

A group of people are in traditional dugout canoes on a tropical beach. The water is clear and blue, and the background shows a dense line of palm trees under a clear sky. One person in the foreground is holding the side of a canoe. The scene is bright and sunny.

Locally-Managed Marine Areas: A guide to supporting Community-Based Adaptive Management

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The Locally-Managed Marine Area (LMMA) Network
Improving the practice of marine conservation

About This Document

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About the Locally-Managed Marine Area (LMMA) Network



The Locally-Managed Marine Area (LMMA) Network works to improve the practice of marine conservation and the well-being of coastal people. Across Southeast Asia, Melanesia, Micronesia, Polynesia, and the Americas, the members of the Network share experiences and information to determine the conditions under which locally-managed marine areas contribute best to conservation, and why. The participants in the Network are motivated to work together because they want to be able to take actions that have a high chance of measurable, long-term success.

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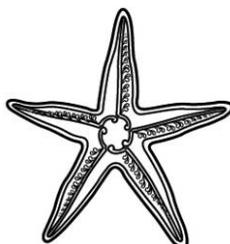
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INTRODUCTION

The Need for a New Approach to Coastal Protection and Management

Throughout Southeast Asia and the Pacific, coastal communities are experiencing dwindling supplies of marine resources. It is generally recognized that conventional, top-down coastal protection and management approaches do not meet the needs of the Southeast Asian and Pacific Islands communities. Abundance of many commercial fishing stocks continues to decline along with those of subsistence fisheries.

It is also generally recognized that in many developing countries – where a substantial share of the Earth’s marine biodiversity is found – conventional, top-down coastal protection and management efforts are too costly both financially and in terms of scarce human resources to be of much practical value for broad-scale national application.

Over the past ten years, White (1994), Johannes (1998a,b), Pomeroy (2006) and others have argued for the move from top-down to more locally-managed approaches to coastal protection and management (**Figure 1**), especially in situations where little data are available. This joint or 'co'-management leads to informed decision making, as traditional knowledge and local sources of information are integrated into the process. It also promotes local enforcement and adaptive management of marine resources by and for the local users.



Figure 1: Top-Down to Bottom-Up Co-Management. The swing from state controlled management towards co-management. This sort of negotiated management implies a very important if not lead role for communities, as in the case of “locally-managed marine areas.”

Locally-Managed Marine Areas (LMMAs) as a Way Forward

Pacific Island communities have long practiced traditional management systems such as seasonal bans and temporary no-take areas that can be adapted for modern use. Most Pacific Islands have a concept of community marine tenure either legally enshrined or informally recognized. Such systems help ensure that benefits from marine conservation efforts will accrue to the local community. Today, many communities and local leaders are working with government and non-governmental organizations to develop fisheries management plans utilizing traditional practices to address major problems facing their fishing grounds. Many of these efforts employ marine reserves, or no-take zones, as part of their strategy.

A recent global review of marine reserves (Roberts and Hawkins 2000) clearly indicates that marine reserves (no-take areas):

- Protect exploited fish populations and enhance the production of recruits, which can restock fishing grounds.
- Supplement fisheries through spillover of adults and juveniles into the fishing ground.
- Provide a refuge from fishing for vulnerable species.
- Maintain biodiversity of natural biological communities that are different from those in open fishing grounds.
- Facilitate ecosystem recovery after major human or natural disturbances.

Another trend in reserves (both terrestrial and marine) is for implementing groups to work with communities near them to define what activities are allowed in these reserves and how communities can achieve benefits from them. In the Pacific, the use of marine protected areas and reserves is being realized by the application, modification, and merging of contemporary marine protection efforts with traditional conservation practices through a process of Community-Based Adaptive Management (CBAM). The outcome is now commonly described as "locally-managed marine areas." Most Pacific island countries are now using LMMAs with some form of protected area. The terms listed in **Box 1** on the following page reflect the extent of these practices in Asia and the Pacific.

The setting up of these LMMAs has been accomplished using a variety of techniques, some probably more effective than others. Established projects that have involved biological monitoring from the outset are showing impressive gains of the kinds described above.

What is a 'Locally-Managed Marine Area'?

This guide follows the definition of a locally-managed marine area (LMMA) as:

"An area of nearshore waters and coastal resources that is largely or wholly managed at a local level by the coastal communities, land-owning groups, partner organizations, and/or collaborative government representatives who reside or are based in the immediate area."

LMMAs are generally thought to be a complementary and sometimes more culturally appropriate approach to marine protection and management in the Pacific Islands than the strict use of centrally-managed marine areas – that is, areas that are largely or wholly controlled by a central government body or outside organization, sometimes from afar.

The term and definition of an LMMA were collectively arrived at and agreed to by more than 100 marine conservation practitioners (including professional resource managers, land-owning community leaders, and government representatives) from 12 countries across Southeast Asia and the Pacific at meetings held in the Philippines and Fiji during 2000 (see [Parks and Salafsky 2001](#)). The word "local" was chosen over "community" – recognizing that conservation projects are often collaboratively-managed by both the community and the government or some other external body. Also, the words "protection" and "protected" are not used because of acknowledgement that the conservation tool(s) employed within an LMMA may involve a combination of management approaches that include species-specific reserves, temporary or shifting reserves, and/or harvest effort limitations (such as gear or seasonal restrictions).

Often a fully-protected area may be one of the tools used within an LMMA. However, an LMMA differs from what is commonly known as a Marine Protected Area (MPA) in that LMMAs are characterized by local ownership and/or control, whereas MPAs are typically designated by levels of management via a top-down approach. For our purposes, an LMMA refers to the *entire* marine area under local management, whereas an MPA, or no-take area refers to one of the management tools that may be employed within it (**Figure 2**, below).

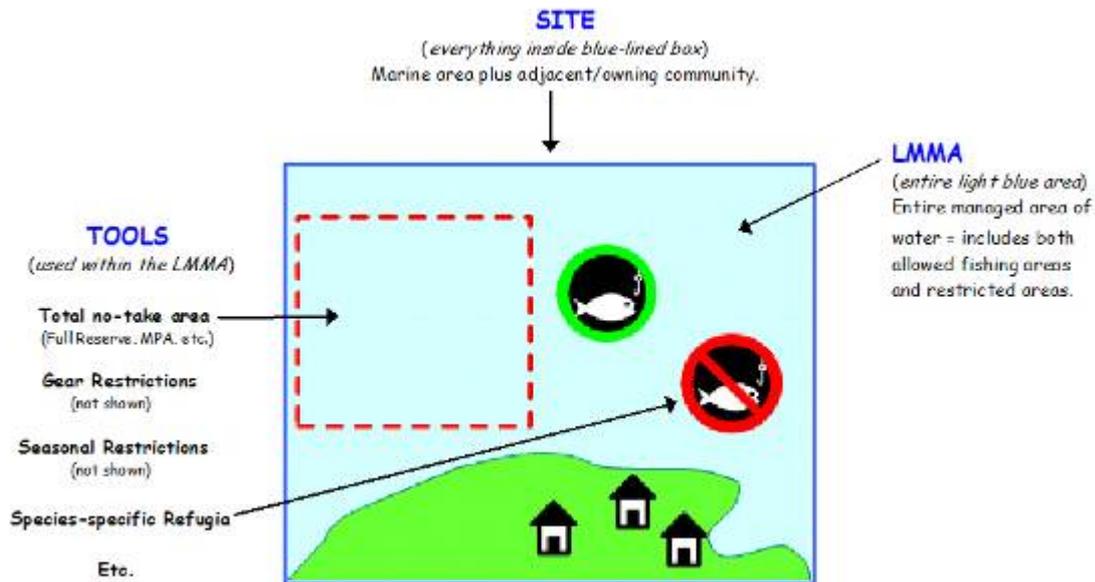


Figure 2: LMMA Terms and Definitions. The diagram above illustrates terms and definitions pertaining to LMMAs.

There is a wide variety of names for LMMA tools being used throughout Southeast Asia and the Pacific Islands (see **Box 1**, below).

Box 1: Various names used throughout Southeast Asia and the Pacific to describe LMMA tools

- Cook Islands** “ra’ui site”; “no-take two year closure”
- Fiji** “tabu area”; “traditional reserve”; “community-protected area”
- Hawaii** “kapu zone”; “traditional marine protected area”; “cultural marine conservation district”
- Indonesia** “sasizen”; “community-based marine protected area”; “no-take zone”
- Malaysia** “community-based marine protected area”; “no-take area”
- Palau** “bau zone”; “no-take area”; “multiple-use marine protected area”
- Papua New Guinea** “tabu area”; “customary areas”; “marine reserve”
- Philippines** “community-based marine protected area”; “marine sanctuary”; “no-take zone”
- Solomon Islands** “tambu zone”; “community-managed reserve”; “community conservation area”
- Vietnam** “peoples’ marine management area”; “village-managed reserve”

(after Parks and Salafsky 2001)

What is Community-Based Adaptive Management?

Community-Based Adaptive Management (CBAM) refers to a process through which LMMAs can be achieved and sustained. Adaptive management is well-suited to the conditions prevailing in much of the Pacific, where ecological and social systems are complex and unpredictable and where there is little chance of obtaining complete scientific information but resource managers/owners often have in-depth local knowledge of their marine resources.

Adaptive management can be defined as the integration of design, management and monitoring in order to learn and improve responses to management efforts. It is an ongoing cycle of designing and checking a plan and then modifying management in light of the results. This implies the drawing up and agreement of a management plan, a method of checking/monitoring results, and regular analysis and discussion of whether the plan needs improving.

Community-based implies that the management is carried out by, or with a major role played by the community, local stakeholders, relevant user groups, and also the locally and nationally relevant institutions and private interests.

The basic process can be summarized as:

- Make a plan
- Implement the plan
- Check how it is going
- Revise the plan (if necessary)
- Carry on...

Using this Guide

This document presents step-by-step guidelines for setting up an LMMA and provides simple and discrete community organizing activities and 'tools' that are used to facilitate and guide communities, local leaders, and their conservation partners through the process of creating and managing an LMMA. These activities and tools are generally used in some sort of sequence as part of community resource management process, which usually requires a partnership of some five to ten years before significant and long-term results are expected.

While there is considerable literature on setting up community marine resource management plans, methods to assist communities develop monitoring plans and techniques are less well-developed. This guide attempts to begin to address this.

Purpose of this Guide

This guide is intended to help coastal communities and their conservation partners create and manage LMMAs. An equally important purpose is to help communities and their partners consider in advance all that is required to establish and maintain LMMAs so that they may reach consensus on whether or not it is realistic or practical to take such a local management approach.

For those coastal communities and their conservation partners who *do* decide that using an LMMA is appropriate, it is hoped that the activities and tools presented in this guide will be useful in designing, implementing and managing the LMMA.

It is also hoped that by moving through this guide and setting up an LMMA, the community and its partners will then be able to move forward with *Adaptive Management*, that is, the process of asking questions about their management approach, collecting information to answer them, and then using the answers to learn how to improve on their local management actions over time (see [Salafsky et al., 2001](#)).

Who this Guide is Intended for

This guide has been written principally with coastal community members and leaders in mind, as well as the partner organizations that support them and their local management efforts. Partners can include government agencies, non-government organizations, universities and other interested parties.

It is also hoped that the guide may also be useful for national decision makers who are considering using LMMAs, conservation scientists and researchers who are working to learn how to improve the practice of marine conservation, donor organizations who support LMMAs and marine conservation work, and students, professors or others in academia.

It is expected that the reader is either a member of or is very familiar with the community or communities who will be leading the LMMA effort. It is also assumed that the reader has some basic knowledge about the local site, the people who live there, and the coastal resources that are found there and are being used locally.

How this Guide is Structured

This guide is structured around four general phases taken along the path of LMMA establishment and use:

- Phase One – Initial Assessment
- Phase Two – LMMA Design and Planning
- Phase Three – Implementation of Community-Based Adaptive Management
- Phase Four – Ongoing CBAM

This four-phase path is not the only way LMMAs are designed and established; for example, some LMMAs are established without much emphasis given to Phase one (Initial Assessment) or four (Ongoing Adaptive Management). Although quicker, such approaches often fail to generate the long-term commitment of community members.

The diagram on the next page (**Figure 3**) depicts a typical process for engaging communities in the assessment, planning, implementation, and monitoring of an LMMA. Phase 3 and particularly Phase 4, 'Ongoing Community-Based Adaptive Management (CBAM)' – which entails ongoing community monitoring and analysis followed by discussion of what changes need to be made to the management plan based on the results – are key aspects of the LMMA approach.

For each phase, we present the steps, tools and exercises necessary to help the reader move through the process to the next phase. These and similar activities and tools have been adapted from the wide selection of community organization and facilitation techniques and experiences documented within the extensive Rapid Rural Appraisal (RRA), Participatory Rural Appraisal (PRA), and Participatory Learning and Action (PLA) literature. To find out more on these approaches, consult the **References and Resources** section at the end of this document.

The Four Phases to LMMA Establishment

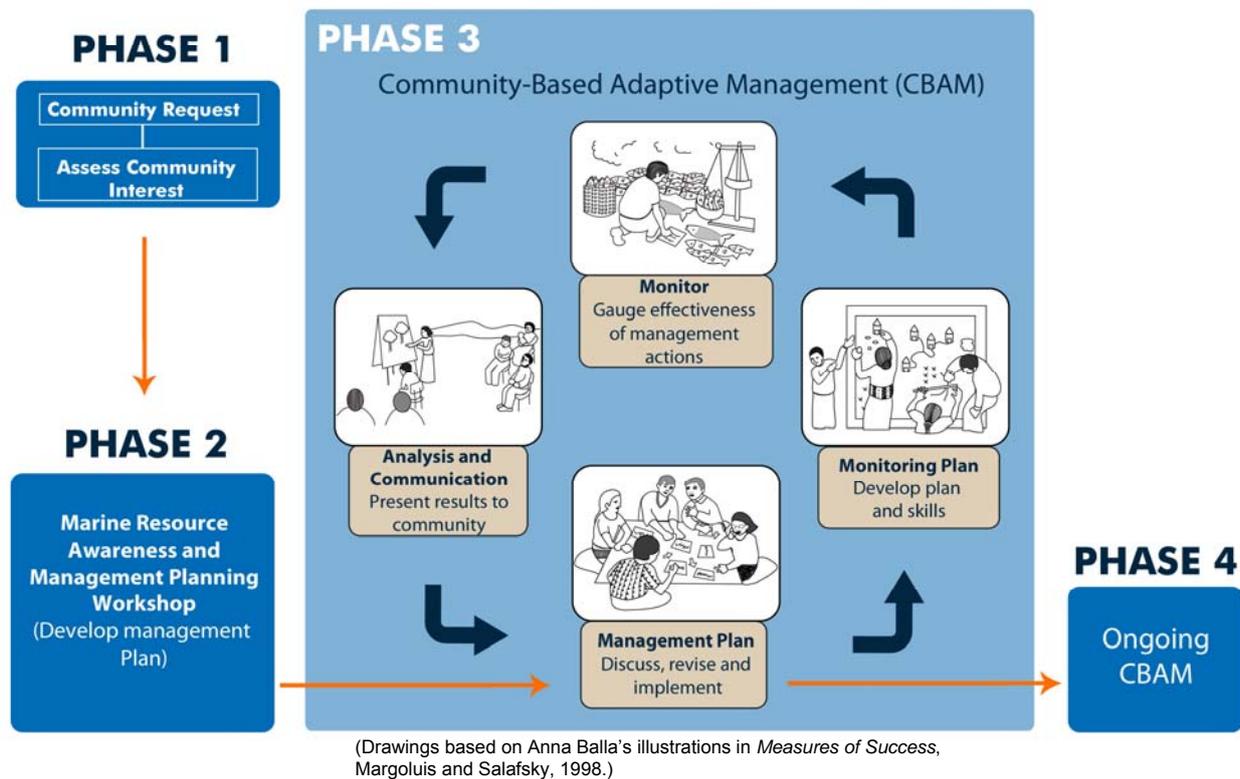


Figure 3: The Four Phases to LMMA Establishment. The diagram above illustrates the four-phase process for planning, designing and maintaining an LMMA.

Each activity or tool in this guide is presented using the following outline:

- A *description* of what the activity or tool is and what it is used for
- The *aim* of the activity or tool
- The *process* of carrying out the activity or using the tool
- Any additional *pointers* that may be helpful in using the activity or tool, including related readings and resources to learn more

The exercises described in this guidebook are relatively easy to apply. However, practitioners must avoid the temptation to apply them just “because they are listed.” Rather, they should be used to reach the objectives of the specific plan designed. Thus it is important to have clear objectives and to design an appropriate overall process.

Not all of these activities or tools may be appropriate or relevant to use at all potential LMMA sites or under all social or natural conditions. Therefore, rather than require all activities and tools to be used in a given order, readers are instead encouraged to pick and choose from those offered here based on the specific needs identified by their community and given the unique circumstances of their site. Likewise, some readers may be asked by their community or partners to recommend which activities and tools presented here should and should not be used, based on the natural, social, cultural, and/or historical characteristics of the site and people living there.

Recognizing this, each of the four phases and all activities and tools have been written so that they are understandable on their own and without the context of the others. However, it is important that the reader and those they work with do have a fairly clear (albeit flexible) vision of the goals and objectives they want to achieve through creating and operating an LMMA. In some cases the local resource management plan will articulate what this is, and in other cases it may require that this be defined by the community prior to commencing the four phases described here. Unless noted as optional, all the activities and tools presented here have been found to be necessary for effective community-based marine management in areas where the authors have worked.

