reefs and associated habitats must be given transcendental importance.

With its mandate to protect municipal waters, local government units are now building on the community-based protection of coastal and marine resources through marine protected areas (MPAs). MPAs are known as a critical mechanism for biodiversity protection and fisheries management. Currently, there are 1,100 marine protected areas (MPAs) in the Philippines. But only about 30% are achieving their management objectives (CCEF MPA Database 2008). Thus, there is a need to explore working initiatives on MPA networking that can help increase the management effectiveness of these MPAs.

The Coastal Conservation and Education Foundation, Inc. has encouraged the development of effective MPA networks in all its target areas. The starting point has been social, institutional and learning networks among municipal governments. As these networks gained strength and confidence in their inter-municipal coordination efforts, they will move towards looking at habitat conditions and representativeness, fish abundance, and other aspects of connectivity. Thus, an enabling condition is set for them to eventually become an ecological network of MPAs.

With this MPA Networking Training Handbook, municipal governments and supporting institutions are encouraged to work towards ecological, social and institutional networks of MPAs. The concepts, principles, and case study provided in this handbook can provide a practical guide for a broader inter-municipal collaboration framework at the ecosystem scale. Ultimately, the road leading towards MPA networking is very long. But we must keep in mind our ultimate goal, which is to have a more productive fishery for the benefit of all stakeholders.

Atty. Rose-Liza Eisma-Osorio
Executive Director

Tips on Using this Handbook

This training handbook is designed to cover a one-day seminar to introduce the concept of MPA networking as an important step in coastal resource management. The three lecture sessions provide an orientation to MPA networks in the context of ecosystem-based management. The lectures examine the use of MPAs both singularly and in plural, the need for networks of MPAs, the intricacies involved in implementing and establishing networks of MPAs and an insight into the Southeast Cebu Coastal Resource Management Council as an example of moving towards a network. The training materials are intended to improve understanding, develop ideas, promote discussion and allow participants to assess applicability within local contexts.

A good understanding of the participant's background and the locality of interest is necessary prior to undertaking the training. This information should also be utilized during training and learning priorities adapted based on any identified needs.

1. Introduction

The Marine Protected Area (MPA) Networking Training Handbook has been designed within the context of ecosystem-based management (EBM) and conducted by the Coastal Conservation and Education Foundation (CCEF).

The handbook was developed from various experiences of CCEF, together with its partners, as carried out in the learning areas of Cebu, as well as in response to the rising need to move towards networks of MPAs in coastal environments of the Philippines.

1.1Training Objectives

The training is a one-day seminar designed to equip participants (community-based MPA managers, municipal agricultural officers, provincial and local government officials, people's organizations, non-government organizations and those involved in coastal resource management) with fundamental knowledge and understanding of the concept of MPA networking.

The training has been developed to initiate dialogue and discussion about the move towards networks of MPAs in the Philippines and abroad. The presentations, group discussions and case study allow participants to develop a well-rounded knowledge base on MPA networking specifically within the context of EBM. The training also encourages participants to openly discuss and evaluate the applicability of MPA networking in an open and transparent environment.

Specific outcomes of the training program include understanding the concept of MPA networking, encouraging participants to discuss implementation of MPA networking within their local contexts, outlining the benefits and challenges associated with networking and providing specific examples of MPA networking in the Philippines.

At the end of the seminar, participants will have accomplished the following training objectives:

- Reinforced their knowledge on MPAs;
- Increased their awareness on the concept of MPA networking;
- Improved their understanding on the important aspects of MPA networks, including ecological, social and institutional networks of MPAs;
- Highlighted the benefits and challenges associated with moving towards a network of MPAs;
- Facilitated group discussion on MPA networking and analyzed local viability of such an approach;
- Increased their understanding about the process of implementing an MPA network using existing documented information and examples from southeast Cebu; and

- Enhanced their knowledge and appreciation for the overall inter connectivity of the coastal environment and the need for a whole-of-ecosystem approach to management.

1.2 Training Outputs

- Post-testing sheets
- Question and answer sheets
- Group discussion and brainstorming outputs

1.3 Training Package Design

This training package consists of seminar lectures, open discussion facilitation and a case study analysis covering the origin of MPA networking within the concept of ecosystem-based management. The lectures are designed to be delivered over the course of one-day (see program of activities). A description of the lecture content and the key objectives of each lecture are provided in the module. Each lecture is supplemented with power point slides (see disc at back) and reading materials for participants' quick reference.

The training module has been designed to supplement with the MPA network designing and planning manual (Varney *et al.* 2010) and can be used to facilitate a "way forward" for participants in their local contexts.

It is important for the facilitators to read and understand the training handbook before working with participants in delivering the training. Facilitators should also have a general understanding of the current status of MPAs or MPA networks of the attending participants. This allows for the plenary sessions to be customized towards the specific needs of the attending participants.

1.4 Suggested Program of Activities

One day

Time	Activity
8:30 – 9:30	**Arrival of Participants, Registration and Settling In**
9:30 – 9:35	**Opening Program** ■ Preliminaries and welcome ■ Singing of hymns and invocation
9:35 – 9:45	**Rationale and Seminar Objectives** ■ Purpose and objectives of the seminar ■ Levelling of expectations
9:45 – 10:15	**Lecture 1: Reviewing Marine Protected Areas** ■ Review the concept of MPAs ■ A brief history of MPAs in the Philippines ■ Objectives and purposes of MPAs ■ Lessons learned and recommendations for MPAs
10:20 – 11:20	**Lecture 2: Introduction to Marine Protected Area Networks** ■ Overall concept of MPA networks ■ Ecological, social and institutional networks of MPAs ■ Benefits and challenges of MPA networks ■ Ecosystem-based management
11:20 – 11:30	**Summary of Lecture 2** ■ Brief 20-minute summary of Lecture 2 highlighting the key points
11:30 – 12:00	**Open Forum** ■ Open forum facilitation to answer questions and address participants' concerns arising from Lectures 1 and 2
12:00 – 13:00	**Lunch**
13:00 – 14:00	**Lecture 3: Sharing on the Experience of the Southeast Cebu MPA Network** ■ Background to the Southeast Cebu MPA Network and CRM Council ■ Achievements and challenges of the network ■ Long-term sustainability and future planning
14:00 – 14:15	**Post-test: What have you learned so far?** ■ Post-test to gauge participant understanding at the end of the seminar
14:15 – 15:00	**Plenary: Next steps and moving forward** ■ Closing remarks and identification of audience-specific steps for moving forward
15:00 – 15:30	**Closing Activities** ■ Short evaluation ■ Distribution of certificates ■ Closing remarks