Note that while the activities and tools presented are useful tools for LMMA creation and use, there may be conditions existing at the site that are not conducive to successful LMMA implementation. To learn more about the evolving guidance on where and when to use LMMAs, visit www.LMMAnetwork.org.

At the end of the guidebook is a listing of resources for more information.

A Central Theme: Participation

Inherent to local management and the use of LMMAs is the concept of *active and meaningful participation* from the community and other stakeholders in coastal resource management and conservation decision making.

It is generally agreed that through a *participatory process*, the people and groups involved will participate at varying levels and/or at different stages in the process. These differing levels of participation can be viewed as a scale or ladder, where receiving information passively from others would be a low level of involvement and taking action together a high level (**Figure 4**, below). Generally speaking, higher levels of participation generate greater levels of empowerment and ownership by the community and groups involved of whatever outputs will be generated, and thus greater overall success of the LMMA.

<i>Level of participation</i>	<i>Description</i>
1. Fully active (highest)	Community members make decisions in partnership with implementing agency or groups and are committed to acting together.
2. Deciding together (higher)	Community members are empowered and facilitated in order to determine options and make decisions.
3. Consultation (moderate)	Community members are given a restricted choice and role in decision making.
4. Information collection (lower)	Community members are surveyed and results are analysed externally.
5. Passively informing (lowest)	Community members are informed of the situation or process.



Figure 4: Ladder of Community Participation. The figure above illustrates the ladder of increasing levels of participation (adapted by Govan et al. 1998 from Arnstein 1971 and others).

Community empowerment and ownership are two vital outcomes to be achieved as a result of processes employed to support communities in establishing LMMAs. Therefore, a high level of local participation in both the management planning and management process itself is a central theme in this guide and in using LMMAs. Those who will be most actively involved in managing the LMMA should participate at the highest possible levels.

The Importance of Process

Experience over the last few decades has shown that marine reserve or no-take area declaration in populated areas without extensive community involvement is less likely to meet conservation goals than that with significant local input. Communities usually have a deep understanding of their natural resources, close contact with the range of problems confronting the community in its daily life, and much of the information required for the pursuit of locally appropriate solutions.

While outside organizations often have technical and financial resources that may be vital for community planning and resource management, experience has shown that successful management requires the local community to feel that the process belongs to them. This ownership can be constructed through good facilitation and participatory process, but can as easily be destroyed by lack of understanding and poor facilitation of the ownership-building process. Thus it is crucial that the support agencies understand the importance of long-term process over short-term products and ensure that good facilitation skills are available.

The role of the facilitating agency is to help the communities identify the main threats to their marine resources, assist them in developing their management plan, and help them implement, enforce and monitor their actions. The role of the community is to do the actual work – to carry out their management plan and commitments. Working together, it is possible for communities to regain much of their lost resources. The result will be more food on the table, preservation of traditional cultures and the island way of life, and greater community cohesion, prosperity and health.

The techniques of Participatory Learning and Action and principles of Adaptive Management are extremely useful in assisting communities to develop successful marine resource management and monitoring plans for themselves. The principles of Adaptive Management as described by [Salafsky et al., 2001](#) are:

- Principle 1: Do Adaptive Management Yourself
- Principle 2: Promote Institutional Curiosity and Innovation
- Principle 3: Value Failures
- Principle 4: Expect Surprise and Capitalize on Crisis
- Principle 5: Encourage Personal Growth
- Principle 6: Create Learning Organizations and Partnerships
- Principle 7: Contribute to Global Learning
- Principle 8: Practice the Art of Adaptive Management

With community monitoring, analysis and discussion, results from the plan's implementation can be evaluated and the plan modified accordingly. Such skills development can also assist communities in tackling other problems they may be facing. The participatory process should be "objective driven" not "tools driven" and will generally seek to:

- Increase equity and self-determination
- Increase likelihood of project continuation once external support ceases
- Increase appropriateness of conservation initiatives
- Increase sense of project ownership
- Increase likelihood of project success



Photo by Michael Guilbeaux

The Importance of Facilitation

Many of the activities and tools in this guide are carried out in the form of meetings or workshops with community members and project partners; these will need good facilitation. The facilitator's role is complex and varied, needing a good deal of sensitivity. The facilitator can be a leader from the community, a staff member from a partner organization, or someone from outside the project.

A facilitator is neither a content expert nor a lecturer nor a chair. A facilitator 'facilitates' – that is, helps to move along a process whereby participants interact with each other, gain new information, and build upon their experience. The facilitator may at times present new information, but his or her key role is to help the group experience and learn together. This should be explained to the group at the outset. Some guidance for community workshop facilitators is given in **Box 2** below.

Box 2: A good facilitator...

- Spends time on the overall process design
- Keeps the group focused on task and process
- Remains objective
- Is an informed guide helping the group to chart its course and accomplish its goals
- Listens more than talks
- Adapts to various learning styles
- Encourages everyone to participate while remembering that individuals participate in different ways (some may talk only in small groups, yet are still participating; others may wish to talk constantly yet contribute little)
- Protects members of the group from attack by the others
- Is gender and culture sensitive
- Helps keep the group within time constraints
- Energizes a group or slows it down as needed
- Recaps, occasionally, what has happened in the workshop and helps the group to make connections between the sessions
- Is flexible
- Makes it FUN

(references: [USP/ICPL/SPREP 2001](#) and [Tawake et al. 2001](#))

Good facilitators will be conversant in a number of different tactics vital to facilitating productive meetings and processes. Some key techniques include use of ground rules, group-making, and energizers. These are discussed under **Facilitator Considerations when Preparing for a Workshop**, page 17.

For the Project Partner: Attitudes and Behavior

When working with local communities, it is important for the partner teams to recognize that they will sometimes be entering an environment and/or culture that is very different from what they are accustomed to. This requires special sensitivity with regard to attitudes and behavior, and it is well worth drawing up some ground rules for all team members to follow when working in the community with which they are partnering. Some examples are:

- Fit into the community and establish rapport. Share meals and accommodations and make jokes. Follow the local dress code and be sensitive to local culture. If you are not sure what to do, ask.
- Try to put people at ease and join in all activities. Do not set yourself apart.
- Use the local language unless you are absolutely sure all participants can understand and are comfortable with the language you are speaking. Use an interpreter if necessary.
- Always listen to answers and do not interrupt. Be humble. Do not give the impression you are more knowledgeable than community members.
- Be modest and friendly. Observe and adapt.
- Be gender sensitive. Be conscious of the appropriateness of your language and gestures. Avoid jokes that might be offensive to anyone.
- Be aware of use and abuse of information, provision of timely reports to community, ownership of information and the benefits thereof, and collection and guardianship of any samples. Be clear what the process involves and what will be done with all outputs.
- Respect confidentiality and privacy; do not spread gossip or divulge sensitive community information to which you have privileged access.
- Show professional standards such as commitment, being punctual, and not unduly raising expectations.

Some Important Points

The implementation of the activities and tools in this guidebook require skills that are not easily learned from books: **attitudinal change/appropriate behavior** and **facilitation**. Some considerations on appropriate attitude and behavior as well as facilitation have been given in the previous sections. Further information on facilitation skills can be found in the Participatory Learning and Action, Participatory Rural Appraisal, and Rapid Rural Appraisal literature. Some useful references are cited in the text throughout the guidebook, as well as in the list of references and resource materials at the end. These are not intended to be exhaustive; the number has been kept to a minimum so that the reader does not have to amass many books. However, it is highly recommended that practitioners are familiar with these techniques and have attended an appropriate training course if possible. This guidebook is merely a starting point for local marine management action.



I. INITIAL ASSESSMENT

A. Evaluate Community Request

Description

Communities drive the CBAM approach. To improve the health of their resources, the target community will need to put long-term effort into caring for and watching over their local areas, so before starting a new project it is necessary to assess their commitment to what will be a long and hard process. As a minimum, this will almost always mean that the community initiates the LMMA project by requesting assistance from outside – this can be a government agency, non-government organization, university or other party – to manage their coastal area or “getting their fish back.” This request needs to be assessed, and other factors that may determine the viability of the project need to be evaluated before the decision to assist is taken.

Aim

To ensure that the requesting community is clearly committed to working towards improved resource management and that the LMMA project has a reasonable chance of success.

Process

The main activities at this stage are meetings, interviews, informal discussions and background information gathering.

- 1) **People and sources** that need to be consulted include, as a minimum:
 - Person making the request
 - Chiefs, leaders, elders and community members
 - Other stakeholders (see **Box 3** on page 12)
- 2) **Other sources** for gathering background information include:
 - Publications and reports
 - Visual inspection of the target area; maps and satellite images if available
- 3) The **kind of information** that should be considered includes:
 - Whose idea was it? Did the request come from an appropriate person or institution?
 - Is the request genuine and the community committed?
 - Are there any conflicts in the area (over power, ownership, land rent, etc.)?
 - Are there insurmountable environmental problems?
 - Will there be active opposition to the project from important stakeholders?
 - Is there a past history with other projects; if so, what were the details?
 - Is the potential partner organization in a position to offer sustained assistance?
 - Will there be support from Government and Provincial agencies?
 - What is the leadership situation in the community?

Pointers

Skills needed for this process include general social and communication skills, as well as interviewing and evaluation skills. Some appropriate tools for this step may be found in PLA guides and the scoping stage of conflict management processes. For more information, see **Collaborating for Sustainability: A Resource Kit for Facilitators of Participatory Natural Resource Management in the Pacific** (Mahanty and Stacey 2004), **Participatory Learning and Action - A Trainers Guide** (Pretty et al. 1995), and the **Community Based Biological Monitoring Training Guide** (Tawake et al. 2003).

B. Stakeholder Assessment and Consultation

Description

This process identifies the different interest groups and people that may be involved in the project and builds a common understanding of the different roles and interests that they may have in setting a foundation for the development of an LMMA.

Aim

To identify the people, groups, communities and organizations that use or have an interest in local marine resources (known as 'stakeholders'; see **Box 3** below), and to ascertain the interests they may have and the roles they may wish to play.

Box 3: Stakeholders – people, groups, communities and organizations who have an interest in an LMMA project, such as:

- Chiefs, leaders, elders, leaders' council, island council, council of chiefs
- Community members including youth, women, other groups
- Relevant local authority, district or provincial government
- National ministry (Fisheries, Environment, Home Affairs, etc.)
- Non-Government and Community-Based Organizations
- Other fishermen (commercial or based elsewhere)
- Tourism operators (resorts, hotels, tour operators, dive companies, etc.)
- Universities, researchers
- Church
- Think of more in your situation...

Process

- 1) A desk-based stakeholder list is compiled based on the available information gathered in the previous activity, **Evaluating Community Request**, and consulting a checklist of potential stakeholders as outlined in **Box 3** above.
- 2) This preliminary list serves as the starting point for meeting with the various stakeholders and discussing the objectives of the project and the potential interests, issues and roles of the stakeholders. During this process other stakeholders should be identified and information compiled to ensure clear understanding of the proposed work and to enable future follow-up.

Tabulate the information as a matrix which contains a detailed list of stakeholders and their interests, issues, contact details and potential roles (see example below).

Stakeholder	Interests	Issues	Role/how will they participate	Contact details
Village chief (name)	Community fishing ground	Dwindling fish and marine resources	Attend meetings, inform and motivate his/her people	Phone, address, e-mail
Hotel operator (name/s)	Marine activities for tourists	Pollution, conflict with village	Attend meetings, work with village	Phone, address, e-mail
Municipal government	Well-being of people	Dissent among villages and businesses	Share information, draft resolutions	Phone, address, e-mail

Table 1: Stakeholder Matrix. The table above shows an example of a stakeholder matrix.

Pointers

It is useful to cultivate good meeting and interview skills, diplomacy and respect for confidentiality where appropriate. The intention is to foster collaboration and avoid conflicts, so the consultation process must be handled in a transparent and committed manner that shows commitment for the long-term. See **Collaborating for Sustainability: A Resource Kit for Facilitators of Participatory Natural Resource Management in the Pacific** (Mahanty and Stacey 2004).

C. Community Familiarization

Description

For a long-term project relationship to start off on a good footing it is important that the community and project partners get to know each other and develop rapport. This may happen during the two previous activities (Evaluating Community Request and Stakeholder Consultation), but if it has not yet been achieved, it must be ensured at this time.

Aim

To develop trust and rapport between the community and project partners, and to discuss and clarify issues, expectations and realistic goals.

Process

This process typically involves meetings, interviews and overnight or weeklong stays and exchange visits. Points to discuss and clarify include:

- Why the community wants to develop such a project.
- The project partner's facilitative role, the non-monetary nature of the assistance, the role of the community, the potential costs and benefits, and so on.
- The origins of the request (person/group) and their past experiences in conservation work.
- That it is the whole community that is in agreement with the proposal, perhaps backed by a letter stating such agreement.
- The scope of the project – will it cover only one village, a district, or the group of communities who have user rights to the target marine area?
- The involved parties' level of understanding of biological and socioeconomic conditions at the site.
- The intended roles of potential stakeholders.

Pointers

For more information, see the **Community Based Biological Monitoring Training Guide** (Tawake et al. 2003).

D. Planning For Next Stage

Description

Once the initial assessments and consultations are completed, the communities and project partners decide whether they will work together. If so, all parties need to agree on an overall process, the respective costs and expected benefits. It is then time for each partner to make the necessary preparations for the next stage, LMMA Design and Planning.

Aim

For the communities and project team to agree on an overall process and clarify the inputs each will make as well as long-term costs and benefits. The agreement should be made publicly and ideally in writing to reduce any future misunderstandings. In addition, for all parties to agree on the scale, timing and resources of the workshops to be carried out in the next phase, as well as each party's roles and commitments.

Process

- 1) Present to the community and project partners the process for facilitating LMMAs, which usually comprises the following components carried out in several workshops or other events:

• Situation Analysis	The community analyses its general situation, the condition of its marine resources, and identifies problems and issues.
• Learning and Awareness	Partners discuss traditional and scientific information important for understanding issues and planning actions.
• Action Planning	Priority issues are selected and actions developed to address these, including timeframe and responsible people/agencies.
• Monitoring	The process for determining if the action plan is working is designed and put into practice.

Table 2: Process for Establishing LMMAs. The table above gives a summary of the steps involved in establishing an LMMA.

The list above reflects a commonly used sequence, although some practitioners start the “Learning and Awareness” as a first step or integrate it throughout. These steps will be discussed in detail in the next chapter, **LMMA Design and Planning**.

- 2) Through a process of village and desk-based planning and consultations between the community and partners, verbal or written agreements and commitments are made regarding the process for carrying out the work and each partners' role and responsibilities. Specific factors regarding the workshop are also determined. These include –

Scale:

- Is the process going to cover one village or more?
- If it will cover more than one village, will one big meeting be held, or meetings in each village sequentially, or will the whole process proceed in one village first?
- How many people can be catered for at meetings?
- If meetings will be constrained in size and not open to all, who are the most appropriate people to have present to represent all stakeholders? (see **Box 4** below)

Box 4: Representative or whole community?

Workshops may have to be restricted in terms of attendance; however, representatives of different stakeholders or communities may not be effective depending on:

- whether there is accepted joint management of the fishing area
- whether the representatives are respected or listened to in their communities
- the degree to which the representatives understand the role they are to play and have the information needed to do it
- the strength of the village governance system
- the amount of interest generated in the representatives' villages by the project
- the amount of involvement of each village in project discussions previous to the workshop

Timing:

- Will there be separate workshops for each component or will several or all components be covered in a single workshop (this may depend on how eager or cautious the community is to implement management measures)?
- What will be the duration of the workshop/s?
- What is the best timing for these?

Resources:

- Are there enough facilitators and resource people?
- Will it be necessary to train any of the existing staff or bring others?
- What food, transport, accommodation and other logistics are needed and who will provide what?

Once these and other questions are answered, you are ready to move on to the next stage.

Pointers

For more information, see **Seeds of Hope** (Ferrer et al. 1996).