2. Reviewing Marine Protected Areas

Lecture	2.0 Reviewing Marine Protected Areas
Objectives	At the end of the session participants will be able to: - Understand the origin of MPAs both globally and in the Philippines; - Acknowledge the various terms associated with MPAs; - Discuss the current MPA setting in the Philippines; - Define objectives and purposes of MPAs; - Discuss the attributes of a good MPA; - Discuss the ongoing challenges associated with MPAs; and - Confer on the recommendations for the future of MPAs.
Importance	- Refresh participant's knowledge and understanding of MPAs and their application throughout the Philippines as an important coastal resource management tool; - Enhance participants' understanding of the current MPA setting in the Philippines in the context of the key threats to coastal and marine environments; and - Develop participants' understanding for the reasons behind the recommendation for moving towards MPA networks.
Methodology	Lecture and power point presentation
Time	0.5 hour
Materials and Equipment	Power point presentation, laptop and screen, handouts
Handouts/ Reading Materials	Lecture notes Power point slides

2.1 Lecture Content

Reviewing Marine Protected Areas (30 mins)

This is the first technical session of the training program and aims to refresh participants' knowledge of MPAs. It is expected that most participants will have some background knowledge on MPAs and this session will ensure that participant's knowledge reaches a unified level.

The following points will be emphasized during the lecture:

- An MPA is a coastal resource management (CRM) tool and is specifically tailored for both fisheries and habitat management.
- MPAs have been a key CRM tool in the Philippines for decades (Varney *et al.* 2010);
- There are specific governance frameworks dictating the application of MPAs; and
- Although MPAs have proven to be a key CRM tool there are ongoing challenges associated with their design, management and long-term viability.

The lecture will include:

- A review of the various issues facing coastal and marine environments;
- An overview of the various definitions and governance frameworks associated with MPAs in the Philippines;
- An explanation of the use of MPAs in the context of coastal issues;
- A snapshot of the evolution of MPAs in the Philippines;
- An outline of the key objectives and purposes of MPAs;
- Examples of what constitutes a successful MPA from lessons learned in the past;
- An overview of the ongoing challenges associated with MPAs; and
- A look towards the next step in improving MPA management effectiveness.

Participants should conclude this session with a refreshed understanding of MPAs and their use in coastal resource management in the Philippines.

2.2 Lecture Notes

The Philippines is a global hotspot of tropical marine biodiversity *(*Lowry *et al.* 2009*).*

The Philippine 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). Total marine biodiversity is very high, with over 5,000 species of marine plants and animals occurring in Philippine coastal and marine habitats (2005).

However, there are many threats challenging the coastal and marine environments of the Philippines, these include but are not limited to:

- Overfishing and the use of destructive fishing techniques;
- Pollution;
- Unplanned coastal development; and
- Resource-use conflict.

Coastal Resource Management

CRM is a participatory process of planning, implementing and monitoring the sustainable use of marine resources through collective action and sound decision-making (DENR 2001). It has been a key tool for several decades in the Philippines as a means of managing coastal and marine environments. Its approaches seek to control and mitigate coastal habitat degradation and overfishing.

What is a Marine Protected Area?

It is a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values. The area is governed by specific rules or guidelines to manage activities and protect part or the entire closed coastal and marine environment (IUCN WCPA 2008).

MPAs have been a key instrument of CRM both globally and in the Philippines for several decades, and remain a critical tool for coastal and marine management. MPAs are generally used as a means of conserving areas of high biological importance and integrity.

Marine Sanctuary: An MPA where all extractive practices such as fishing, shell collection, seaweed gleaning and collection of anything else is prohibited. It also allows for control of human activities, including access, in order to protect the ecosystem within the specific site (R.A. 8550; Miclat and Ingles 2004).

Marine Reserve: An MPA where strict sanctuary conditions are not mandated for the entire area yet there is still a desire to control access and activities such as boating, mooring and other various fishing techniques. It allows for zones that include a sanctuary area (R.A. 8550; Miclat and Ingles 2004).

Marine Park: An MPA where multiple uses are encouraged that emphasize education, recreation and preservation; usually implemented by zonation schemes that can include a sanctuary area (R.A. 7586; Miclat and Ingles 2004).

MPAs are one marine management option, other options include:

1. Gear restrictions
2. Quotas
3. Minimum mesh sizes
4. Closed seasons

Most of these options are, however, difficult to enforce and manage because...

1. Need large amounts of information about the life histories of fish species;
2. Most theory is based on single species theory on stocks which is not applicable to multi-species or multi-gear fisheries, as in the Philippines; and
3. Coordinated enforcement can be difficult and expensive.

Why MPAs?

Coastal and marine ecosystems around the world, and in the Philippines, are under severe pressure due to unsustainable use of resources, pollution and habitat destruction. MPAs are one coastal resource management tool being employed to attempt to reduce the severity of these pressures.

MPAs in the Philippines: evolution and responses

The Philippines has a long history of CRM with approximately one sixth of the country under some form of coastal management planning providing the basis for MPAs (TNC 2008). The Philippines declared its first national marine park (the Hundred Islands) in 1940 which followed with further MPA designations at the local and national government levels in the 1970's and 1980's up to the present (TNC 2008). Currently

there are approximately 1,169 established MPAs, covering about 500 km², managed by municipal and city governments through co-management arrangements.

Under the National Integrated Protected Areas System (NIPAS) Act of 1992, 28 national MPAs have been proclaimed covering about 15,000 km² (TNC 2008). MPAs in the Philippines are most often coordinated at the community- or barangay-level, allowing for diverse stakeholder participation and grass roots beneficiaries.

Community-based MPAs encompass (TNC 2008):

- No-take, are managed and enforced by the community and the LGU (co-management) and have a legal basis.

Figures 1 and 2 outline the typical MPA governance structures at the national and municipal levels in the Philippines.