II. LMMA DESIGN AND PLANNING

A. Management Planning Process Design/Flow

As stated at the end of Chapter I, the next stage along the path of LMMA establishment is the management planning and design process, which has its own set of steps. Prior to starting the process of management planning, you will have completed some important activities as outlined in the previous chapter – that is, you will have agreed on the overall objectives of the project with all partners and have roughly determined the number, timing and scale of the workshops needed. You will also have a rough plan regarding the workshops necessary for carrying out the next steps. A sample sequence and tools used for such workshops is shown in **Figure 5** below:

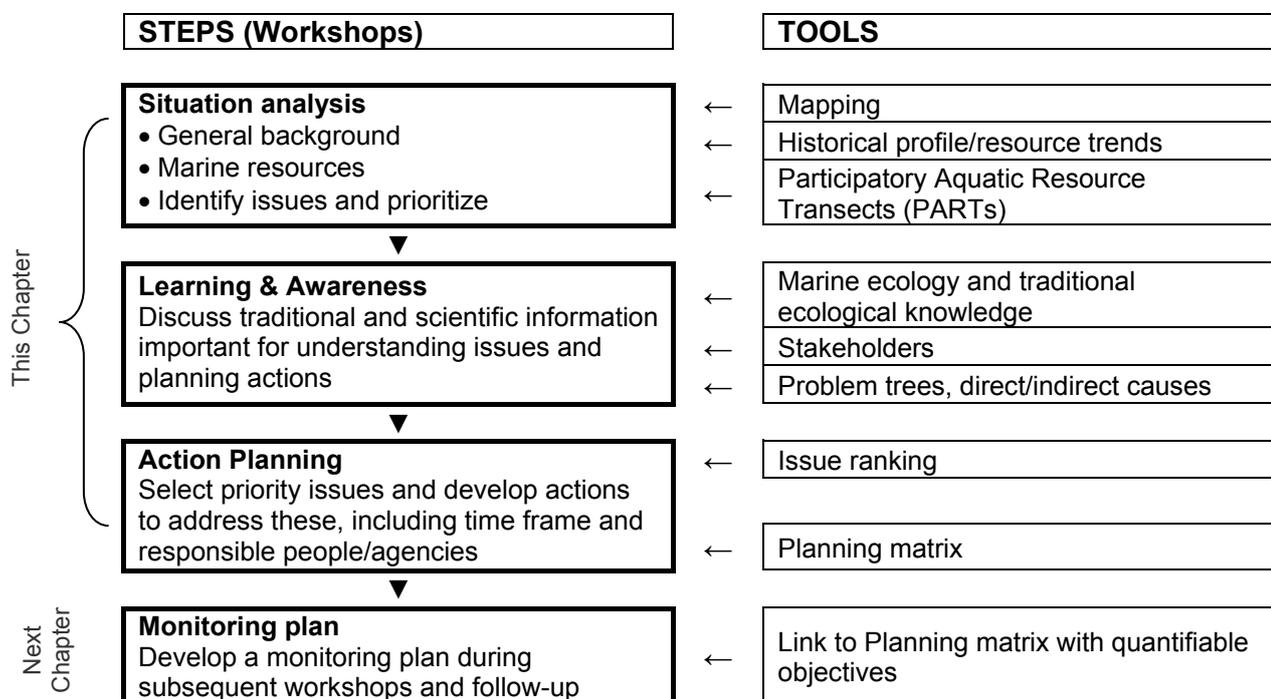


Figure 5: Management Planning Workshop Sequence. Example of workshop sequence and tools used by some sites in Fiji, Vanuatu and Solomon Islands.

This chapter focuses on the first three steps, while Chapter III covers monitoring. It is important to give thought to the design of each individual workshop and it is recommended that this be written down to help the facilitation team (for examples, see “Questions when Preparing for Participatory Workshops and Learning” at www.fspi.org.fj under the Community & Coasts Programme, Training Resources). The following points must be considered in designing a workshop:

- **Objectives:** This is the most important point. The objectives must be clear and agreed to by all parties; they should be stated at the start of the meeting and on any information materials or reports. The objectives will determine the following points.
- **Tools:** Use the objectives to guide you in selecting the simplest and most effective participatory tools or processes to achieve them. A selection of the most popular tools, along with details on how to use each, is presented later in this chapter.

- **Sequence:** The tools should be used in a sequence that helps the process flow naturally. For example – going from the general to the more specific, from the simple to the more complicated (see **Figure 5** on the previous page).
- **Participants:** Ensure you have a wide representation of the appropriate stakeholders at the meeting (as identified in the **Stakeholder Analysis** from Chapter I). Take care to involve important groups such as women (see **Box 5** below) or distant fishermen – design special tools or meetings if necessary.
- **Continuity:** When a workshop is following on from a previous one, ensure that enough of the same people are invited and remind them of the results and decisions from the previous meeting.
- **Logistics:** Make sure that the meeting announcement, transport, accommodation, food, tea breaks, venue and other logistical matters are being taken care of by one of the facilitating team together with the community.

Box 5: Women in Fisheries

In many developing countries, women obtain a large proportion of the marine catch for home and market by gleaning for shellfish, catching octopus and/or line fishing. In spite of this, they are often under-represented at participatory activities due to cultural factors. One should make a strong attempt to have women present at such activities by specifically asking for their attendance in equal numbers to the men if at all possible. In addition, it would be helpful to not require them to do the cooking for workshop attendees so that they may participate fully.



Woman in Navakavua, Fiji.
Photo by Elizabeth Holle.

During the management planning process and throughout the project, it is important to consult with women of the community to ensure they are not unfairly disadvantaged by the plan (for example, having to walk a far greater distance to access the reef due to any designated no-take or otherwise restricted areas). Along with other stakeholders, they should get a fair share of the benefits. It is also good to discuss with them what parts of the implementation and monitoring they would be interested to be part of or lead. For some activities, the women's expert knowledge of the inshore area will make them indispensable. In some sites, it has been proven useful to have a workshop on gender issues to raise the awareness of community leaders on this topic.

In the long run, it is good to work within cultural norms but it is also important to raise awareness on gender issues and seek ways to gently push for gender equality.

B. Facilitator Considerations when Preparing for a Workshop

- **Venue:** It is important to have an idea of what possible venues will be available. Good floor space or tables that people can sit around during group work are important, as are adequate lighting and of course a roof!
- **Ground rules:** When facilitating workshops or groups, it is very useful to establish agreement as a group on the way things are going to be conducted. This may include things such as punctuality, respect, smoking, tea break timing, language, and so on. Once agreed on, these can be referred back to in order to help in enforcement.

- **Groups:** Most exercises will be done in smaller groups to allow a better chance for all participants to have input. Six to eight people is ideal, but ultimately the overall number of participants will need to be considered – the more groups there are, the more time will be spent reporting back to the plenary. The groups should be formed taking into account the objectives of the exercise and the characteristics of the community where the work is being carried out. Some criteria include: **gender** (sometimes women prefer to work without men present); **tribes, kinship or landholding groups** (related groups may be able to discuss their resources better and have authority over them); **age** (sometimes it is useful to see how different age groups regard their resources and use them); **random or intentionally mixed** (in some cases it may be good for participants to work in groups with different stakeholders to gain a better understanding of each others' positions). The exercises are explained first in the plenary, and perhaps an example is shown before splitting into groups.
- **Plenary report backs:** After almost all group sessions, there will need to be a report back session from each group to the plenary, possibly followed by plenary discussions and/or questions. Time allowances need to be made for a report back from each group and this session will need to be facilitated to ensure that discussion is focused and agreements or outstanding points recorded.
- **Timekeeping:** It is important that a realistic amount of time is set aside for each activity, and to keep track of time allotted. In a workshop situation, time is usually limited; if certain exercises run over time, this may result in vital exercises at the end of the workshop being shortened or missed altogether. Assign someone to keep track of time and ensure that exercises stick to the agreed time limit or that other provisions are made to extend or modify the workshop.
- **Link the exercises – flow:** The workshop should be designed to provide a flow in the intended direction. It is important to ensure that participants are reminded of previous results and conclusions as each next step is started, and to keep everyone regularly updated on the progress through the overall agenda. Finished exercises may be displayed on walls or elsewhere so that people can refer to them or see what others have done.
- **Energizers and icebreakers:** When the meeting dynamics are low – such as when people are tired or after lunch – it is helpful to use techniques known as *energizers* to revitalize the group and increase enthusiasm. In addition, when a group of people are meeting for the first time and do not know each other, *icebreaker* techniques are useful to facilitate a pleasant and non-threatening way of introducing them to each other.
- **Materials:** Be prepared with all the materials that will be needed. A list of these should be made in advance and adequate supplies brought. Materials may include: butchers paper or flip charts, felt tip pens, cards, tape, post-it notes, pencils, note paper, digital camera (to record outputs), counters or beans for ranking/voting, scissors, and so on.
- **Record keeping:** Sometimes it is useful to have a workshop recorder or specific person assigned to record and be responsible for important information such as the names of attendees, agenda followed, decisions made and any new topics that come up, and to collect all outputs and keep in a safe place.

C. Tools and Exercises

The rest of this chapter presents details on a selection of the most popular tools and exercises used during the LMMA Design and Management Planning Process. When utilizing each, it is important to first explain to the community what the tool is and what is the purpose of the exercise before beginning the session.

1. Mapping

Description: A process in which participants record and discuss a geographic representation of the important features of the land and sea area they want to manage – such as coastline, different natural resources, infrastructure, etc. The group may wish to include the identification of problems or issues directly on the map to ensure that these are geographically referenced, or to do this in a separate exercise. One map may be used which contains much information, or separate maps can be used for different aspects, such as past and present conditions.

Aim: To generate discussion and create a visual display of where the communities, households, institutions, and infrastructure are located against the natural setting (including land/sea habitat types and elevation). From this background information, the location of various activities (including marine resource harvesting) and known resource issues and opportunities can also be assessed and displayed for LMMA design and management planning purposes.

Box 6: Mapping Exercise Topics

Topics that may be selected for group mapping exercises include:

Infrastructure: homes, churches, schools, bridges, roads, paths, wharves, etc.

Boundaries: political, tribal, linguistic, etc.

Commercial: hotels, resorts, fish markets, harbours, shops, etc.

Geographic features: rivers, farming areas, forests, marine habitats (mangroves, sea grasses, etc.), location of important species, etc.

Resource use: key resources and who harvests what, where, when and how. Other impacts such as aquaculture, mining, dredging, etc.

Biological or other phenomena: spawning aggregations, bleaching, flooding, etc.

Traditional uses or special features: sacred sites, tabus, fish traps, etc., or even things that people like or hold in esteem.

Problems: things that are considered to be problems, such as resource conflicts, destructive fishing, commercial fishing, etc.

Box 7: Use an existing map or draw your own?



Both photos by Hugh Govan

In some situations, it may be more appropriate to work using copies of existing accurate maps (above left) – for instance, if the exact location of features (such as boundaries) is vital. On the other hand, working from a blank sheet of paper to draw a map from scratch (above right) gives participants more flexibility (for example, increasing the scale in important areas and ignoring others), and may be less intimidating, thus creating a more relaxed working atmosphere. Significant interpretations about the relative importance of features to communities can be made based on the way they are drawn.

Process

- 1) Prior to the meeting, define the objective of the map, which is typically to gain a collective understanding of the community's marine resource situation, and then make a checklist of features, resources, activities and issues to be mapped (see **Box 6** on previous page).
- 2) Prepare the materials needed (for example, the exercise might be carried out on butcher paper with pens, or on sand with sticks and shells).
- 3) Begin by explaining the activity and dividing participants into groups (see Facilitator Considerations on group formation earlier in this chapter).
- 4) Ask participants to mark the position of a few important landmarks and to discuss the extent of the map. This is to determine the scale and central features. A good start might be marking the coastline, rivers, islands, mountains, villages, etc.
- 5) Ask participants to consider the checklist of features, resources, activities and issues. Encourage participants to discuss these and add things they think are important in relation to resource occurrence, distribution, use or access.
- 6) Use symbols, colours, or various materials (stones, leaves, etc.) to identify each of the features, resources, activities and issues on the map, and record what they mean in a legend.
- 7) Ask questions while the map is being created and ensure that the answers are noted on the map or by a workshop recorder.
- 8) Ensure the map is kept safe or recorded for future reference and participants' names recorded on it.

Sample local area/resource use maps from the Solomon Islands



*Left: Hand-drawn map with habitats indicated and corresponding legend.
Both photos by Hugh Govan*



Right: Locations of specific problems and issues such as dynamite use or coral bleaching are indicated with post-it notes.

Pointers

For more information, see **Participatory Learning and Action: A Trainer's Guide For the South Pacific (Ecowoman and SPACHEE 2000)** and **Participatory Learning and Action - A Trainers Guide (Pretty et al. 1995)**.

2. Participatory Aquatic Resource Transect (PART)

Description

A descriptive assessment of the makeup, uses and status of the local marine habitat types and resources, based on the visual observation of a group of people walking along a straight line across a specified cross-section of nearshore environment.

Aims

- a) To characterize the habitat types and important (“keystone”) resource species found within the coastal waters of the area being locally-managed; and
- b) To identify common marine resource uses, issues and opportunities within the local area.

Process

- 1) Make a map of the area beforehand and prepare a list or matrix of priority topics for the transect (for example, flora & fauna, bottom type, village use, cash use, keystone resources, traditional management, resource issues, opportunities and solutions – see **Table 3** below).
- 2) Explain to participants the purpose and steps of the activity. Ask them where they harvest resources and have them suggest one or more sites to do the transect, covering as many ecological zones and use areas as possible.
- 3) Once agreed, proceed along the transect, taking time within each zone to discuss and answer the questions. If you meet other community members along the walk, use open questions to find out more about their use of the resources in the area.
- 4) At the end of walk, work as a team to compile the information onto flip charts for presentation at a larger community meeting.
- 5) When recording the information, it is important to keep a copy of the transect data matrix produced, and main points discussed on these topics.

Sample Participatory Aquatic Resource Transect (PART) data matrix

	Mangroves	Mudflat/ Seagrass	Patch Reef	Fringing/ Fore Reef	Lagoon	Barrier Reef
Flora & Fauna						
Village Use						
Cash Use						
Keystone Resources						
Traditional Management						
Resource Issues						
Resource Opportunities						

Table 3: Participatory Aquatic Resource Transect data matrix. Example of a Participatory Aquatic Resource Transect (PART) data matrix used by FLMMMA to organize data collected during PART.

Pointers

This exercise can take much longer than most others – up to a day – and is prone to bad weather or other logistical problems, so plan accordingly.

For more information see **Collaborating for Sustainability: A Resource Kit for Facilitators of Participatory Natural Resource Management in the Pacific** (Mahanty and Stacey 2004), and **The Utility of Using Participatory Aquatic Resource Transect (PART) Technique across Freshwater and Nearshore Marine Ecosystems in Community-based Conservation Efforts** (Parks 1997).

3. Problem Identification

Description

A process in which the problems and issues affecting the community and its resources are identified and clarified so that they can be addressed later in the planning process.

Aim

To list, discuss and clarify the basic problems affecting the community and its resources.

Process

- 1) Generate a preliminary list of problems, using one of at least three options:
 - a. Collate the problems, issues and dislikes identified from the **Mapping** exercise presented earlier.
 - b. Collate the responses from the column/row on problems or issues from the matrix generated from the **Participatory Aquatic Resource Transect (PART)** presented earlier.
 - c. Generate a list of problems using a brainstorming exercise (see **Box 8** below).

Box 8: Brainstorming

Brainstorming is a useful tool to generate a broad list of ideas from group participants. The primary rule is that everyone is encouraged to call out as many ideas as possible. The facilitator tries to keep up the pace and ensure that no discussion or criticism is entered into while he/she writes the ideas on a flipchart. All ideas are valid and the facilitator must encourage everyone to contribute as much as possible until the flow of ideas has stopped.



Photo by Alifereti Tawake

- 2) Discuss and clarify the problems identified. Tools such as ranking or matrices (discussed later in this section) may be used to help participants focus on key problems.
- 3) Separate problems into direct and indirect threats.

Pointers

For more information, see **Collaborating for Sustainability: A Resource Kit for Facilitators of Participatory Natural Resource Management in the Pacific** (Mahanty and Stacey 2004).

4. Root Cause Analysis: Problem Tree

Description

This is a method to determine root causes of problems and identify possible solutions. This exercise may be extended to include solutions if appropriate.

Aim

To help participants identify and agree on the underlying causes of problems and examine the links between these root causes and their effects. This provides a basis for discussion on solutions in either this exercise or during **Action Planning**, later in this section.

Process

- 1) From the problems identified in the previous exercise, **Problem Identification**, the group or facilitator selects a problem to be worked on (typically a resource degradation issue), and writes it down at the head of a flipchart.
- 2) Ask the participants why the problem occurs and look for the immediate social, environmental and economic causes. Write these causes on cards or post-it notes and stick them to the chart under the problem. Make sure the causes are written down as a problem that opens the door to other questions – for example, “Lack of information” leads to “Why is there a lack of information?” and so on.
- 3) As you work downwards toward the roots, keep asking the question “Why does this problem happen?” for each of the immediate causes identified. Discuss each item and write the answer on a post-it note or card. Then place the notes on the line below the causes they relate to. If the same cause underlies several items, write it separately for each one.
- 4) Repeat the steps until it is not possible to break the problem down any further. At this point, you have identified potential root causes of the problem. It is well worth checking “back up the tree” to see that the logic holds both ways and clarify any issues that arise, moving or modifying the notes as appropriate.
- 5) Finally you should connect the notes with arrows to show the links and make sure that the notes are strongly affixed to the paper.
- 6) Repeat this process for each problem originally identified in the previous exercise. Participants could tackle different problems in different groups, then present back to the plenary.

See sample Problem Tree on next page.

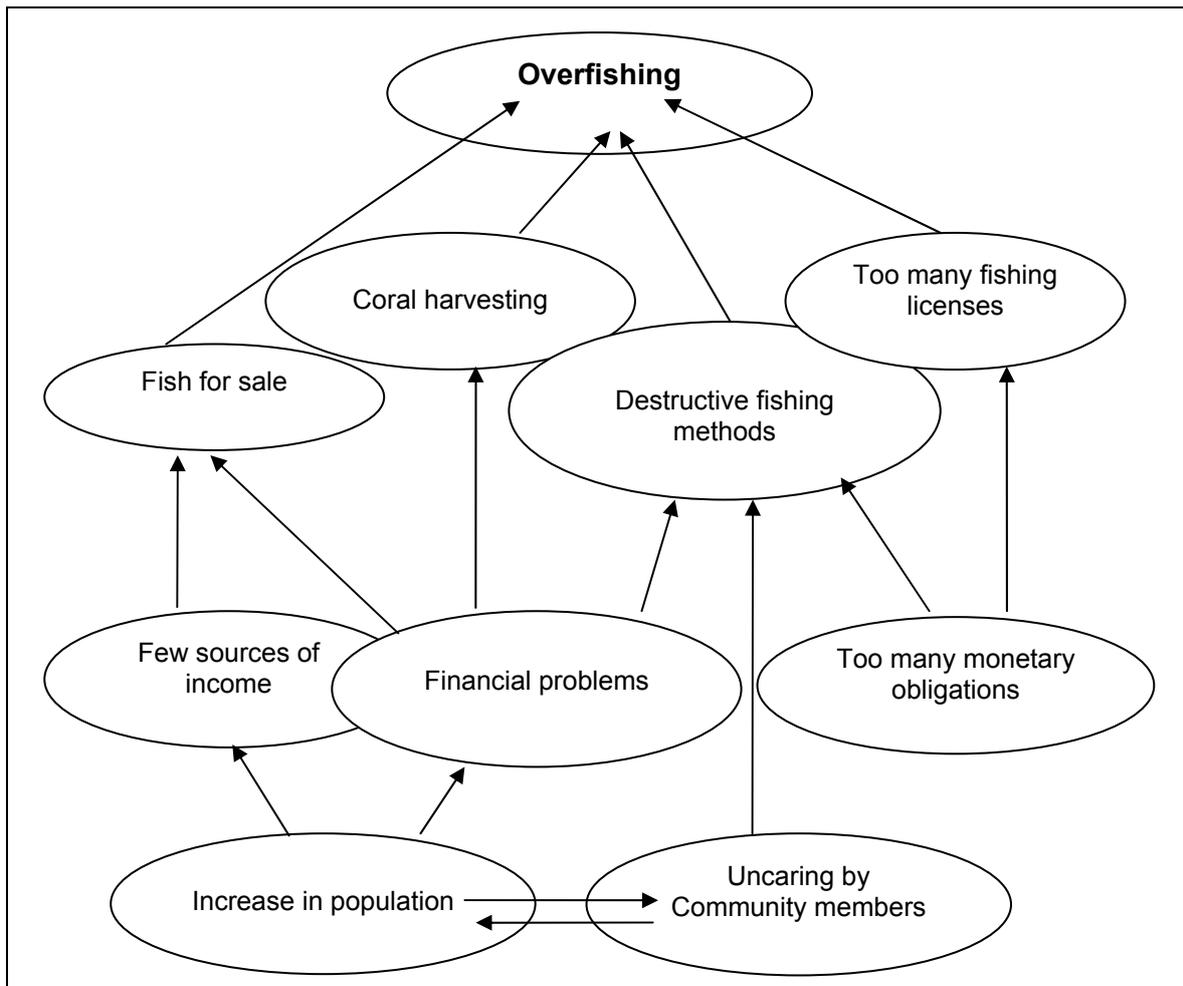


Figure 6: Problem Tree. A general example of a Problem Tree from Fiji.

A similar exercise can be carried out as a matrix (see **Box 9** below); on the left side of the paper note the problem and move over to the right putting down the possible causes. Both exercises can be taken further in discussions, looking for solutions and who might be able to implement them. However, it may be preferable to leave this as a separate exercise, as the results from such forms the core of an action plan.

Box 9: Matrices

These are an important component of many exercises, such as problem ranking or action planning. They are simply a table with columns and rows. When using a matrix, give previous thought to how you will go about it – for example, will you work across a row filling in each column before moving on to the next one or try and fill in all the rows of the first column before moving to the next and so on. An example of a matrix can be seen in a previous exercise, **Participatory Aquatic Resource Transect (PART)** and will also be used in the next exercise, **Priority Matrices and Ranking**.

Pointers

For more information, see **Collaborating for Sustainability: A Resource Kit for Facilitators of Participatory Natural Resource Management in the Pacific** (Mahanty and Stacey 2004), **Socioeconomic Manual for Coral Reef Management** (Bunce and Pomeroy 2000), **Participatory Learning and Action: A Trainer’s Guide For the South Pacific** (Ecowoman and SPACHEE 2000) and the **Community Based Biological Monitoring Training Guide** (Tawake et al. 2003).

5. Priority Matrices and Ranking

Description

This is a process that allows participants to rate which coastal resource issues (problems, threats and root causes) are the most important ones that their community is facing.

Aim

To have the community prioritize their most important problems, threats and root causes. This will help the community identify where they should focus their LMMA efforts and time.

Process

This exercise requires the listing of problems, threats and root causes identified by the group in outputs from previous exercises, **Problem Identification** and **Root Cause Analysis**. A number of options for this exercise is available. The option presented below is a *pair-wise ranking*, which allows for an objective, comparative approach, but ranking can also be carried out by simply voting – assigning numbers of voting tokens (beans, stones, etc.) to represent different options. Either way, see **Box 10** below for a caution.

Box 10: Ranking

Ranking can be carried out in a number of ways, but it is important that the facilitator and group do not become too obsessed with obtaining a rank or score. One of the most important reasons for using this tool is to encourage discussion and comparison of issues to gain a broad understanding of the relative importance of each; if this is achieved then the object of the exercise has been reached. Friction can be generated where the actual ranks are given too much importance.

If it is important enough and time permits, then the ranking criteria should be discussed as they will to some extent determine the outcome.

Pair-Wise Ranking

- 1) Break into small groups of 4 to 6 people each. Give each group a piece of butcher's paper and some markers.
- 2) Each small group will now create a ranking table on their piece of paper. Add one to the total number of previously identified problems/threats, then divide the table into this many columns and rows. For example, if 9 problems/threats were identified, then the table should be divided so that it has 10 rows and 10 columns.
- 3) In the **top row** of boxes in the table, skip the first, far left-hand side box and then thereafter title each problem/threat into the remaining boxes across. Now, under the **far left-hand column**, skip one row down and then enter each problem/threat again down into the rows below. Be sure to enter the problems/threats in the same order across the top row as down the far left-hand column.
- 4) Next, diagonally through the middle of the table from the top left to bottom right, note where the same title in the rows and columns meet (for example, where the "Threat 2" column meets the "Threat 2" row). These squares and all those below them in the column should be blocked out. Each small group should now have a ranking table ready that looks similar to the example on the next page.

Pair-Wise Ranking Matrix

	(Threat 1)	(Threat 2)	(Threat 3)	(Threat 4)	(Threat 5)	(Threat 6)	(Threat 7)	(Threat 8)	(Threat 9)
(Threat 1)									
(Threat 2)							X		
(Threat 3)									
(Threat 4)									
(Threat 5)									
(Threat 6)									
(Threat 7)									
(Threat 8)									
(Threat 9)									

Table 4: Pair-Wise Ranking Table. A pair-wise ranking table of 9 problems/threats ready to be filled in.

- 5) Now it is time to do the paired rankings. In each open box, compare the threat/problem listed in the top box above against that listed on its far left. For example, in the box with the “x” in the table above, the comparison would be between Threat 7 (listed above) versus Threat 2 (listed to its far left). In this comparison, have the small group ask themselves which of these two threats/problems is more important for the community to resolve. “Importance” will be both in terms of how severe/extreme the threat or problem is, and also in terms of how much impact it is having on people’s lives and their resources. When the small groups come to agreement on which of the two compared threats/problems is more important for their community to address, write the name of the threat in the box to indicate that it is preferred, or more important, in comparison to the other. If no agreement can be reached, consult with the advice of an outsider (from another small group) or the facilitator until a choice can be made between the two options.
- 6) Repeat these paired comparisons until all open boxes have been filled in with the selected threats.
- 7) Once the table is filled in, on a separate sheet of paper list all of the threats/problems considered and the total number of times each was chosen within the table (the 'score').
- 8) Once this has been done, rank the problem/threat from highest to lowest in terms of their scores (the number of times it was chosen). See example below.
- 9) Take the results from each small group to the plenary for discussion and possibly agreement.

Example of a Completed Ranking using the Pair-Wise method

1.	<i>Qoli sivia</i> (overfishing)
2.	<i>Qoli ni lase</i> (coral mining)
3.	<i>Duva</i> (use of traditional fish poison)
4.	<i>Musu ni vei dogo</i> (mangrove cutting)
5.	<i>Benuci ni matasawa</i> (rubbish dumping on beach)
6.	<i>Sisi ni qele</i> (siltation)

Table 5: Completed Pair-Wise Ranking. Above is a list of the most important marine management problems as derived from a pair-wise ranking exercise, from Verata, Fiji.

Pointers

Carrying out this exercise in plenary is possible, but may lead to dominance by a few vocal people. Simple voting techniques may help, for instance – “fist of five,” in which everyone raises their hand to vote, raising a number of fingers relating to how much they support the proposed choice – no fingers is no support and five fingers is full support.

For more information, see **Collaborating for Sustainability: A Resource Kit for Facilitators of Participatory Natural Resource Management in the Pacific** (Mahanty and Stacey 2004).

7. Reef Biology and Ecology: Food Pyramids

Description

In order for communities to be able to make informed decisions, it is very important that they have access to as much information as possible about their marine ecosystems. This knowledge may be available in part from traditional ecological knowledge. However, traditional knowledge will often need to be supplemented by scientific concepts, presented in ways that are easy for the community to relate to. The need for scientific training will depend on how much of a grasp the community already has on biology and ecology concepts and the time available. Methods may include discussions on traditional knowledge, posters, community theatre, simple graphic representations, or exercises on key scientific concepts.

Aim

To raise awareness and generate discussion on important scientific concepts. In the following example of a food pyramid, communities become aware of the inter-relatedness of species and how the loss of one affects others.

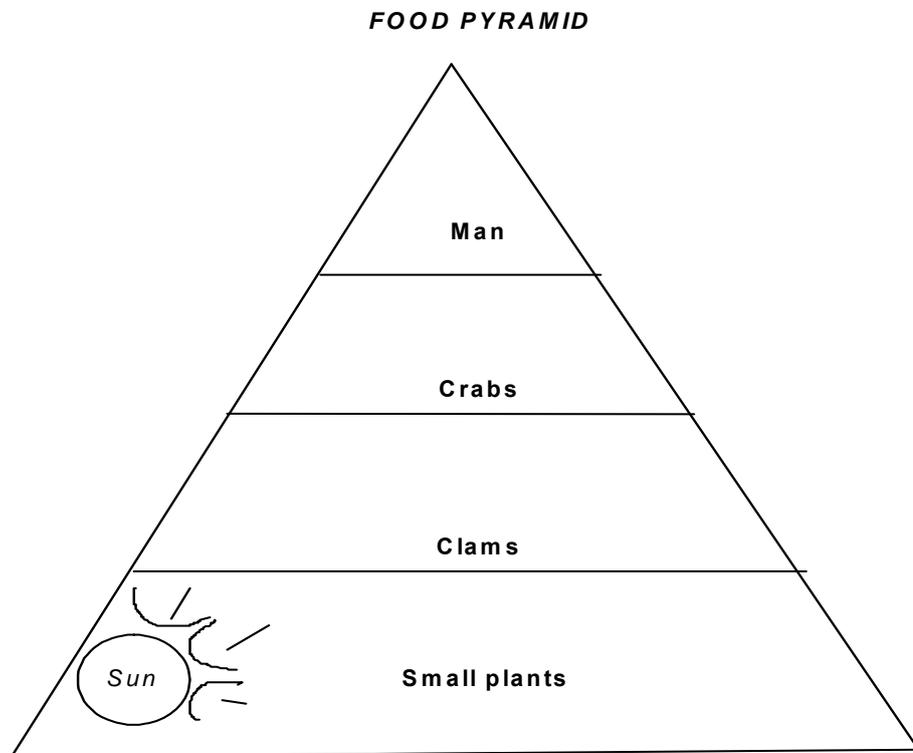


Figure 7: Food Pyramid. A sample food pyramid, as used in the example below.

Process

- 1) The idea of marine ecology is introduced and an example of a marine food pyramid given (see **Figure 7** above). A pyramid is used to reflect that there are more organisms at the bottom (the foundation) of the pyramid, and fewer at the top.
- 2) The group chooses a marine organism from which to structure a food pyramid (optionally, this can be carried out as part of a field exercise).
- 3) The group then prepares a food pyramid based on the chosen organism and discusses the role of this organism within one level of the food pyramid to evaluate the overall health of the entire pyramid.

- 4) The group then chooses a different marine organism and incorporates it into the food pyramid in its appropriate place. Continue to the top and bottom of the pyramid.
- 5) Ask the group what would be the effect of overharvesting one of the mid-level organisms of the food pyramid. Point out that the organism/s in the level below them will initially flourish due to lack of predation.
- 6) Going further, point out that the organism below the one that is flourishing will eventually be exhausted and disappear due to being eaten by the flourishing population above them; in turn the once-flourishing population will crash. Then, follow the chain of thinking up the pyramid. If one organism is overharvested, then the one above that which is dependent on it will also suffer and diminish. Make it graphic by putting an X through things that disappear.

Food Pyramid Example

- In the example of a food pyramid above, suppose the crabs – a mid-level organism – are overharvested by people. The effect is felt throughout the entire food pyramid as follows:
- At first, the organisms below the crabs (in this case, clams) will experience a lack of predators.
- Without any predators, the population of clams will grow much larger.
- However, because the clam population grows so big, they will eventually eat and deplete all of the organisms in the level below them (in this example, the small plants floating in the water that the clams filter feed upon).
- Now the clams do not have enough food to survive and also die out.
- Now, not only have people harvested all of the crabs to local extinction, but in doing so they have also lost all of their clams too, because the food pyramid within which these organisms exist has been disturbed and fallen apart. Without these two very important food resources, how will people subsist? Where will the money come from that would have been received from selling the clams and crabs at the market? Money that is needed to now buy packaged (and probably less-healthy) food from the store?

Pointers

Some key ecology concepts that communities may want more information on include:

- Relationship between species (food web)
- Reproductive processes, spawning and larval dispersal
- Importance of various habitats (for example, mangroves as nurseries or coral as protection)
- Impact of destructive practices on environment
- Watershed and pollution impacts
- Effect of traditional management practices and no-take areas on environment (with examples from other communities or countries)

For more information, see **The Utility of Using Participatory Aquatic Resource Transect (PART) Technique across Freshwater and Nearshore Marine Ecosystems in Community-based Conservation Efforts** (Parks 1997).

8. Seasonal Harvest Calendar (optional)

Description:

This exercise helps communities examine changes that happen to their marine resources over the year. For example, certain resources may fluctuate seasonally, and other activities may dominate the community's time and attention; these will impact potential management activities.

Aim

To discuss and record the variations in factors affecting the community and its resources over an average year.

Process:

- 1) Divide into small groups with butcher's paper and markers.
- 2) Make a matrix with 13 columns. The far left column is left blank for the questions listed below and the other 12 are for each month.
- 3) In each row of the first (far left) column, list the following questions:
 - What are the main activities (involving fisheries but also others, including gardening, etc.) carried out in your community and how do they vary over the year?
 - What are the main sources of income for your families over the year?
 - What are the main food items from the sea and reef?
 - What methods of fishing are used in your village?
 - For each of the most important species mentioned during the **Mapping** exercise, what are the relative catches each month?
 - Do any of these species have seasonal migrations or mating activities? If so, note down in the appropriate month.
 - Include any other issues that may be seasonal (such as poaching) and indicate the appropriate month/s they occur.
- 4) For each topic, make a mark under each month to indicate the relative abundance or importance for that month. This may be a number, a cross, multiple crosses, or some other indicator mark. Notes may be added. Another variation is to use pie charts for each month to indicate proportions of different catches for that month.

Pointers

For more information, see **Collaborating for Sustainability: A Resource Kit for Facilitators of Participatory Natural Resource Management in the Pacific** (Mahanty and Stacey 2004) and **Participatory Learning and Action - A Trainers Guide** (Pretty et al. 1995).

9. Historical Timeline (optional)

Description

This is a list of important events or major decisions that have occurred within the community's history that helps to identify past issues, problems, and any steps taken or achieved to overcome them.

Aim

To identify, discuss, and understand how events and decisions that have occurred at local, national, and international levels relate to or have influenced the community's use of its coastal resources. This exercise should help people think about how their community's present identity and behavior is related to their overall history and also how major changes may be related.

Process

- 1) Divide into groups. It may be beneficial to include both old and young people in each group to ensure that historical information is known by at least some members.
- 2) Record participants names, date and village.
- 3) Identify dates when there were significant changes in selected factors (for example, fishing methods, population, farming practices) and record any events. Use these dates to compare different points in history to the present.
- 4) Record this information in tabular form (list the factor/event in rows, and list the dates or period of time in columns).
- 5) Some examples of factors/events to focus on include:
 - Infrastructure – roads, electricity, water supply, bridges, sewerage systems, communications
 - Crops and vegetables
 - Populations growth, settlements, immigrants
 - Political events
 - Natural disasters – hurricanes, tsunamis
 - Employment
 - Health
 - Education
 - Farming practices/vegetation
 - Waste management/disposal
 - Religions
 - Resource depletion
 - Other developments
- 6) Facilitator should ask simple guiding questions – such as what, where, when, how – to help participants understand the exercise and keep focused.