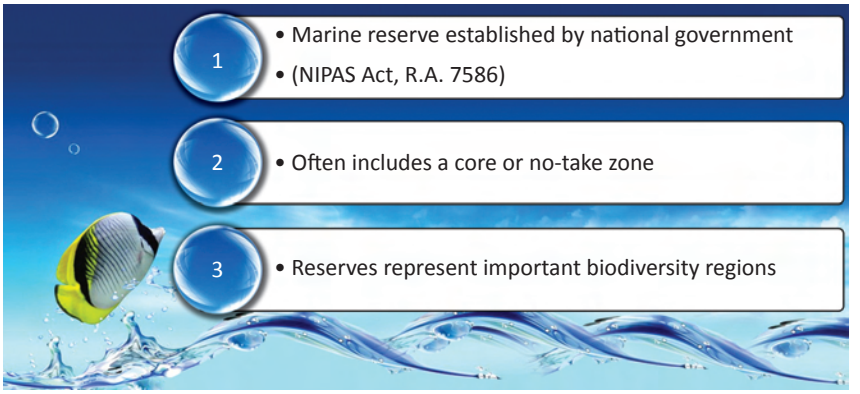

Figure 1 National governance framework for MPAs

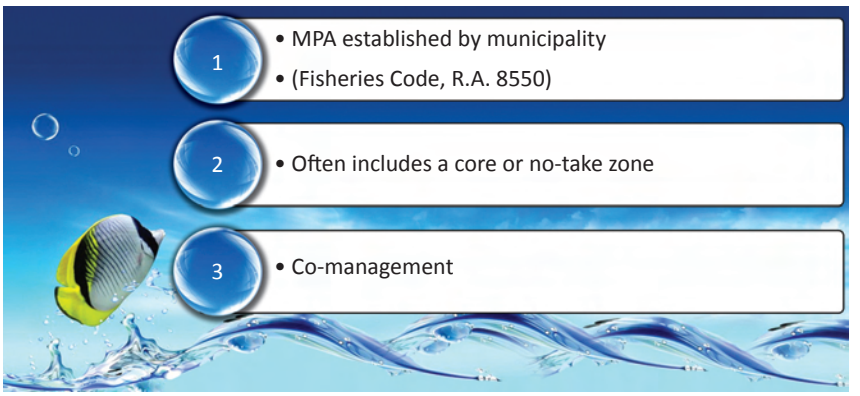

Figure 2 Municipal governance framework for MPAs

MPAs in the Philippines have generally been supported based on the:

1. Belief that the MPA will lead to increased fish yields by protecting fish and habitats from overfishing and destructive fishing methods; and
2. Potential for alternative income generation through tourism activities in the MPA.

Long-term Objectives of MPAs (Salm *et al*. 2000 cited in CRMP n.d.):

- Preservation of biodiversity and genetic biodiversity
- Conserving ecosystems and maintaining ecological processes
- Sustainable use of resources
- Protecting commercially valuable species
- Replenish depleted stocks
- Education and research
- Protection from natural hazards
- Recreation and tourism
- Multiple objective MPAs

When planning for MPA establishment and implementation it is important to consider what constitutes a "good MPA". The following are some examples (CRMP n.d.):

- Reasonable quality of resources; if the habitat is poor, make the MPA bigger and include more habitats;
- An organized and active management committee is present with clearly defined roles and a medium term action plan;
- Inclusion of all sectors of a community management commitee within the MPA including a clear outline of various roles;
- At least 60% of community members are willing to support the MPA;
- Clear and strict guidelines developed through a series of consultations;
- Clear, delineated and marked boundaries and zones for the MPA with guidelines on the use of each zone; and
- Clear, attractive, well-positioned and in local dialect signboards stating the purpose of the MPA and its spatial scale.

MPAs are confronted with numerous challenges, some of these are associated with implementation and management issues including:

- Small MPAs often being insufficient to meet the goal of increased fish yields;
- Although small MPAs maintain fish abundance and diversity within their boundaries, when heavy fishing pressure exists beyond the boundaries of the MPA, small and scattered MPAs will fail to maintain fish abundance (Christie *et al.* 2002).

- If MPAs are the only tool in the area, small MPAs may not support fish and invertebrate populations that are large enough to sustain themselves (IUCN-WCPA 2008). In order for young organisms to be able to replenish and sustain populations within MPAs, the area of protection must be fairly large (2008);
- It remains difficult to implement large MPAs in the Philippines due to socio-economic and management challenges (Christie *et al.* 2002);

Box 1. Attributes of a Successful MPA

Successful MPAs

- Need a good initiator/ facilitator with experience in implementation of coastal projects
- Counterparting of resources and involvement of all agencies with a mandate
- Involvement of all sectors of community and municipality – co-management
- Continuous IEC
- Clear and strict guidelines for the sanctuary
- A good management committee is established with a clear management plan
- Full-time guarding and patrolling
- Aware and well-informed community
- Budget allocated for future years
- Variety of strong leaders in the community as well as second liners

In addressing the above mentioned challenges elected local officials and MPA managers are becoming more interested in creating MPA networks. These networks link individual MPAs and are designed in order to optimize ecological and social connectivity for improved management effectiveness and increased fish yields (Lowry *et al*. 2009 and Palumbi 2004)

3. Introduction to Marine Protected Area Networking

Lecture	3.0 Introduction to Marine Protected Area Networking
Objectives	At the end of the session participants will be able to: - Define and understand the meaning of an MPA network; - Understand the basis for setting up networks of MPAs; - Outline what constitutes an MPA network; - Understand the three components of an MPA network, including ecological, social and institutional networks; - Discuss the benefits and challenges associated with and purposes of MPA networks; - Discuss the attributes of a successful MPA network; - Discuss the different areas required to work together in MPA networks; and - Outline what constitutes ecological, social and institutional collaboration within an MPA network.
Importance	- Introduction to the concept of MPA networking allows the participants to reflect and discuss the need for a broader approach to fisheries and marine habitat management. - Participants learn about the various facets and complexities associated with networking MPAs.
Methodology	Lecture and power point presentation
Time	1 hour
Materials and Equipment	Power point presentation, laptop and screen, handouts
Handouts/ Reading Materials	Lecture notes Power point slides

3.1 Lecture Content

Introduction to Marine Protected Area Networking (1 hour)

The second lecture introduces the concept of MPA networks. To begin, the presenter will outline the definition and meaning of MPA networks.

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 (IUCN-WCPA 2008).

The following points will be emphasized during the lecture:

- An MPA network is a collection of MPAs carefully chosen to achieve either biodiversity conservation and fisheries enhancement;
- MPA networks provide more protection than a set of individual, unconnected MPAs (Varney *et al.* 2010);
- MPA networks are designed based on local ecological processes, such as the location of species spawning areas, ocean currents, larval dispersal and recruitment, among others, thus leading to the protection of a holistic ecosystem (Pisco 2007 cited in Varney *et al.* 2010);
- In an MPA network, young and adult fish can travel on an ocean current and settle in a nearby MPA, thus increasing fish abundance;
- An MPA network is also a group of people or institutions which manage individual MPAs, and are interested in collaborating on management efforts (White *et al.* 2006);
- A social MPA network involves communities, stakeholders and managers of MPAs who share collective goals and interests for their area.