Sample Historical Timeline Table

Factor or event	1960 – 1980	1980 – 2000	2000 – Present
Population			
Fishing Methods			
Major developments (tourism, new roads, etc.)			
Logging, agriculture			
Hurricanes/Tsunamis			
Political events			
etc.			

Table 5: Historical Timeline. The above is a sample table for filling in historical data.

Pointers

For more information, see **Training Resources** at www.fspi.org.fj under the Community & Coasts Programme.

10. Action Planning Matrix and Next Steps

Description

This is the key outcome of the process and defines implementation and guides monitoring. It is typically carried out during an **Action Planning Workshop**. The community lists down priority management actions to be taken, including timing, the problem being addressed, and who will be involved, with regard to the threats/problems identified in earlier exercises.

Aim

To achieve a commonly agreed and practicable plan of action that will serve as guidance for the community's actions and a reference point for monitoring of progress.

Process

- 1) Divide into groups. You may decide to keep the groups from the previous exercises, but you can also divide them into stakeholder groups such as young women, young men, men, women, elders, fishers, farmers, etc.
- 2) From the prioritized list of threats and problems generated in a previous exercise (**Priority Matrices and Ranking**), assign one or more of these to each group.
- 3) Each group will then –
 - a) discuss the threats/problems assigned to them and what, if anything, has been done to address them;
 - b) propose solutions and come up with a list of activities, process and steps that needs to be taken to address the threat;
 - c) identify who is the appropriate stakeholder or group that will need to take the lead in implementing those solutions, and
 - d) estimate a timeframe or dates when the task is expected to be completed.

Sample Action Planning Matrix

Prioritized Threats/Problems (most urgent to address)	What has been done to address the problems	Solutions: Undertakings and Activities	Stakeholders to implement (include lead agency)	Timeframe for Implementation	Who in community is responsible

Table 7: Action Planning Matrix. The above is a sample action planning matrix ready to be filled in.

- 4) Allow as much time as possible for each group to go through and fill out the planning matrix (see sample above).
- 5) Ask each group to present their suggested management actions to the plenary and seek agreement and further suggestions from the whole group. **CAUTION:** Be sure that each groups' presenter is not defensive of their ideas; it is important to be open.
- 6) Collate the agreed actions from each groups' table into one master matrix. The collated planning matrix can be taken back to the whole village – possible during a village meeting – for further discussion and ratification before implementation. See **Table 7** on the next page for an example of a completed matrix from Verata, Fiji.
- 7) Discuss and agree on next steps. What is going to happen after the Action Planning Workshop, or after the management plan is written up, and so on?

Example of a Completed Action Planning Matrix

Threats/ Problems Identified	PROPOSED SOLUTIONS		WHO IS RESPONSIBLE FOR THE TASKS?		When To Be Implemented
	What has been done about the problem?	Proposed Tasks to resolve the problem	Within the district	From outside the district	
Destruction of Reef	Nothing has been done about this	Awareness campaign about how coral destruction is not beneficial to the community.	Workshop Participants Environment Committee	Fisheries Officer A, (FAB – Research Unit, Officer B). OISCA	December 2002
Overfishing	Have put aside reserve marine areas for village A, B and C	<ul style="list-style-type: none"> • To be gazetted by government • Fishing ground demarcation • Selection of committee and fish wardens • Monitoring of marine reserve areas 	Village and Tikina Council meetings and "Bose Vanua"	Provincial Council Meeting Native Lands Commission Fisheries FAB	Within 6 months and to be monitored annually
Duva (plant fish poison)	Use of 'duva' has been banned in a village meeting	Fish wardens to strictly enforce law and resolution by the village council	Fish Wardens Environment Committee Chief	Fisheries Provincial Office	1/02/2003

Table 8: Completed Action Planning Matrix. Above is an example of a completed action planning matrix, based on the Marine Resource Management Plan for Korolevu-i-wai, Fiji, November 5-7, 2002.

Pointers

It is important that the action planning matrix be as specific and detailed as possible with descriptions of steps to be taken and clear timelines. It is also vital that no stakeholder be assigned a role without their agreement and reasonable expectations that they can fulfill it. The main point is to come out with a written agreement on the actions that the community and partner organizations are committing to. If outsiders are named responsible for any action and do not fulfill their functions, the plan will be greatly reduced in value. It is helpful to publish your plan on posters to increase the awareness and commitment of the community and to inform outsiders of your activities. For more information, see the **Community Based Biological Monitoring Training Guide** (Tawake et al. 2003).

The remainder of this section introduces various management options for you to consider for your action plan.

D. Management Options

(The following management options are largely sourced from Austin Bowden-Kerby; for more information, see the **Ecology and Management Issues Posters** and **Coral Reef Management Options to Engage Communities and Accelerate Fisheries Recovery** at www.fspi.org.fj under the Community & Coasts Programme, Training Resources, Management Planning, Knowledge)

When designing the management action plan, communities need to consider their best options; the strategies chosen should address the root causes of fisheries decline identified by communities in previous exercises (for example, if the root cause of decline is thought to be introduction of gill nets in the 1960s, then gill net management should be part of the management plan). Typically, some sort of no-take reserve is utilized as part of the overall LMMA strategy to help species and habitat recover and/or continue to flourish.

Box 11 below lists possible management strategies that may or may not be appropriate for communities, depending on the site. The biology and ecology behind each method, as well as the human and financial resources needed to carry them out, should be understood and discussed prior to including it in your action plan. Be careful of just presenting a list of options to communities as many may seem attractive but may not be appropriate.

Box 11: Management Options

1. Permanent no-take zones (marine reserves, marine protected areas, etc. – see Box 1 on page 3)
2. Rotational or temporal no-take zone (giving the reef a resting period)
3. Zoning the management area – delineating different areas for different uses (for example, banning commercial fishing where it competes with subsistence fishing or tourism, etc.)
4. Ban the use of poisons for fishing (both traditional and modern)
5. Ban fishing that destroys habitat (dynamite fishing, smashing corals to chase fish into nets, etc.)
6. Regulate or ban night fishing with underwater lights
7. Regulate or ban spear fishing using SCUBA
8. Control the use of pressurized gas or SCUBA for harvesting beche-de-mer (sea cucumbers), etc.
9. Ban the harvest of egg-bearing female lobsters or crabs
10. Establish size limits for clams, lobsters, crabs, octopus, and certain fish
11. Control the use (and sale) of small-mesh fish nets (require a minimum mesh size of 3 inches for most types of net fishing)
12. Ban gill netting, or replace gill nets with fish traps that don't kill the fish, so that rare species can be released. Use fish traps and fish fences to replace some types of net fishing (perhaps using more durable modern materials).
13. Protection of spawning aggregations from fishing
14. Seasonal closure of a fishery (during reproductive season)
15. Ban on harvest of very rare species in the larger management area (turtles, bumphead parrotfish, humphead wrasses, triton's trumpet or other shells, etc.)
16. Discouraging destructive practices such as walking on corals, anchoring on corals (make permanent moorings, or buy or make sand anchors), and harvesting corals (replace with sustainable coral farming)
17. Ban the disposal of rubbish into the sea, especially plastics, batteries, and cans
18. Removal of crown of thorns starfish if there are > 5 per hectare
19. Removal of tree trunks that wash up or fall onto the reef, as they roll around during storms, smashing corals
20. Replanting corals to dredged or dynamited reefs that are not recovering
21. Planting corals (staghorn types) for fish houses where the corals have died out or where there is a deficiency of fish habitat
22. Restocking or aggregation of surviving rare shellfish within a limited area of a no-take zone, with proper monitoring and a protection program
23. Training and activation of community "Fish Wardens"
24. Limiting the numbers of commercial fishers in a particular area
25. Development of effective enforcement and problem-solving process in the community
26. Re-establishing traditional fishing methods that allow "totem" species (species sacred to a particular clan) to be easily released
27. Reduce nutrient pollution to reefs by improving sewage systems and reducing other sources of nutrients such as run-off from piggeries, fertilizer, etc.
28. Other sorts of sustainable management practices

These are just some ideas; the community should identify those that are most appropriate for their site. For more details on any of the above options, see the Communities & Coasts Programme Training Resources at www.fspi.org.fj.

Traditional versus Modern Management Techniques

Throughout the Pacific Islands, communities have long practiced traditional techniques to preserve their marine resources, such as seasonal bans or no-take areas, either temporarily or permanently. In Fiji, the traditional use of *tabu* (no-take) areas was used to make an area of the reef a temporary no-fishing zone when a chief or special community member died. Besides being considered a sign of respect, declaring the *tabu* also had a practical effect of ensuring there were plenty of fish that could be easily caught to feed visitors when the mourning period ended many months later. This customary practice of declaring temporary *tabus* was a good way of ensuring that there was plenty to eat from the sea.

On many Pacific Islands, particular reef areas were considered sacred according to the pre-Christian belief system, so these areas were permanently closed to fishing as *tabu* areas. Over time, the traditional practice of establishing *tabu* areas has mostly been abandoned, so there are less fish to eat. However, today in many areas, island chiefs have begun to reintroduce the practice of no-take areas to try and increase the number of fish once more.

While falling back on traditional management practices alone may work well in some places, adding other options or blending traditional with modern techniques may make management plans more effective. This is especially true now that commercial and other modern fishing methods have become prevalent, growing populations have increased demands on resources, and pollution and siltation has added stress in many areas.

No-Take Areas

1. What is a No-take area?

A no-take zone (also known as a marine reserve, marine protected area, *tabu* area and more; see **Box 1** on page 3 for various names) is a coastal or marine area that is closed off to all fishing, either temporarily or permanently. After studying how to manage coral reef fisheries resources for many years, fisheries scientists have discovered that the best way to manage coral reef resources is to establish permanent no-fishing areas. Many scientists don't realize that this "modern breakthrough" in fisheries science is actually a traditional Pacific Island way of managing easily overfished resources!

Today many islands are experiencing serious resource decline, and communities are reestablishing traditional management practices, often updating and optimizing their techniques with the assistance of non-governmental organizations or other outside parties (for example, government and universities). Much of these efforts incorporate the use of no-take areas. To make the best use of no-take areas, we need to understand their benefits.

2. Benefits of No-take Areas

- a) *No-take areas provide an undisturbed place for fish and other marine life.*
In the first year of establishment, the fish in the no-take area grow bigger. Fish or turtles may also come from outside the no-take area to seek refuge in the no-take area. The corals also grow better because people are not walking on them, thus improving habitat for marine life.

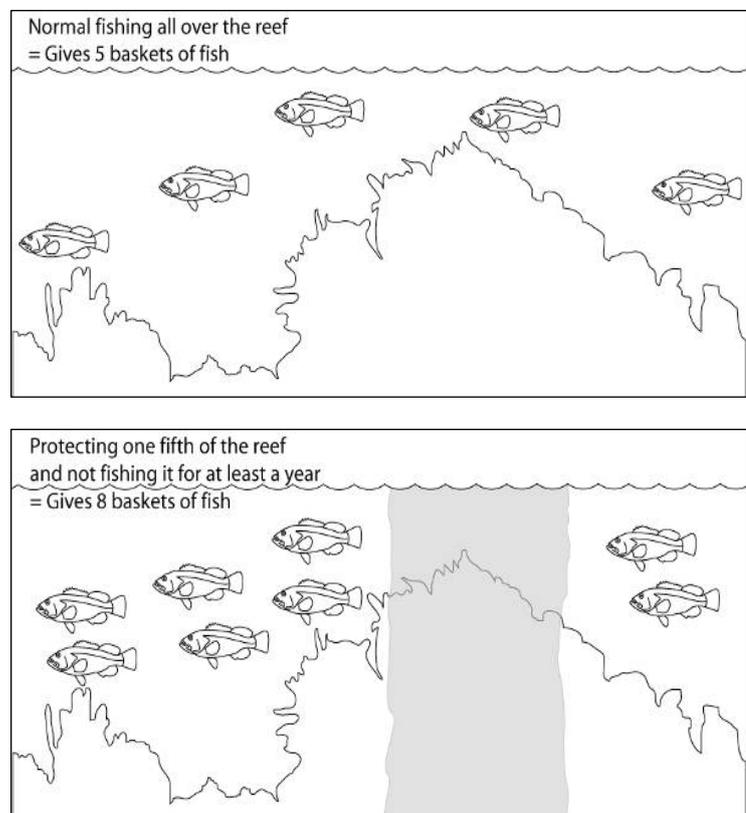
- b) *No-take areas allow spillover of fish and other marine life to fishing areas.*
In the second year, as the fish and shellfish continue to grow larger in the no-take area and need more space, they begin to “spill over” into nearby fishing areas. This spillover increases fish catch in the open harvest areas. Even closing a reef for just six months or a year will increase the size and number of fish caught in the open fishing ground near the no-take area.
- c) *No-take areas allow fish and other marine life to become big enough to reproduce.*
Fish, clams, octopus, and other marine life have a better chance of growing into mature adults within the safety of the no-fishing zone and begin producing lots of babies that either stay in the immediate area or spread to new areas, depending on water circulation and tidal currents. This “seeding” effect of no-take areas allows new marine resources to grow in and around the no-take area. For example, octopus babies always stay nearby because they don’t have a swimming larval stage. The mother octopus sticks her eggs on the top of her cave-like lair and takes care of the eggs diligently – protecting, cleaning, and keeping water moving over the eggs at all times. No-take areas allow octopus to produce many babies, and when these babies hatch, they move out to surrounding reef areas.
- d) *Permanent no-fishing areas help restore critical spawning densities.*
Many animals can not move around to look for mates like fish do, so when only a few are left on the reef, reproduction fails. Slow-moving creatures and animals attached to the substrate - like clams and beche-de-mer (sea cucumbers) - make babies by releasing eggs and sperm into the water during certain phases of the moon. When too few animals remain and they are too far apart for the sperm and eggs to find each other, they fall below a “critical spawning density.” As no babies are being produced, it may take many years for severely overfished shellfish or sea cucumbers to return, if at all. No-take areas provide a place for these benthic animals to reside safely, thus allowing a better chance for reproduction.

3. Important Considerations for No-take Areas

- a) *Variety of habitat.* Many species that live on coral reefs as adults grow up in seagrasses, seaweeds, and mangrove areas when they are young. Thus it is important to have these habitats as part of the no-take area, so that juvenile creatures can grow up to move over to the reef. Sandy and rocky shorelines are important nursery areas for particular types of sea cucumbers, so protecting these areas from too many human activities should also be considered.
- b) *Health of reef.* Communities often choose unhealthy reef areas where there are few fish as their no-take zone because they don’t want to lose the better fishing areas, and they want the sick reef to get healthy again. However, it is important to include healthy areas of reef that contain a variety of marine resources as part of the no-take area so that all sorts of fish and shellfish can reproduce and spillover to other areas. Thus the no-take zone should contain healthy as well as sick reef areas.
- c) *Patrolling and Enforcement.* As the no-take area starts filling with fish, some people will be tempted to fish there. Thus it is important to set up your no-take zone in areas where the community can easily see and stop violators. An enforcement system and penalties should be clearly established during the management planning process. Some communities have a Fish Warden system in connection with the government, where trained community members have the legal right to inform and arrest violators.

- d) *Period of time.* Closing a reef for 3-5 years is necessary for significant recovery of fish; permanent closure yields even greater results. While temporary closure will result in more and bigger fish in the open fishing grounds, it may not do much to restore animals that have become very scarce. Many species take years to mature, so the longer an area is closed to fishing, the more animals will be able to reproduce. Opening the no-take area after a temporary closure may wipe out any progress that has been made in reestablishing breeding populations of these species. Thus it is best if some no-take areas are permanently closed. After seeing an increase in fish and shellfish, communities may be tempted to lift the no-fishing ban, but in doing so, most of the benefits are lost. The greatest benefits occur when the no-take area becomes full of mature fish and acts as a breeding ground, so the offspring fill up the open fishing areas. However, it may be possible to open a permanent no-take area about once every year or two to harvest food for a special occasion, but only if it is **strictly limited** in time (a single day or less), and there is a set limit on the amount to be taken. In addition, only those resources that are very abundant and recover quickly should be harvested (such as octopus and certain fish), however giant clams, trochus, beche-de-mer, and other slow-growing animals should not be taken, otherwise it could be a major setback.
- e) *Size.* Scientists recommend that a minimum of 20% (one-fifth) of the fishing ground be closed, ideally permanently, for full benefit of the no-take area (see **Figure 8** below). If one-fifth of the reef (20%) is put aside as a protected area, the fishing in the other four fifths (80%) will increase, often drastically. On Apo island in the Philippines, which was severely overfished, closing one-fifth of the reef resulted in a five-fold (500%) increase in fish catch in the open fishing grounds in just three years. However, if a reef is not yet heavily overfished, the increase in fish catch won't be as drastic, but the no-take zone will serve as a sort of insurance to prevent overfishing by maintaining healthy breeding populations.

Figure 8: Fish Catch in Open Area versus No-Take Area. Fish catch in open harvest area (top) versus one-fifth of reef as no-take area (bottom).



- f) *Make it known.* It is important to post the rules of the no-take area and to display its boundaries so that all members of the community and neighboring villages know about it. Using prominent sign boards, buoys, sticks or other markers to delineate the borders help ensure that there is no confusion about where the no-take area is located. In some cases it may be possible to legally gazette the area with the national government.