The lecture outline will include:

- Overview and definition of MPA networking;
- An explanation on the use of MPA networks in biodiversity conservation and fisheries management;
- An outline of the main components of an MPA network;
- Emphasise the interconnectivity of ecosystems and the need to link them within MPA networks;
- Emphasize that alongside ecological linkages, both social and institutional linkages within MPA networks are of equal importance;
- Ecological, social and institutional considerations of an MPA network include the need to understand ecological boundaries, improve cluster collaboration and increase management coordination.

Summary (20 minutes)

Undertake a five minute break after the lecture finishes. After the break undertake a 20 minute lecture summary session to highlight the main points of the lecture and the key learning areas required for participants to grasp the concept of networking.

3.2 Lecture Notes

Coastal and marine management is not a stationary process; it is adaptive and should continue to reflect ecological changes as well as the needs of the community. As mentioned previously, one of the key CRM tools used in the Philippines is the establishment of MPAs. However, at present, based on global experiences and the numerous challenges associated with MPAs, questions regarding their effectiveness are now being asked. As a consequence of these questions, the concept of MPA networking has emerged.

What are Marine Protected Area Networks?

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 (IUCN-WCPA 2008).

According to White *et al.* 2006, an MPA network is a collection of MPAs carefully chosen to achieve either biodiversity conservation and fisheries enhancement (see Figure 3). Strategically placed MPAs create stepping stones of genetic and ecological connectivity to ensure that the full range of biogeography, habitats, biological communities and genetic diversity are protected.

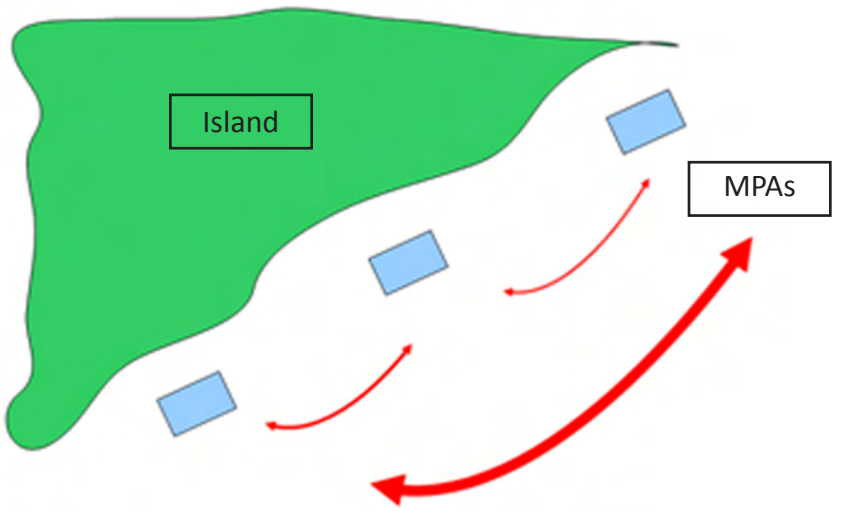

Figure 3 MPA networks (Varney *et al.* 2010)

An MPA network designed to conserve biodiversity is a group of MPAs selected on the basis of (White *et al.* 2006):

- Biogeographic representation
- Habitat representation and heterogeneity
- Presence of species or populations of special interest (e.g. threatened or vulnerable species)

An MPA network designed to enhance fisheries is a group of MPAs selected on the basis of (White *et al.* 2006)*:*

- Size of reserves necessary to protect viable habitats
- Presence of exploitable (target) species
- Vulnerable life stages of selected species
- Connectivity among reserves
- Links among ecosystems
- Provision of ecosystem services to people

MPA Networks

Given the small average size of MPAs and the vast home range of species needing protection, there is growing recognition of the importance of MPA networking to protect critical stages in the life cycle of species that move from one habitat to another as they mature or migrate over long distances as adults (World Bank 2006). Similarly, there is also a growing need to achieve biodiversity conservation at ecologically relevant scales to ensure that ecosystem processes are preserved (2006).

MPA network design must build on best available natural and social science information to create networks that are ecologically coherent and to facilitate sharing of knowledge, skills and experience in conservation and achievement of sustainable socio-economic benefits (World Bank 2006). Existing international and regional instruments will play a key role in supporting national implementation of MPA networks (2006).

It is important to reiterate that an MPA network constitutes not just any collection of MPAs (TNC 2008). 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 important habitats, and interconnected by the movement of animals and plant propagules (2008).

Networks Operate on an Ecosystem Scale

Ecosystems are interconnected (see Figure 4). Ecosystem processes such as larval dispersal, recruitment and habitat needs throughout a fish life cycle are supported in a network of MPAs that has been designed to protect key habitats, spawning areas and connects MPAs through ocean currents and larval dispersal (Varney *et al.* 2010).

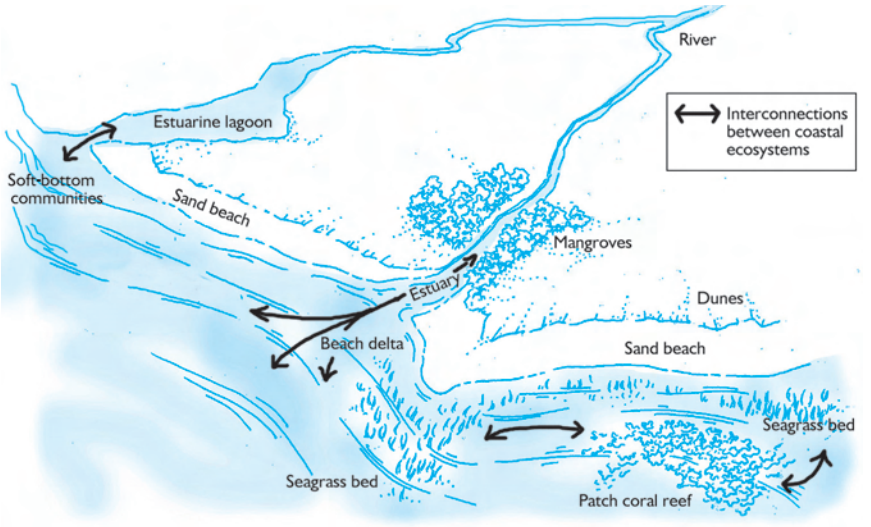

Figure 4 Interconnectedness of ecosystems within a catchment area (Varney *et al.* 2010)

In an MPA network, young and adult fish move out of one MPA, travel on ocean currents and settle in nearby MPAs, thus increasing fish abundance. Therefore, MPAs must be appropriately placed, sized and spaced to function collectively as an ecological network and to achieve fishery goals (IUCN-WCPA 2008). Networks can also help to maintain functional marine ecosystems by encompassing temporal and spatial scales of ecological systems (IUCN-WCPA 2008).

MPA networks provide more protection than a set of individual, unconnected MPAs.