Sign marking tabu area. Photo by Alifereti Tawake

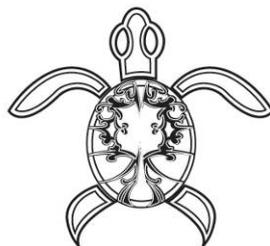
- g) *Alternate Livelihoods.* People who are negatively affected by the no-take area (for example, people who live close to and normally fish in that area who now have to travel farther to fish) should be identified and prioritized for possible involvement in other socioeconomic activities, such as new types of cottage industries, home gardening, cooking of new or underutilized foods, sharing benefits from eco-tourism related to the no-take area, or mariculture of corals, seaweeds, sponges, or other products. However, as the failure rate of new businesses is high, only small projects with minimum risk should be attempted, and only after careful consideration. Evidence shows in most instances this should be done after the core work is established and operating well. Even so, the priority is to recover fish stocks in the village's marine areas; using an LMMA approach, this can often be very successful and provide food and income sustainably.
- h) *Monitoring.* One potential complication with no-take area establishment is that sometimes a species may become overabundant until the natural balance is restored, preventing the recovery of other species. An example of this is when sea urchins - that are normally eaten by people - become so overabundant that they begin killing corals, that is until such time that their triggerfish predators finally recover. Another example is when octopus become overabundant in the months following no-take area establishment, killing most of the remaining shellfish, so that the no-take area has fewer shellfish than the open fishing areas! Octopus predators such as black-tipped reef sharks and moray eels may take many years to recover. Monitoring the resources for recovery inside and around the no-take zone can help determine if there is a serious ecological imbalance. Monitoring can also help pinpoint where an additional intervention might be in the community's best interest, such as a regulated sea urchin or octopus harvest from within the no-take area to offset this imbalance and provide a means for community fundraising. Monitoring will also show which resources are returning and which are not, and where other measures may be necessary to restore particular fisheries species to the reef.

4. Guidelines for Setting up a No-Take Area

Some ideas for setting up a No-Take Area are given below. These are just guidelines; each community should set their own rules according to their particular circumstances.

- a) Pick an area that has variety – including shallow reef top, deep reef edge, cuts or channels, sandy area, and mangroves and seagrasses if possible. The more diverse the area, the better the chance that the homes of an assortment of fish, shellfish and other marine creatures are protected.

- b) The no-take area should ideally be all the way from the beach to deep water and one kilometer wide. It should include all the land and rocks that are covered at high tide out to a hundred meters or more into the deep sea to stop boats from fishing close to shore.
- c) Choose a place that is easy to look after (for patrolling and enforcement), rather than reef areas that are far away and out of sight.
- d) Close off 20% to 30% of the marine area as a reserve. The more that is closed to fishing, the faster the returns will be. With 20% to 30% of the marine area protected, fishing in open areas can get better by 4 or 5 times in only a few years.
- e) To make sure that everyone knows where the no-take area boundaries are, pick some obvious landmarks, such as a point of land, a cliff, a cave, or a river, so that no-one can say they thought they were outside the reserve when they were inside.
- f) Draw a map and have everyone who controls the fishing rights sign it and agree that this is the protected area.
- g) Have a village meeting to let everyone know where the no-take area is and what the rules are. Be sure to also inform other communities that use the area for fishing, and anyone who may be absent during the village meetings.
- h) Do a monitoring survey when you first establish the no-take area (this is covered in detail in the next chapter), so you can measure the recovery of the resources over time. A simple way of monitoring to see if the fish and shellfish are returning is to get fishers (both men and women) to start a fishing diary and in it keep various information, such as how many fish, octopus, clams, etc. they catch every day, how long they are out fishing, where they fish, and what fishing methods they use.
- i) Set up long-term no-take areas in addition to shorter-term no-take areas.
- j) In addition to no-take areas, you should consider other measures to help fisheries resources recover faster in the entire fishing ground, such as regulating net fishing, banning harmful fishing methods, and prohibiting commercial fishing in areas where people catch their daily food (see **Box 11: Management Options** on page 34).
- k) If there are other serious problems affecting the reefs, such as outside pollution or mud and silt coming from human activities on land, no-take areas and other types of fisheries management may not be so effective. In such cases, long-term solutions such as reforestation may be needed.



III. IMPLEMENTATION OF CBAM

Now that you have carried out the steps for LMMA design and planning – holding various workshops to introduce and discuss the project, and utilizing the various tools and exercises necessary for planning your LMMA – you are now ready to begin the implementation phase.

There are various steps within this phase as well, and more workshops to be held that focus on the action part of your management plan. The following are the steps and associated tools and exercises used during the implementation phase of the LMMA, which includes letting others know, setting up and conducting baseline monitoring, and documentation.

A. Letting Others Know

1. Communication to Stakeholders

Description

Typically LMMAs are developed by a group of representatives of a community or communities with facilitation by government and/or non-government staff. This group needs to then take the action plan that has been developed back to the community they represent and others involved with or interested in the project for presentation and discussion.

Aim

To ensure that all community members and other stakeholders are aware of the action plan and agree with its contents.



Presenting management plan at a community meeting, Fiji. Photo by Toni Parras

Process

- 1) The first step is to review the output of the **Stakeholder Analysis** exercise from Chapter II, and determine which stakeholders are important to include at this stage. This is best done as an activity toward the end of the **Action Planning Workshop** but could be done afterward at a meeting of key project implementers.
- 2) Identify who will consult with each stakeholder group.
- 3) The actual consultation is usually best done at a meeting. This can either be at a regular meeting of the stakeholder group or a special meeting for this purpose, as desired by the stakeholder.

Pointers

The nature of how this is done will depend on the local situation. It is especially important that all resource users are consulted, including those that might not be present at community meetings. Some stakeholders may be living outside the local communities, so a way needs to be worked out of informing them and getting their feedback and input. It is advisable that one of the action points from the **Action Planning Workshop** is getting commitments from representatives to inform members of the group they represent.

2. Determining Stakeholders' Roles

Description

Action plans usually include an indication of who will be the main implementers of each action and who will assist. It is important that each of these persons/groups is aware of their responsibility and agree to it.

Aim

To make people aware of their roles in the action plan, to accept their role and have a plan to fulfill it, and to determine how different groups will co-implement the plan.

Process

Some discussion on the role of stakeholders may have already taken place during the previous step, **Communication to Stakeholders**. It may be, of course, that the stakeholders involved in the planning and acceptance of any action plan may be somewhat different than those who will actually be implementing the plan. Therefore it is important to consult all implementation stakeholders at this stage, and to hold a meeting for them to make mutual commitments to carry out their actions and discuss how their activities can be coordinated. It is recommended to first discuss the plan with groups who may not be aware of their roles, before having the larger meeting of all implementing stakeholders.

Pointers

For more information, see **Collaborating for Sustainability: A Resource Kit for Facilitators of Participatory Natural Resource Management in the Pacific** (Mahanty and Stacey 2004).

B. Biological Monitoring

How will you know if the action plan you implement is successful? In order to make the most of your careful planning and implementation, you need to monitor certain indicators to help you determine whether your actions are resulting in the desired outcome.

Biological monitoring will help communities know what is in their fishing ground and keep track of how many resources are being extracted and what may be becoming depleted. While the concepts and methods of biological monitoring need to be well understood and practiced, community members love this chance to learn science and enjoy doing it.

The following are the steps for setting up biological monitoring of your LMMA.

1. Review Management Plan

Description

A biological monitoring workshop should be held as soon as possible after the action plan has been approved by the community and other stakeholders. At the start of the workshop, you will review the contents of the management plan with the community to determine six priority actions from which to derive biological indicators.

Aim

To determine six priority actions from which to derive biological indicators for the coming year.

Process

- 1) Prepare copies of the management plan for all participants in advance.
- 2) Review and discuss with participants which actions are already underway and how they are going.
- 3) Pick six priority actions using a ranking exercise, such as the pair-wise ranking in Chapter II.

Pointers

The priority actions that are chosen in this exercise will be used in an upcoming step, **Selecting Biological Indicators**. For more information, see the **Community Based Biological Monitoring Training Guide** (Tawake et al. 2003).

2. Understanding the Importance of Monitoring (Knowing vs. Believing)

Description

This exercise helps participants understand what monitoring is and why it is important. Many communities may think more in terms of supernatural causation rather than adaptive management as a reason for changes in their fishing ground. This exercise helps explore and clarify these issues.

Aim

- a) To introduce the concept of monitoring and the idea of quantifying change; and
- b) To recognize the difference between belief and fact (assumption vs. direct observation)

Process

- 1) First, define monitoring to the group as “observing and taking note of something for a specific purpose.”
- 2) Then give some practical examples of monitoring, such as the village chief taking note of who is coming in or going out of the village, or someone keeping track of their purchases while shopping to make sure they do not exceed the money they have in their pocket. The Electricity Authority monitors the level of the Hydroelectric Dam to see when it is low so that the public can be advised to conserve energy.
- 3) The group should then be asked to give examples of monitoring.
- 4) The facilitator then talks about the difference between knowing and believing. Again examples are given, and then a quiz of four statements is presented and participants are asked if it is something they know or believe. Examples:
 - a) We have experienced a big change in our fishing ground in the last year. _____ (Belief)
 - b) There are plenty crabs now compared to last year. _____ (Belief)
 - c) A fisher gets an average of 5 crabs within 1 hour of fishing. _____ (Fact)
 - d) Clam populations have increased 10 times in the protected area and 3 times in the harvest area in the last 6 years. _____ (Fact)

After the quiz, the group should discuss their answers and clarify why a statement is a belief and another is a fact.

Pointers

For more information, see the **Community Based Biological Monitoring Training Guide** (Tawake et al. 2003).

3. Selecting Biological Indicators

Description

This is a key step in which the group decides what biological resources will be monitored.

Aim

To determine what biological organisms can be measured to indicate if the management plan is effective or not.

Process

- 1) Divide into working groups. From a previous exercise in this section, **Review Management Plan**, participants should have chosen six priority actions from the management plan. Using these, different groups can be assigned different actions or each group can work on all actions to compare ideas.
- 2) Ask each group to determine a specific time-defined goal for an organism that will likely be affected by their management action, for example – setting up a *no-take* area (the action) will double the number of clams in one year (specific time-defined goal). A few examples should be given in plenary before breaking into working groups.
- 3) The groups then present their ideas back to the plenary and they are discussed. Of the organisms that groups felt would be most affected by the management actions, a list of possible indicators to monitor is created.
- 4) The group then discusses what makes a good indicator. A common acronym that lists various criteria is “SMART,” which stands for:
 - S** – Specific, impact oriented (likely to change by your action)
 - M** – Measurable (can be counted)
 - A** – Achievable (can be attained)
 - R** – Realistic (time and money required are minimal)
 - T** – Time defined (change will occur over a certain period)
- 5) Go over each criterion for every possible indicator on the list. Indicators that meet all the criteria are the most practical choices. From these, the community picks a few that are best to start with for their biological monitoring.

Pointers

Each community's situation will be different. For many, 1 or 2 things to monitor may be sufficient; for those, the principle of starting small and being successful is key. Other communities that have additional outside support may want to undertake a more ambitious program along the lines of Reef Check (see www.reefcheck.org, under Protocols and Data, Monitoring Instruction). Either way, a marine biologist should ideally be available to advise whether the proposed indicators are really sensitive to the management action and if any other factors need to be considered.

4. Sampling Design Concepts

Description

Basic concepts of sampling are discussed, including *representativeness* (is the selected 'sample' area you are monitoring representative of the entire fishing ground?), *bias* (monitoring particularly favorable or non-favorable areas), *control sites* (areas outside the no-take area), and more. Community members – especially the implementing shareholders – need to understand sampling concepts in order to do effective biological monitoring.

Aim

To understand the reasons for setting up representative transects for monitoring and how to do it.

Process

- 1) Ask the community if they think it would be possible to count the total number of one of their indicators in their entire management area. Once everyone agrees that the answer is 'no,' present the idea of counting indicators in just a part of the fishing ground to see how those populations in that area change over time. Explain that this 'sampling area' needs to include enough area to be representative of both areas of high population and low populations of your indicators. See **Figure 9** below.

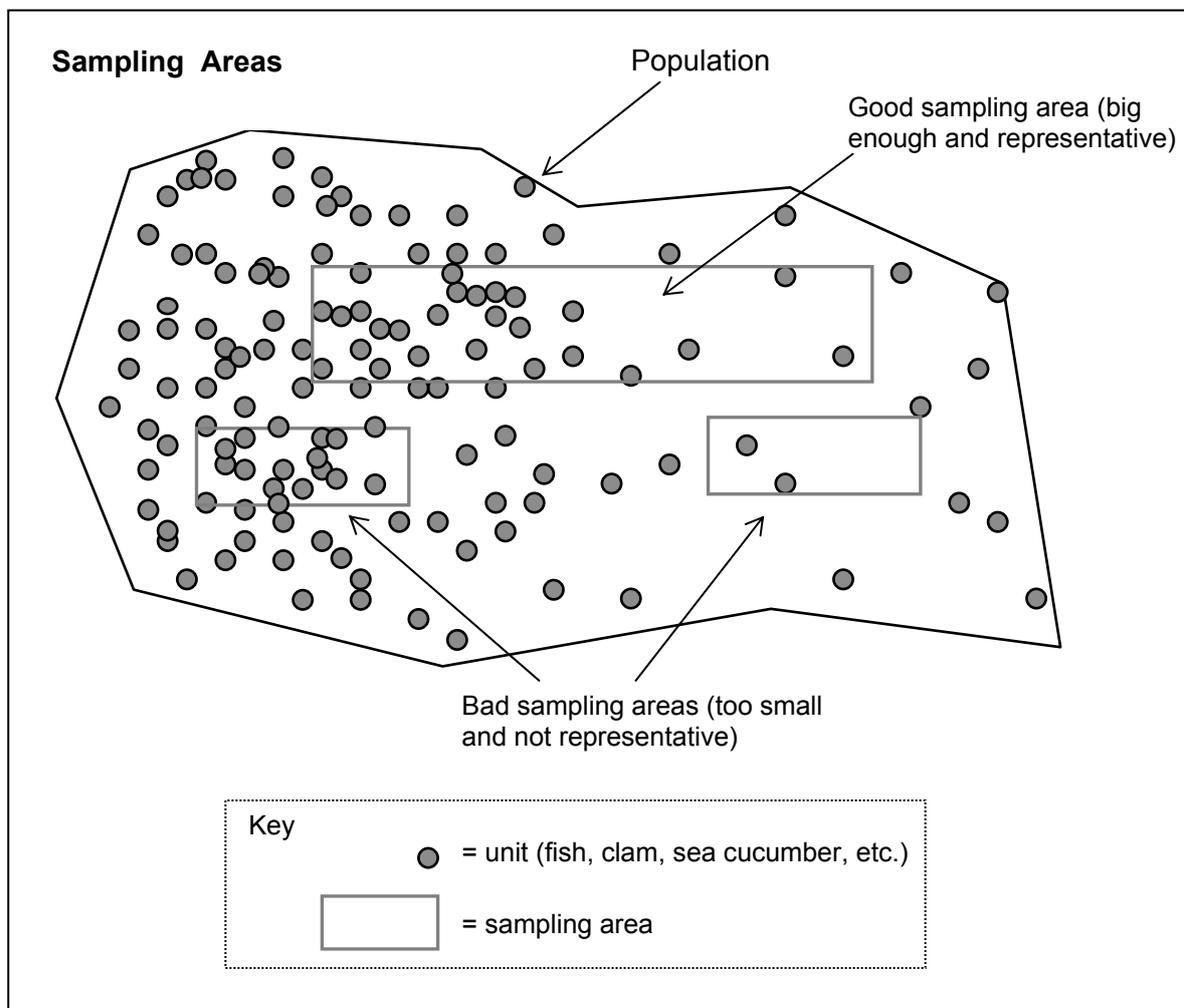


Figure 9: Sampling Areas. The diagram above shows an example of good and not so good areas for sampling your indicator species population.

- 2) Have the group draw a map of the fishing ground and mark the areas where each indicator is abundant and where each is scarce. This map is useful as a visual aid to identify good and bad sampling areas (see **Figure 9** on previous page). The idea is to count in several different areas to avoid bias.
- 3) Once the concepts are clear, do a field exercise. Set out an area of the village green and randomly distribute 200 'fish' cut out of heavy paper. Groups can be given different representative methods of sampling (for example, a 5m x 5m corner, placing a measuring tape and putting a 1m x 1m quadrat every 5 meters). The group will need to know the measurements of both the area that they sampled and the entire area containing fish. They can then determine what the monitoring in the sampled area predicts for the population of the entire area, as follows:

$$\frac{\text{Number of fish counted}}{\text{Sample area}} = \frac{\text{Total fish expected}}{\text{Total area}}$$

So for example, if your sample area is 25 square meters and your entire area is 300 square meters, and you counted 20 indicator fish in the sample area, you could predict 240 indicator fish for the entire area, as follows:

$$\frac{20}{25 \text{ square meters}} = \frac{240}{300 \text{ square meters}}$$

- 4) This exercise should demonstrate that counting in several small areas throughout the entire area as a good sampling design.
- 5) Monitoring is done not only to assess the current state of resources, but also to see how things are changing over time. Typically, a community's management plan will include a no-take area, the benefits of which include species recovery, seeding and spillover into adjacent harvest areas (see **Figure 10** below left). Review these benefits with the group and explain the need to monitor change both inside and outside the no-take area to see if these benefits are in fact happening. The area chosen as the sample *outside* the no-take area is often referred to as a 'control site.' See **Figure 10** below right. This can either be an area affected by the no-take area (for instance, by spillover), or one that might not be affected at all. Sampling in each of these areas is good to control potential bias.

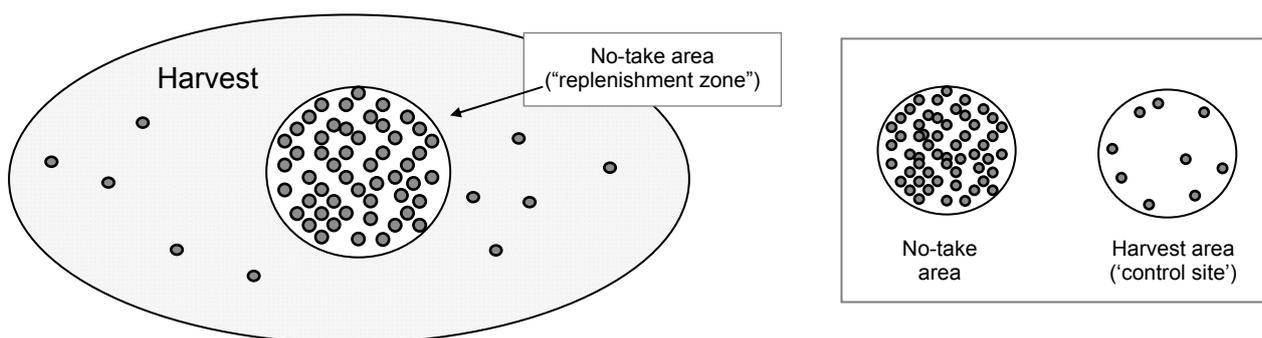


Figure 10: Paired sampling areas. The diagram above left shows an example of how a no-take area can serve to replenish harvest areas. We sample from sites inside *and* outside the no-take area (figure at right) to compare the population inside the protected area with the control population to see if there is a difference, and if so, how much of one.

Other factors that might cause changes in the indicator population at the time of monitoring should also be discussed, such as time of day, tide, season, and method used. Explain the importance of monitoring under the same conditions using the same methods for the baseline assessment as for all subsequent monitoring to ensure the most accurate comparisons.

Pointers

Sampling design is a key topic and needs to be well prepared and discussed. Take as much time as needed to cover it, as this is a key session and also more theoretical than most. Use many examples and ask questions to ensure that everyone understands.

For more information, see the **Community Based Biological Monitoring Training Guide** (Tawake et al. 2003) and **A Community Biological Monitoring Training Video** (University of the South Pacific 2005, available to order by contacting tawake_a@usp.ac.fj), both of which describe this in detail.

5. Methods Training

Description

The purpose of this exercise is to attain practical skills on land that are needed to perform biological monitoring and to determine which method will be best for each chosen indicator before heading into the water. The three methods presented here are *belt transects*, *line transects with quadrat*, and *timed counts*.

Aim

- a) To learn about different biological monitoring approaches and determine which is most appropriate for each chosen indicator.
- b) To learn how to use a compass to take bearings.
- c) To learn how to fill in monitoring sheets.

Process

- 1) Give an overview of each method, showing the equipment used.
- 2) Demonstrate how take a compass bearing from a given landmark.
- 3) Demonstrate how to fill out the monitoring sheet. You can use the basic layout of this form to prepare a waterproof slate in advance for recording all the needed information (see sample biological monitoring forms in the **LMMA Network Learning Framework Database Userguide**, available at www.lmmanetwork.org under Resources, LMMA publications).
- 4) Discuss and agree on which method is most appropriate for each indicator previously selected by the community, then divide into groups and rotate among three stations where each method is demonstrated.

The following are instructions for each method:

Belt Transect

A belt transect is typically used to count fish or other organisms on the reef or seabed that can be easily seen while snorkeling. Practice on land first.

- 1) Lay a 100-meter measuring tape on desired area, making sure it is not snagged on any rocks or coral. Lay the tape with reference to a compass reading and record bearing.
- 2) Wait 15 minutes to allow fish and other organisms to resume normal behavior after being disturbed by divers placing the tape.
- 3) Begin swimming slowly along the transect line. At every five meters (5, 10, 15, 20, etc.), stop and count the fish for 3 minutes within a 5-meter corridor (2.5 meters on either side of the tape). You can use a full arms length (slightly shorter than 2.5 meter) as a guide for the distance. Record the number on an underwater slate. Do not count fish outside the 2.5 meter sampling area on each side.
- 4) If diving in pairs, one diver records fish on one side of the line (2.5 meters or arms length) and another on the other side. Alternatively, Diver 1 can record the first 20-meter segment and Diver 2 can do the second 20-meter segment and so on. Care is needed to properly label slates and to avoid double counting.
- 5) In addition to counting the number of fish, sizes can also be estimated. Write all information down on your underwater slate.



Community members practice belt transect on land, Philippines. Photo by Daisy Flores-Delgado

Line Transect with Quadrat



Photo by Daisy Flores-Delgado

This method utilizes a 100-meter line together with a 1-meter quadrat (one square meter of wood, PVC pipe or stainless steel divided by string into 100 equal smaller squares). This method is used to determine substrate types and amount of coverage, as well as the population of sessile marine species. For example, use this method to determine the presence or absence of hard and soft coral (alive or dead), shellfish and seagrass, and the respective percent coverage of each. Practice on land first.

- 1) Lay a 100-meter measuring tape carefully on the reef or seabed. Lay your transect line with reference to a compass reading and record reading.
- 2) Lay the quadrat every 10 meters starting from 0 meters.
- 3) For marine resource (species) monitoring –
 - a) Count the number of target species within the quadrat. Do not count outside the quadrat.
 - b) Use a separate meter tape or ruler for measuring individual sizes.

For reef ecosystem (habitat) monitoring –

- a) Estimate the percentage of live coral, dead coral and sand/rubble coverage within the quadrat by counting the number smaller squares in which each type of cover is dominant. For example:

Live Coral = 32 squares = 32% coverage
Dead Coral = 30 squares = 30% coverage
Sand/rubble = 38 squares = 38% coverage

Timed Count

The timed count method is used to measure marine resources that can be harvested in a specific time frame, such as one hour (this is also called “Catch Per Unit Effort” or CPUE).

- 1) Divide the survey area to be monitored equally on a map and mark these segmented sampling sites as A, B, C and so on.
- 2) Divide participants into monitoring teams and assign each team one of these areas. Try to maintain consistency in the number and gender balance of each team.
- 3) Start the survey by blowing a whistle and keep track of the time spent monitoring.
- 4) Teams move in a specified direction (along the shoreline, or north to south, etc.) and count the number of indicator species they see. For example, when monitoring for crabs in a very dense mangrove area, observers walk along a line from the shoreward to seaward edge and count the crabs they see; they may be mating crabs (male and female), single crabs found under mangrove roots or on top of crab holes, or even fresh crab holes where crabs are confirmed to be inside the hole.
- 5) Try to ensure that each team does not double count. Be particularly careful when counting mating crabs or crab holes where the crab itself is not actually seen.
- 6) One team member in each team takes note of the length of time of monitoring.
- 7) Stop the survey when the whistle is blown again at the end of the allocated time.

Another way to gauge Catch Per Unit Effort is to set up a village blackboard where fishers (both men and women) mark down how many of a certain species they caught, how many people went fishing, and for how long.

Pointers

For sample biological data field survey forms, see the **LMMA Network Learning Framework Database Userguide**, available at www.lmmanetwork.org under Resources, LMMA Publications.

6. Practical Exercise

Description

The workshop participants get in the water and practice the biological monitoring methods they have learned on land.

Aim

To allow participants to build their skills and practice monitoring before performing an actual baseline monitoring survey to obtain data for analysis.



Diver practicing biological monitoring, Solomon Islands. Photo by Hugh Govan

Process

- 1) Previous to the practical exercise, determine which method/s will be used and who will have what responsibility (compass person, counters, recorders, timekeepers, etc.).

- 2) Obtain and prepare underwater slates and markers in advance.
- 3) Split into teams of around six people.
- 4) Choose a 5 x 100-meter sampling area (100 meter transects in five different areas) with a random choice of compass bearings at the start of each 100 meters and begin the survey. It may not be possible to complete all 500 meters depending on the site.
- 5) Hold a debriefing at the end of the monitoring to discuss how things went and to clarify any questions participants may have.



Filling out monitoring forms, Solomon Islands. Photo by Hugh Govan

Pointers

If boats are used for monitoring in deep areas, ensure that safety aspects are considered. If possible, it is normally best to choose areas that can be monitored by snorkel.

7. Conducting a Baseline Survey

A survey should be done as close to the start of the project as possible. This is the baseline survey. The data collected during the baseline survey will be kept as a record of the condition of the marine resources at the beginning of the project, and will be compared to data from future monitoring to see what is happening to the marine resources as a result of management actions. The same survey is done at regular intervals to learn how things are changing.

Explain to participants the importance of monitoring under the same conditions using the same methods for the baseline assessment as for all subsequent monitoring to ensure the most accurate comparisons. Factors to consider include method, time of day, tide, season, water conditions, and other things that may affect the survey – the idea is to maintain consistency.

The instructions for conducting the baseline or 'pilot' survey are the same as for the **Practical Exercise**. You should conduct your baseline survey in the sample areas where you plan to conduct your ongoing monitoring, both inside and outside of the protected area (as discussed in a previous exercise, **Sampling Design Concepts**).

There will likely be a need to support the monitoring teams the first few times they monitor on their own until they build up their skills.

8. Data Analysis

Description

After doing the monitoring and collecting data, it is necessary to analyze and interpret it so that it will be useful to the community in making decisions about their management actions. In this exercise, raw data from monitoring are recorded, analyzed, presented and discussed.

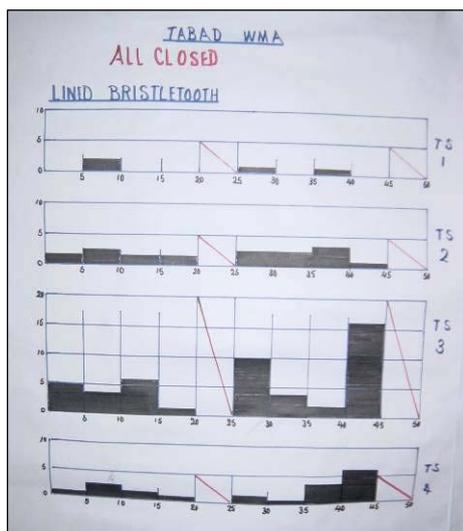
Aim

- To create awareness of how to keep data safe.
- To introduce different ways of presenting data such as tables and histograms.
- To develop skills in analyzing and interpreting data.

Process

- First, review the following questions and complete the check list before analyzing results.
 - Do we know why we do monitoring and how it relates to the project?
 - Do we know what threats we are addressing and what indicators to monitor that determine whether or not project objectives are being met or not?
 - Do we know our objectives and our expected outcomes?
 - Are we clear on the survey method(s) that we will be using to monitor our indicator species?
 - Are our surveys completed?
 - Have we placed this information/data in a safe place so that we can find and use it in the future?
 - Do we want to present our survey results to the rest of our community members?
 - Are we going to discuss the results in our next village meeting with our management plan?

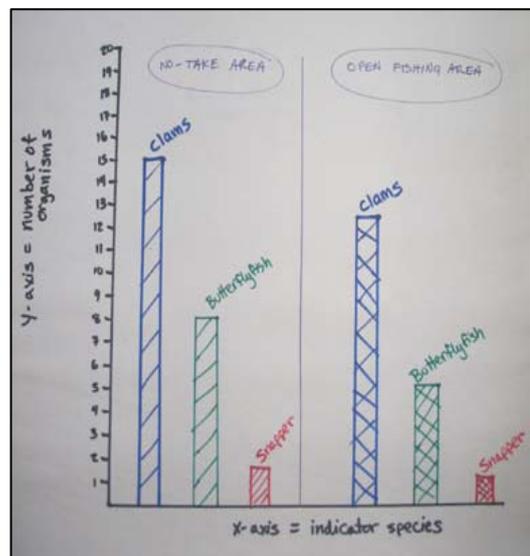
If all the boxes are checked off then we can go ahead with the analysis.



Data table showing number of indicator species found in different transects within the protected area. Papua New Guinea.
Photo by Pamela Seeto

- Put the raw data on butcher paper. Discuss the importance of not losing data after all the hard work done to collect it. Provide field record books and have each person record the raw data. Stress that they need to keep this. A copy should also be sent to the project partners.
- Next, summarize the data. Sum up the data from all the transect or quadrat counts and put into a table (see example at right). Emphasize the importance of labeling what is being measured and giving a title to the table.

- 4) Demonstrate how to make a greater impact on community members by presenting the data visually using a **histogram** (see photo below). This is a visual representation of the data using vertical bars to represent the number of things; the taller the bar, the more the number of things. To do this:
- Draw a vertical line on the left hand side of the paper. This is your **y-axis**.
 - Make notches (tic marks) of equal distance along the y-axis to represent numbers in increments of 5, 10, 50 or whatever is most appropriate, making sure the largest number you have can fit on the paper.
 - Label the y-axis as "number of organisms" and label the unit numbers on the tic marks.
 - Draw a horizontal line along the bottom of the paper. This is your **x-axis**. Your x-axis can represent the different types of organisms counted, the organisms inside versus outside the no-take area, or the different years counted, or a combination. For starters, we will simply list the species counted in the baseline survey.
 - Starting from the x-axis, draw a line upwards parallel to the y-axis up to the number indicating how many organisms (number of fish, clams, or whatever your indicator is) were counted. Then draw a short line across and back down to the x-axis, making a rectangular box, or bar.
 - Do this for each organism you counted inside the no-take area, and again for each organism you counted in the open harvest areas.
 - Clearly label each bar so everyone knows what they represent. Different color pens or shading can be used to differentiate species, no-take versus open fishing areas, or date surveyed.



Example of a simple histogram.

- First demonstrate the histogram using an example made with 'dummy' or fake data, then break into working groups and have each group prepare histograms of their data.
- Now that you've plotted the data, it is time to discuss what it means. What can you learn about your marine resources based on the data analysis? What management decisions can you consider based on the results? You may not be able to make concrete decisions from the baseline survey data, but you are now armed with baseline data that will be crucial in measuring progress as you do continued monitoring.

Pointers

Many of these skills will be new to people so give plenty of time for them to practice until they are confident with how to put data into tables and make histograms. The baseline data will be used again for analyzing against future data collected from monitoring, so it is important to keep it safe and labeled well.

For more information, see the **Learning Framework Database User Guide (LMMA Network 2005)**, available at www.lmmanetwork.org under Resources.

9. Develop Monitoring Plan

Description

Now that you have your baseline data, you will need to do continued monitoring to collect data to compare against your baseline to see what changes are taking place in your LMMA as a result of your management actions. Participants discuss how they will perform the continued monitoring of their site and present data back to their community.

Aim

To develop a biological monitoring plan.

Process

- 1) If there is more than one LMMA site present, divide into groups by project site.
- 2) Each group develops their monitoring plan using the following headers:
 - Indicator
 - Method
 - Size of monitoring area (number of transects)
 - Monitoring schedule (how often, time of year, tide, etc.)
 - Monitoring team
 - Location (where the monitoring will take place; inside/outside the no-take area)
 - Reporting (who will inform community members of the monitoring results)

See sample biological monitoring plan below.

Sample Biological Monitoring Plan

Best Indicator Identified	Monitoring Method & Communicating Analyzed Results	When to Carry out Monitoring	Who Implements Monitoring Tasks	Area to be Surveyed	Reporting
Population and sizes of "kaikoso" (clams)	<u>Line Transect w/ Quadrat</u> 1) Count and measure "kaikoso" population and sizes within the quadrat (1x1m) at the end of ten meters within a 100m reserve x 5 transects (500m) 2) Communicate results at village and Tikina Council meetings after the monitoring	1) Low tide 2) Every 6 months	Pio Seru Amelia Sese Jope	<u>Ucunivanua</u> Tabu area – <u>Lomo</u> Non-Harvest area – <u>Matanaiverata</u>	Pio and Sese will present to next village meeting

Table 9: Biological Monitoring Plan. Example of a biological monitoring plan from a Fiji LMMA site.

Pointers

Different projects will choose different approaches; some have village teams, some have district teams that cover the different villages; some have different teams for different organisms. As always, the decisions are up to the community but it is good to discuss options and share any concerns. The project partner may need to assist in biological monitoring the first few times but should not take the lead. It should also be determined and agreed who will obtain and look after monitoring equipment. For more instruction on monitoring, see the **LMMA Network Learning Framework (LMMA Network 2004)** at www.lmmanetwork.org and **A Community Biological Monitoring Training Video (University of the South Pacific 2005)** available to order by contacting tawake_a@usp.ac.fj.

C. Socioeconomic Monitoring

Socioeconomic monitoring will help you assess the changes that occur in the social, cultural and economic well-being of your community as a result of your management actions. Socioeconomic monitoring is just as critical as biological monitoring in determining the success of your LMMA.

The steps for socioeconomic monitoring are basically the same as for biological monitoring. Unless otherwise stated, the same description, aims and processes apply – simply substitute 'biological' with 'socioeconomic' when reviewing those sections. Below is a recap of the steps, with details for the ones that are significantly different for socioeconomic monitoring.

1. Review Management Plan

To understand the priority actions you are focusing on and help you choose your indicators.