Networks Operate on a Social and Institutional Scale

An MPA network is also a group of people who manage individual MPAs, and are interested in collaborating on management efforts (White *et al.* 2006). A social MPA network involves the communities, stakeholders and managers of MPAs who share collective goals and interests for their area. Social networks provide a rationale for individual MPA stakeholders or communities to coordinate with each other to share experiences and to enhance each other's efforts in managing their respective MPAs (White *et al.* 2006).

A network of MPAs are individual MPAs that share a common ecosystem, share a common social goal such as increased fish yields and are willing to collaborate institutionally to coordinate and manage the network.

An MPA network has three components (see Figure 5) (White *et al.* 2006):

1. A shared ecosystem;
2. A group of managers with a shared social interest; and
3. Different institutions willing to work together.

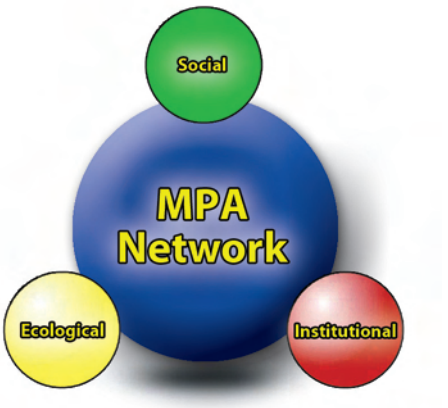

Figure 5 Components of an MPA network

When designing and planning an MPA network, the ecological, social and institutional components are equally important.

Ecological Network of MPAs

A network of MPAs operates at the ecosystem level (not at jurisdictional boundaries) and includes four key ecological principles (see Figure 6) (Varney *et al.* 2010).

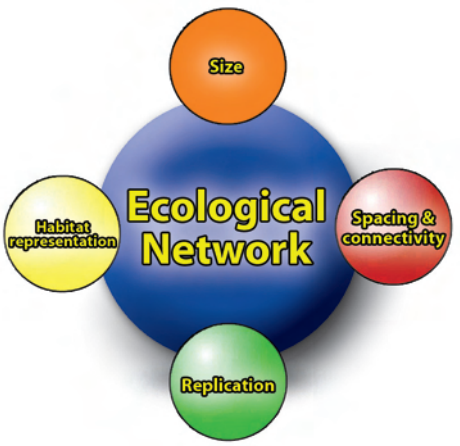

Figure 6 Four components contributing to an ecological network of MPAs

1. *Size: Big enough for the home range of an adult fish?*

The size of your MPA is an important consideration based on movement of adult fish and distances travelled for sleeping, feeding and spawning (Varney *et al.* 2010). The movement of an individual adult fish creates an ocean neighbourhood or spatial area in which it moves over the course of its life (Palumbi 2004). To increase optimal fish population, an MPA should be at least twice the size of the adult's neighbourhood or home range (see Figure 7) (Palumbi 2004). However, the adult home range of a fish may be larger than one MPA.

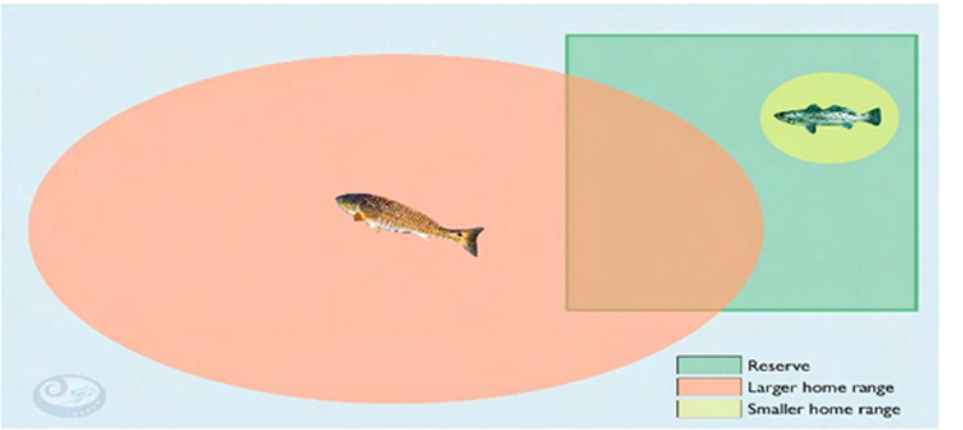

Figure 7 The home range of an adult fish is usually greater than one MPA (Varney *et al.* 2010)

The ideal size of an MPA within a network of MPAs = big enough for the species of interest adult fish to spend its entire life inside and big enough for many adults = bigger MPAs will have more fish.

2. *Spacing: MPAs are connected to one another*

Nearly all marine ecosystems are connected. This connectivity is illustrated by the movement of marine animals from different habitats and regions along ocean currents (Varney *et al.* 2010). Marine animals float on currents in between MPAs in the form of invisible eggs, larvaes and juveniles. Connectivity in a habitat will be achieved if (Palumbi 2004):

- Connections of neighboring or continuous habitats such as coral reefs and seagrass beds are protected within MPAs;
- Larvae move through the water column between and within MPA sites and either settle back inside the same MPA or in another MPA within the dispersal range of the species of interest; and
- Adult fish move between sites because of habitat needs.

MPAs should be spaced close enough so they can act as sources of larvae for one another (Varney *et al.* 2010).

3. *Habitat Representation: Fish need many habitats*

Habitat representation ensures that all ecosystems and habitats within the area are represented in the network of MPAs. Protecting some of every habitat is important because each habitat supports a unique community and most marine organisms use more than one habitat during their lives (IUCN-WCPA 2008).

4. *Replication: Multiple MPAs are more resilient than one MPA*

Replicating MPAs with similar characteristics ensures that in the case of an unexpected change due to a catastrophic event, all critical habitats and fish species will not be destroyed (Varney *et al.* 2010).

MPA network will be resilient if (IUCN-WCPA 2008):

- The risk is spread by replicating representative habitats within MPAs;
- Full protection of critical areas that can serve as reliable sources of larvae replenishment; and
- Biological and ecological connectivity is maintained among and between habitats.

Social Networks of MPAs

Social networks encourage MPA stakeholders to share experiences and in the process, enhance each other's efforts in managing their respective MPAs (White *et al.* 2006).

The elements of MPA social networks include (see Figure 8) (Varney *et al.* 2010):

- Linkages among and between MPA managers;
- Opportunities for MPA managers to share information in a collaborative setting; and
- Participation in collaborative learning through awareness raising programs.

Figure 8 Components of a social network of MPAs

1. Social Linkages

Communication = the basis of social networking

Strong communication throughout the social network is vital for its long-term success. Communication should be both planned and regularly reviewed. Communication between MPA managers may be through emails, text messages, cross-visits or in-person at trainings. Linkages and relationships between MPAs encourage information sharing, idea exchanging and the instilling of common management goals (Varney *et al.* 2010).

2. Leadership Development

Strong leaders = successful MPA networks

Strong leaders are pivotal to the success of MPA networks; they act as opinion leaders and local champions of MPAs (see Figure 9) (Varney *et al.* 2010). Leaders can promote MPA networking goals and play central roles in inter-institutional collaboration (2010). Leaders also need continuous development through education and training.

Figure 9 Government officials can play key roles in building MPA networks (CRMP n.d.)

3. Awareness Raising

Awareness-raising through formal and informal community environmental education and training are important within an MPA network (Varney *et al.* 2010). Awareness raising ensures local communities are well-informed about MPA networking initiatives and be given the opportunity to contribute in various ways.

Awareness-raising provides:

- New information to managers;
- Sustained social networking; and
- Increased capacity and improved MPA management at both the individual and network management levels.

Institutional Networks of MPAs

Aspects of an institutional network of MPAs include:

- Commitment from local and municipal groups;
- Perceived need for collaborative management of resources;
- Enabling legal framework in place; and
- Management body that can guide network collaboration.

MPA Institutional Network = CO-MANAGEMENT

The key aspects of institutional networks are further outlined below (Varney *et al.* 2010).

1. Formation of an Integrated Network Management Body

The formation of a network management body formalizes the body which can guide group actions, decision-making and resource-sharing at the network level. Network management bodies need to facilitate participatory processes, transparent decision-making and continued coordination when developing and implementing a network management plan.

2. Community Engagement

MPA network planning and management decisions should be made transparently with inputs from all levels of government and community groups. Transparency is achieved when stakeholders are informed and knowledgeable of the decisions impacting their livelihoods. Thus, there is continued importance to involve the community in decision-making initiatives associated with the network.

3. Conflict Resolution

MPA managers should be prepared to encounter conflict. Mechanisms to enable conflict resolution should be utilized during participatory processes; if not successful, however, the involvement of external mediators should be considered. Conflict can arise during decision-making. It is important to be prepared, open and transparent throughout the decision-making process.

4. Capacity Development

Developing a management system for a network of MPAs will likely increase the need for human and institutional capacity (Lowry *et al.* 2009). Network management and associated institutions will need to be actively strengthened through technical training and education. Capacity development can be in the form of:

- Environmental education
- Information management
- Social and ecological monitoring
- Leadership
- Conflict resolution
- Enforcement procedures

5. Alternative or Supplementary Livelihood

An MPA network will require expansion of existing MPAs and/or the establishment of new MPAs. Consequently, fishers may be negatively impacted in the short-term as increased fishing grounds become no-take areas. Alternative or supplemental livelihood programs can provide additional and diversified income to fishers as well as supporting the success of no-take zones (Beger *et al.* 2001).

There needs to be a gradual community-based consultation process with local fishers to form the basis of any alternative livelihood interventions. The network management body can play a large role in ensuring the success of alternative livelihood ventures by involving a diverse range of stakeholders.

6. Sustainable Financing

Recurrent costs in network management may include (Eisma-Osorio *et al.* 2009):

- Network management meetings
- Law enforcement/patrolling
- Enforcement apprehensions
- Technical training

Financial support of the network management body will require cost sharing from participating local goverment units, national goverment agencies and external sources. Coordinating local MPA user fee systems is also a potential source of revenue for a network management body (White *et al.* 2006).

Each LGU in the Southeast Cebu MPA Network contributes funds annually for the operations of the council. This inter-institutional commitment to cost-sharing presently sustains the monthly meetings of the cluster. In addition, external funding sources support other needs of the cluster.

7. Coastal Law Enforcement

MPA networks present coastal law enforcement challenges as well as opportunities. Scaling up enforcement efforts to a broader area presents challenges for effective and efficient enforcement. Existing enforcement activities such as patrolling, prosecution and apprehensions must be integrated and coordinated to the full scale of the area (Eisma-Osorio *et al.* 2009). Consequently, a network joint enforcement team based on committed and financially supported local institutions such as the *Bantay Dagat* should be established (Christie *et al.* 2009). The network joint enforcement team should have fair, strict and

standardized enforcement protocols throughout the network.

8. Network Monitoring

Monitoring the biophysical and socio-economic conditions of coastal management interventions such as MPAs is necessary to ensure management responsiveness and improvement (Uychiaoco 2002). Standardization of indicators across multiple MPAs in the network will encourage a more holistic approach to evaluating how such networked sites interact, and determine success in meeting goals and objectives of the overall network (Pomeroy *et al.* 2004).

9. Information Management

MPA-relevant social, biological and management effectiveness information should be collected throughout the network, standardized, synthesized, and maintained in an accessible format for network managers as well as for each community. Comprehensive information management at the network scale will require commitment and coordination from each LGU and the network management body.

10. Evaluating and Adapting

In the long-term, evaluation of an MPA network is necessary for further improvements. It requires reflection on the goals and objectives set forth by the network management body. Evaluating MPA network programs, once operational for a number of years, will provide insights to improving and adapting existing programs to better meet the overarching goals of the network.

11. Individual MPAs

Well-managed individual MPAs are the foundation of a strong MPA network. At the initial planning stages, it is necessary to assess the current management effectiveness of each individual MPA. The inclusion of an individual MPA within a network should not discount local efforts to maintain and strengthen the MPA's management; alternatively both local and inter-municipal management efforts should be maintained.

Box 2. Attributes of a Functional MPA network

Attributes of a Functional MPA Network (TNC 2008)

- Individual MPAs are managed effectively.
- Individual MPAs protect critical fisheries habitat:
  - Existing MPAs which maximize fisheries enhancement should be identified.
  - New MPAs which contribute to fisheries enhancement should also be identified.
- Individual MPAs contribute to fisheries enhancement:
  - Total management area should be based on critical habitats, fisheries, oceanography and existing MPAs.
- At least 10-20% of all critical habitat should be represented within the MPA network.
- MPA management bodies are effective and linked to larger planning area – with continuous emphasis on trying to improve this link.
- Management system is both horizontal and vertical.
- Network links are multifaceted – environmental, social and institutional.