2. Understanding the Importance of Monitoring (Knowing vs. Believing)

This is just as necessary for socioeconomic factors. For example, you could say "People in my community are better off from the LMMA," or "Fishers in my community earned 20% more this year than they did last year from the same amount of time fishing." Which is Fact and which is Belief?

3. Selecting Socioeconomic Indicators

Description

Similar to biological indicators, it is important for the community to consider socioeconomic indicators as a measure of project success. This is best achieved during a separate workshop dedicated to socioeconomic monitoring.

Aim

To determine key socioeconomic indicators of management plan success.

Process

- 1) Prepare copies of the management plan and also the indirect threats (root causes of problems) identified from previous exercises.
- 2) Ask the group to consider what social and economic changes they are expecting to occur via each management action, especially in relation to any root cause factors they are addressing.
- 3) As in selecting biological indicators, examples are given in plenary and then participants break into working groups to discuss possibilities.
- 4) All groups come back to plenary to present and discuss their ideas. From these, a combined list of possible indicators is prepared.
- 5) Use the **SMART** criterion presented previously to compare possible indicators. The ones that meet all the criteria are the most practical choices. From these, the community picks a few that are best to start with for their socioeconomic monitoring.

4. Sampling Design Concepts

Description

Sampling design is relevant in socioeconomic monitoring in that for many villages it will not be possible to survey each household (although in small communities it may be possible to do so). Therefore, only households in some of the village are surveyed to determine how the population and well-being of a large village is changing over time.

Aim

To understand the reasons for selecting a representative sample of your community for socioeconomic monitoring to avoid bias and to learn how to do it.

Process

- 1) When doing household sampling, two important points should be noted:
 - a) The sample size should represent the socioeconomic status of the community. To do this, it is recommended that not less than 30% of the total households in the community be surveyed.
 - b) Avoid bias when choosing households to be surveyed using the following instructions:

To avoid bias in a small community (approximately 30 households):

- Write down the name of each household on a piece of paper – that is, one piece of paper for one household.
- Put the pieces of paper in a container, hat, or bowl.
- Pick the pieces of paper one by one and note down the name of the household on the piece of paper.
- Continue until the number of households that needs to be surveyed is reached.

To avoid bias in a large community (larger than 30 households):

- Write down the name of all the households in the community.
- The households are selected in proportion to the fraction of the group needed. For instance, if one-third of the total households needs to be surveyed (recommended), then choose a starting point between the first and third name and work your way down the list selecting every third household to survey.

This is your sampling group on which to conduct your socioeconomic monitoring.

5. Methods Training

The socioeconomic methods presented in this guidebook are *direct observation* and *interviews* using questionnaires. Give an overview of each method and discuss with the community which would be most appropriate for the indicators they have chosen to monitor.

The following are instructions for each method, which should be practiced amongst project partners before conducting in a village:

Direct Observation

Direct Observation is a technique that involves recording observations of key factors or issues relevant to the project goals and objectives. This may involve observing and recording individuals, groups, processes, events, or relationships. This tool is easy to learn and use. For example, you may count the number of people attending a village meeting; this can be an indicator of the cohesiveness of the community. Or you could observe the number of fish caught and sold daily to determine how much income is earned. Discuss and practice more examples with the group.

Interviews

An interview is a method to gather in-depth qualitative information. Questions are generally open-ended, meaning the respondent can answer the question he or she is asked in different ways. Interviews can take place individually or in different groups.

- 1) A **household survey** is used to gain information on household factors, such as number and ages of family members, income, etc.
- 2) You can also interview **Focus groups**. For example, you might meet with a group of village elders to get their ideas on village governance or harmony. A focus group can consist of key informants or different stakeholders, etc.
- 3) Individually interviewing **key informants** is used when collecting data on sensitive subject matter, particularly when customary traditional ties or relationship pressure may influence a respondent's answer in a group. Ideally key informants are local experts who are articulate and have keen knowledge about the topics of interest.
- 4) Questionnaires are used for interviews. The following are some considerations when preparing a questionnaire:
 - Include questions specific to your chosen indicators that will provide the data necessary to gauge the effects of your action plan.
 - Don't make it too long – short questionnaires are more manageable at the community level.
 - The questionnaire should be clearly understood by the interviewer – thus it is crucial for community members to be directly involved in preparing the questionnaire.
 - Include questions that will address the characteristics and changes of the socioeconomic indicators chosen. For example, you may include questions that address household socioeconomic factors such as source of income, average weekly or monthly income, wealth, number of people in household, etc. The husband and/or wife of the household will typically be able to provide the answers to these questions.
 - For some questions, you may ask for an exact figure – for instance, for average household income, you may ask “what is your monthly income?”. However, in some communities it may be difficult or sensitive to collect the exact figure. In this case you would ask the household member to select their income range (for example, \$10-30 per day, \$30-50 per day, \$50-80 per day, and so on).
 - When possible, ask closed questions – for example, yes or no, multiple choice or short answers. When this is not possible, use open-ended questions – for example, you could ask the respondent to explain in their own words why there is a lack of cohesiveness in the community or non-compliance with fishing regulations.

6. Practical Exercise

After preparing the questionnaire, it is important to trial it among participants and evaluate it. This will help ensure that the questions are clear, and will provide good practice for those who will be conducting the actual survey in the community.

- 1) Role-play – that is, one person in the group poses as the interviewer and another as the respondent, and go through the questionnaire. After the role-play, discuss any thoughts and suggestions as a group and make note of anything that interviewers should be mindful of before conducting actual interviews in the community.
- 2) It is also useful to give the questionnaire to some people similar to your target group. Either during or after the survey you can discuss with them to see if the questions are clearly understood. Looking at the responses can also help determine if the questions were understood.
- 3) When conducting the interviews, consider the following points:
 - For household surveys, go in pairs, ideally male and female. In communities in which the head of the house is male, women (wives and daughters) are often left out during the interview. Having both a male and female interviewer will facilitate the engagement of the women in the household in the interviewing process.
 - Introduce yourself. Give your name, where you are from, organisation you represent, and other personal details that you feel comfortable and useful to reveal. This will help break the ice and even the playing field before asking questions.
 - Explain the purpose of the interview and explain the objective of the questionnaire. It is helpful to give a brief background of the questionnaire and its purpose in the context of the community's resource management activities.
 - Seek the permission of the head of household before conducting the interview.
 - Be polite and clear when asking questions.
 - Be attentive and a good listener.
 - Repeat the answers back to the respondent if you think that you have not quite got it, to make sure that you are correctly and accurately recording the information.
- 4) After participants practice on each other, have a debriefing to discuss and clarify any questions or comments that may have come up.

7. Conducting a Baseline Survey

As with biological monitoring, a socioeconomic survey should be done as close to the start of the project as possible to provide baseline data as a record of the conditions at the start of your project. The same survey will be done at regular intervals in the future – perhaps every year (this may vary depending on the indicator). Data from all future surveys will be compared against the baseline data to learn how things are changing. Use the same guidelines as for the **Practical Exercise**, above.

8. Data Analysis

Same procedure as for biological monitoring.

9. Develop a Monitoring Plan

Develop a socioeconomic monitoring plan for each community using the following headers:

- Socioeconomic Factor
- Indicator
- Method
- Monitoring schedule (how often, time of year, etc.)
- Monitoring team

See sample below.

Sample Socioeconomic Monitoring Plan

Socioeconomic Factors	Indicators	Methods/Tools	Timing and scale	Who's Responsible
Togetherness of the <i>vanua</i>	Numbers of heads of <i>mataqali</i> (sub-clans) units at the <i>vanua</i> council meeting	Direct Observation Key Informants Interview	Once a month	Village headman Socioeconomic Monitoring Team
Environmental awareness increase	Number of fishing cases reported using duva (<i>derris sp.</i>) and fishing net less than 3.5 inches declines	Direct Observation Baseline and monitoring survey	Once a week Once every two years	Village Headman <i>Qoliqoli</i> Committee and Biological Monitoring Team
Marine resources as the main source of household income	% dependence on marine resources	Baseline and Monitoring survey	Once a year	Village headman Socioeconomic Monitoring Team
Alternative sources of income	Number of new community enterprise	Direct Observation	Every six months	Village headman Socioeconomic Monitoring Team
Household income	% change in average household income level	Baseline and monitoring survey	Once every two years	Village headman Socioeconomic Monitoring Team

Table 10: Socioeconomic Monitoring Plan. Example of a socioeconomic monitoring plan for the Vueti Navukavu Project in Fiji.

Pointers

For more information and guidance on Socioeconomic Monitoring, see the **LMMA Network Learning Framework (LMMA Network 2004)** and **Learning Framework Database Userguide (LMMA Network 2006)**, both available at www.lmmanetwork.org under Resources, LMMA Publications.

Also see **Socioeconomic Monitoring Guidelines for Coastal Managers in Southeast Asia (Bunce and Pomeroy 2003)**, **Groundwork for Community-Based Conservation (Russell and Harshbarger 2003)**, and the **Socioeconomic Manual for Coral Reef Management (Bunce et al 2000)**.

D. Documentation (Keeping Records)

Discussion

To do adaptive management, good record keeping is critical. Management plans, biological and socioeconomic monitoring data, contacts, and other project information need to be kept safe, organized, and in more than one place.

Aim

To maintain all key records of information related to the project.



Recording information at the field site, Indonesia.
Photo by Cliff Marlessy



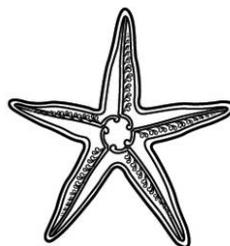
Recording information during a community workshop, Fiji. Photo by Toni Parras

Process

- 1) The importance of record keeping should be discussed at the first management planning meeting with all project partners, and a plan should be developed to maintain key records. Usually the partner organization will be responsible for writing up the reports from all workshops. Discuss and agree on who will do this.
- 2) Copies of all materials and resources should be provided to both the community and project partners to ensure safe storage. A filing cabinet for this should be available both in the community and with the project partner.

Pointers

This key aspect of project implementation is often overlooked. Invaluable information can be lost! Sufficient time and resources and specific people must be allocated for doing this.



IV. ONGOING CBAM

Once you have developed and implemented your management plan and performed your baseline monitoring, the real fun begins! It is difficult to anticipate all the needs that will develop, but the key is to stay flexible and adapt as you learn the results of your management actions.

It is important for community members and project partners to meet at least annually (more often during the first few years of the project) to discuss management plan progress, monitoring results, lessons learned and possible changes that need to be made to the management plan. The following are a few pointers for ongoing adaptive management; more sources can be found in **References and Resources**.

A. Review Action Plan and Monitoring Data

1. Community-Based Adaptive Management Meetings

Description

A main focus of Community-Based Adaptive Management is to encourage communities to plan and make decisions based on facts. Therefore the review and analysis of the management plan and monitoring program are keys to project success. This approach will be new to many, so it is necessary to ensure these activities take place.

Aim

To conduct regular meetings to review the progress of the management plan and the analysis of monitoring data.

Process

- 1) Project partners should make regular visits to the communities to discuss progress as well as any problems that have arisen and how they can be addressed.
- 2) Especially important is ensuring that the monitoring takes place close to the scheduled times.
- 3) At least once a year there should be a formal project meeting among major stakeholders. Discuss in advance what data should be presented and organize this well in advance; assist the community monitors if necessary to prepare these presentations. The meetings can either be specially scheduled or part of a regular community meeting. During the meeting, review the management plan to see which items have been completed, which are ongoing, which need to be amended and which need to be prioritized for the upcoming period.

Pointers

Both the community and project partner are likely to have more frequent meetings amongst themselves (perhaps monthly or quarterly) to briefly plan for the upcoming period.

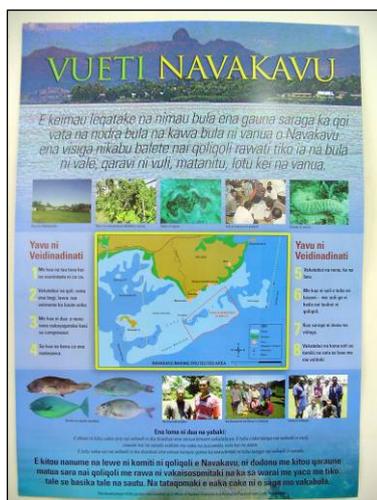
B. Maintaining No-Take Area Effectiveness

Almost all LMMA project teams decide to set up no-take zones in their fishing areas to help address overharvesting of their marine resources. While this can often assist in reviving species populations, there will always be some people who are inclined to take advantage of the bounty and fish in the no-take area. Therefore it is important to ensure that people know about the no-take area, where it is, what the rules are, and what the penalties are for breaking the rules (see **Guidelines for Setting up a No-Take Zone** in Chapter II). You may also need to consider patrolling the closed area to discourage poaching and to catch violators.

The following are some typical activities that you may want to consider for your no-take area. The exact nature of how these actions will be undertaken depends on the cultural, geographical and legal factors surrounding your site and will need to be discussed among the community and project partners. As such, specific instructions for the following activities are not given; rather this is an introduction to some of the common types of activities that will need to be undertaken for a better chance of LMMA project success.

1. Declaration and Demarcation

Declaration can be traditional and/or legal. It is important to consider who needs to know about the no-take area and then develop a plan to inform them. In traditional cultures, this is likely to take the form of a ceremony. Neighboring users should also be informed. There may also be district meetings at which the declaration can be announced. A difficult group to inform may be commercial fishers who only occasionally visit the area. In many countries, licenses are required for such fishing given via the Fisheries Department, so communities will have to work with them to keep them informed. Some systems may require a legal declaration of the closed area. Communities may require assistance in finding out what the steps are to meet these legal requirements for gazettal.



Another part of the declaration is typically a statement about the rules concerning the area and the penalties for violating them. These penalties may be traditional in that violators may face social repercussions or public shame. In some areas, traditional no-take areas are said to possess considerable *mana*, or spiritual power, and there are many stories of violators suffering physical punishments from these. In other societies, a more legalistic approach is needed whereby different violations have specific fines under a community legal system. Rules and penalties can be posted on signs in or near the fishing and no-take areas or printed on posters hung around in the community or handed out to each household.

Poster about the protected area in Vueti Navakavu in Fiji is produced in the local language and given to every household to increase awareness.

You will also need to delineate the boundaries of the no-take area. There may be distinctive geographic features that set the area off and this will make it easier to observe. It is also good to use physical markers such as bamboo poles, buoys, or other materials to demarcate the no-take zone.



Various ways of marking your no-take area (from left to right): palm leaves and sticks; buoys; signage.
Indonesia, Photo by Cliff Marlessy Philippines, Photo by Toni Parras Fiji, Photo by Toni Parras

2. Patrolling

Once the no-take area has been declared, the issue of patrolling arises. This is generally a responsibility of the community to determine what is necessary. In Fiji and the Philippines, patrolling is done by voluntary fish wardens who are trained and authorized by the Fisheries Department. This process may be facilitated by the project partner.



Patrolling Helen Reef Project site, Palau.

In general we have found that respect of the no-take area generally increases within the community as time proceeds and more people learn about the project and its benefits. Outsiders, however, may be tempted to break the rules as the no-take area fills with fish. In this case, patrolling is necessary. Patrolling is obviously easier if the no-take area is visible from the village area rather than far away from it. If distant, speedy boats will be needed and/or assistance by national authorities. Each community will have to determine what is best for their site.

3. Sharing Lessons Learned

It is always beneficial to provide people with the chance to reflect on what they have learned and discuss this with other practitioners. Oftentimes within countries there are multiple communities and agencies implementing LMMAs at different sites. One of the most powerful sources of learning is sharing experiences and ideas among practitioners. This can be done by several means. Project partners can meet regularly to discuss activities and share anecdotes from their sites. Different sites can hold cross-site visits, where members from one project visit another site to exchange knowledge, skills and stories (this can be done within country or even with other nations). This is a great way to help villages new to the LMMA process get up and running and improve their efforts, as well as learn about different perspectives and techniques. Finally, formal meeting with projects from many countries in the region to formally discuss results and share lessons can help to energize and enlighten practitioners and renew their efforts.

4. Extended Monitoring (optional)

Many organizations these days are part of learning networks. Through monitoring project success and factors that may affect it, lessons can be learned about what factors are most important in determining project success. Once the ongoing adaptive management monitoring is well established for a project, communities may wish to take part in such learning networks by extending the range of biological and socioeconomic monitoring.

The LMMA Learning Framework sets out such a monitoring approach. More information can be found in the **References and Resources** section.

5. Upscaling LMMA Work (optional)

As projects proceed and expand there are often issues identified that are beyond the community's ability to solve and which need a regional or national approach. Some examples are extensive dynamite fishing, live rock harvesting, and marine areas being jointly used by both fishers and tourist resorts. In such cases it is useful to have a mechanism such as a national Integrated Coastal Management (ICM) initiative. Under an ICM project pilot areas and/or national groups can meet together and identify such larger scale issues and develop plans to address them. Such groups will include community representatives, the commercial sector, and relevant governmental and non-governmental agencies. Such initiatives can, of course, benefit from the ideas and experience of the community-based projects. Having their management plans also helps the communities speak with a more powerful voice when dealing with other agencies.

Coral reefs and other marine areas have no political boundaries; larvae produced in no-take zones will drift with the currents to open areas many kilometers away. Thus a series of no-fishing areas throughout the oceans is needed as part of the larger management of island and coastal nations.



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