Moving Toward Sustainable MPA Networks

- MPA networks are not created rapidly; they take time, persistence and commitment;
- MPA networks evolve over time with good planning;
- Communication and collaboration between all stakeholder groups are vital for the overall success of networking (socially and institutionally);
- Open and transparent decision-making limits confusion and ensures consistency;
- Implementation and design guidelines can assist in improving MPAs and creating networks;
- Ongoing monitoring and evaluation are vital for long-term sustainable MPA networks;
- Lessons learned and continuous adaptation is required to improve networks over time;
- Community involvement in planning and implementation is important;
- A high level of community participation in decision-making is required to reduce conflict and improve overall understanding;
- Successful alternative income activities are identified to minimize trade-offs;
- Continuous training, education and capacity building programs help to improve local understanding and appreciation;
- Influential champions should be identified to promote MPA networks;
- Inputs are necessary from all government levels;
- Early and ongoing economic benefits to complement ecological benefits; and
- Equitable distribution of all benefits.

Ecosystem-based Management

MPAs can only be effective when implemented within a larger framework of coastal management and supported by a range of other tools. MPAs are an important management strategy within a larger area-wide management framework with broader goals, such as maintaining essential ecological processes and life-support systems, preserving genetic diversity, ensuring sustainable utilization of species and ecosystems, managing watersheds, and so on.

Ecosystem based management (EBM) emphasizes the protection or restoration of ecological processes and management at ecologically relevant scales. EBM, while being sensitive to the true marine ecological parameters and recognizing the interconnectedness of ecosystems, does not exclude the human elements of the system (see Figure 10).

MPA networks are a specific tool of EBM that can help to manage and preserve this interconnectedness. EBM requires the development of consistent coastal planning and management frameworks across jurisdictional boundaries. Other tools of EBM may include spatial planning, zoning, fisheries policies, law enforcement activities, limits on fishing effort and restrictions on fishing gear.

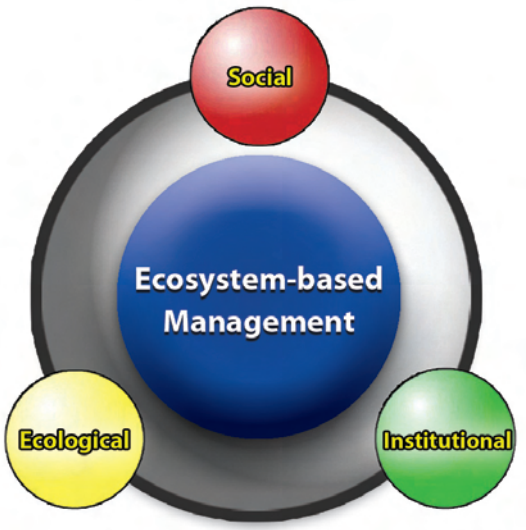

Figure 10 Human-use patterns, culture and social norms are all considered within an EBM planning framework

An example
Coral reefs are one of the highly valued ecosystem in the Philippines. EBM would consider not only the health of one coral reef, but also the health of neighboring mangrove and seagrass habitats which serve as nursery and feeding areas for coral reef fish. As such, an EBM approach would recommend viewing coral reefs not as a singular entity but as part of an entire integrated and inter-connected coastal ecosystem.

4. Southeast Cebu CRM Cluster

Lecture	3.0 Sharing on the Experience of Southeast Cebu CRM Cluster
Objectives	At the end of the session participants will be able to: - Understand the background of MPA networking in Southeast Cebu; - Understand the practical methods in implementing MPA networks; - Discuss the planning and management approaches used by the Southeast Cebu CRM cluster in implementing their MPA network; - Understand and discuss the challenges faced by the Southeast Cebu cluster in implementing MPA networks; and - Provide insight into the future objectives of the Southeast Cebu MPA network.
Importance	Sharing on the experiences of planning and implementing MPA networks in Southeast Cebu will allow participants to observe first-hand experience in establishing and managing an MPA network.
Methodology	Lecture, power-point presentation and discussion
Time	1 hour
Materials and Equipment	Power point presentation, laptop and screen, handouts
Handouts/ Reading Materials	Lecture notes Power point slides

4.1 Lecture Content

Presentation on the Southeast Cebu CRM Cluster Case Study (45 mins)

The Southeast Cebu CRM Cluster has made some serious progress in MPA networking over the last five years. Consequently this lecture use this MPA network as a case study for outlining the background, evolution and outcomes of the approach to network planning and management.

This lecture gives an example of how MPA networks are being approached in the Philippines, providing information on both the successes and constraints of such an approach.

The lecture outline will include the following:

- Background on the Southeast Cebu CRM cluster;
- Discuss the key resource threats facing the cluster;
- Discuss the outcomes of inter-municipal collaboration;
- Outline and discuss the Southeast Cebu CRM cluster's approach to MPA networking;
- Outline methods used in maintaining their MPA network;
- Discuss the lessons learned from MPA networking and cluster collaboration; and
- Outline the way forward for the future of the Southeast Cebu CRM cluster.

Summary (15 minutes)
Summarize the concepts in this session by drawing from participants' ideas and the key points of the lecture, as well as answering any questions that arise.

4.2 Lecture Notes

Background on Southeast Cebu CRM cluster

Southeast Cebu traverses an irregular coastline over 100 km; in the east is Cebu/Bohol Strait, a body of water separating the islands of Cebu and Bohol containing more than 158.6 km² of coral reef ecosystem. There are seven municipalities making up the Southeast Cebu CRM cluster (see Figure 11), with the overall population growing at more than 2.0% annually. Municipal fisheries provide livelihood to many families in the Southeast municipalities (Eisma-Osorio *et al.* 2009).

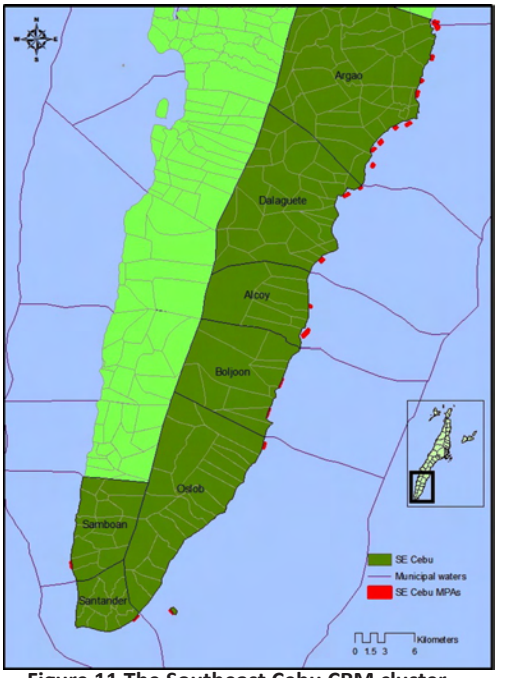

Figure 11 The Southeast Cebu CRM cluster
(Map made by Theresa Black in coordination with CCEF)

MPAs and MPA Networking in Southeast Cebu

Southeast Cebu has 22 established MPAs over the seven coastal municipalities. Realizing they shared similar issues and a common resource base, the municipalities collectively agreed to integrate municipal coastal management efforts through an inter-municipal collaboration system. The Southeast Cebu Coastal Resource Management Council (SCCRMC) was established to integrate area management efforts. The municipalities have begun to plan at the ecosystem level and considered as its goal to have a more productive fishery for the benefit of all stakeholders.

Common coastal and marine resource threats in Southeast Cebu

- Degradation of key coastal and marine habitats
- Overfishing
- Dwindling fish stocks

Moving towards Inter-Municipal Collaboration

Recognizing they shared the same resource-use issues, the seven municipalities agreed to integrate their coastal management efforts. Coastal management efforts therefore expanded beyond municipal boundaries to cover a broader ecosystem-scale. Ecosystem boundaries were determined using jurisdictional boundaries in consideration with the marine fisheries ecosystem.

Key CRM achievements in Southeast Cebu due to collaboration:

- Adoption and implementation of a multi-year CRM plan;
- Development of a coastal environmental profile;
- Annual program and budget forecasting;
- Training of staff and operational municipal CRM unit;
- Development of CRM-related organizations e.g. people's organizations, Fisheries and Aquatic Resource Management Councils, and Technical Working Groups; and
- Shoreline/foreshore management measures planned.

Box 3. Good Practices in Southeast Cebu CRM Cluster

Demonstrated Good Practices Employed in Southeast Cebu CRM Council
MPAs established and MPA network emerging
Mangrove management
Fisheries management
Local legislation identified in the CRM plan
Coastal law enforcement
Coastal environment-friendly enterprise development
Revenue generation
Multi-institutional collaboration for CRM

MPA Networking in Southeast Cebu

MPA networking has been a goal of the Southeast Cebu CRM cluster with MPAs established in all seven municipalities. There are 22 MPAs in over 300 ha with no-take areas covering 0.24% of the total combined municipal waters. The MPAs are mostly managed by fishers organizations in coordination with the municipal governments. The Southeast Cebu Coastal Resource Management Council provides a venue for MPA managers to meet and discuss pressing concerns regarding management of MPAs at the municipal level, thus forming the institutional network.

Key achievements in MPA networking of the Southeast Cebu CRM cluster include:

- Community-based MPA management activities;
- Formation of MPA social network;
- Coordinated enactment of uniform fisheries regulations; and
- Cross-boundary law enforcement operations (see Figure 12).

Figure 12 Inter-municipal CLE patrol boat

Southeast Cebu Coastal Resource Management Council

To ensure collaboration and collective responsibility, a coordinating body for all identified programs of the municipalities was formed through the Southeast Cebu Coastal Resource Management Council. The council is composed of Mayors and Vice-Mayors of the seven municipalities that function as a policy-making and supervising body. Additional council support includes:

- A management committee and a secretariat, composed mostly of technical staff from each municipality; and
- A technical and legal advisory group coming from government agencies and NGOs which provides specialized support to the Council.

Southeast Cebu Coastal Resource Management Council

- The Council has become a venue for the discussion and resolution of important issues and activities.
- Including banning of compressor fishing, protection of critical habitats from foreshore development, regulating municipal tourism activities, and creating a social network among MPA managers, among others.

The Council has re-energized municipal coastal management initiatives. MPAs are now effectively managed and municipal coastal law enforcers are formally organized with an institutionalized incentive scheme.

Areas of success for the Southeast Cebu CRM cluster include:

- Communication
- Collaboration
- Sustainable funding arrangements
- Conflict resolution
- Access restrictions
- Improved ecosystem conditions

Lessons learned and moving forward as a cluster

Over the past five years there have been numerous CRM and MPA management lessons learned based on the experiences of the Southeast Cebu CRM Cluster. The cluster has identified the need for further institutional strengthening, allowing for a stronger presence and improved decision-making practices. Along with institutional strengthening, the cluster is also moving towards improved scientific approaches to MPA networking and, most importantly, further research into the function of MPAs. Inevitably the cluster wants to determine if all the necessary habitats are being protected adequately.

Other ways in which the cluster would like to move forward is through further linking of the Southeast Cebu cluster with other municipalities across the Cebu/Bohol strait. This would allow for improved law enforcement capabilities and approaches to common coastal resource management initiatives. As with any management body, long-term sustainable funding is always a challenge and the cluster has identified the need for further research and testing of new revenue-generating schemes.

Finally, the prioritizing of actions and long-term cluster goals should be the immediate focus of the cluster in the short-term. Once a consensus is identified for these, then long-term actions can begin to be implemented.

5. Post-training Test

Post-test	What have you learned so far?
Objectives	At the end of the session participants will undertake a short test to determine the overall level of understanding within the group.
Importance	The post-test allows facilitators to understand the effectiveness of the seminar and to identify any areas for improvement.
Methodology	Pre-arranged post-test questions
Time	15 minutes
Materials and Equipment	Post-testing question sheet (see Appendix A)

6. Plenary: Next steps and moving forward

Plenary	Next steps and moving forward
Objectives	The final plenary session is an opportunity for facilitators to summarize the key concepts of the seminar and to draw on the local knowledge of participants to identify clear steps in moving towards MPA networking.
Importance	The final plenary session allows facilitators to highlight information and more importantly to guide participants in formulating ideas / plans for moving towards MPA networks within their local contexts.
Methodology	There are no specific guidelines for the plenary session. The session should be tailored towards the specific audience, as well as taking into account: • Current context of participants experience in MPA establishment and management; • Overall group dynamics of the participants; and • Prioritizing of important steps in forming a network of MPAs.
Time	30 minutes
Materials and Equipment	Whiteboard, markers, metacards and manila paper

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Appendix A.

MPA Networking Seminar Post-test Question Sheet

Name: _____ Date: _____

Please answer the following questions.

1. List the three components of an MPA network.

1. _____
2. _____
3. _____

2. List the four ecological factors that need to be taken into consideration when designing an ecological network of MPAs.

1. _____
2. _____
3. _____
4. _____

3. Name one of the roles of a social network of MPAs?

_____

4. Are the social, institutional and ecological considerations of an MPA network of equal importance? (Write your answer as "yes" or "no" below).

_____

5. What are two words starting with "C" that are important for the success of institutional networks?

a. C _____
b. C _____

6. Are MPAs and MPA networks the ONLY tools for coastal resource management? (Write your answer as "yes" or "no" below).

_____

7. What is the name of the "bigger-picture" management framework guiding the concept of MPA networking?

_____

8. When thinking about your local context, outline one of the next logical steps in moving towards a network of MPAs?

_____
_____
_____