Learning Framework

of the

Locally-Managed Marine Area (LMMA) Network

A Foundations of Success Learning Portfolio

Version 2.1

(June 2004)

About This Learning Framework

This framework is a product of the Locally-Managed Marine Area (LMMA) Network. For more information, to provide feedback, or to obtain additional copies of this document, please contact the LMMA Network at:

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About the LMMA Network

The LMMA Network is a group of practitioners involved in marine conservation projects throughout Asia and the Pacific who have joined together to learn collectively and improve the success of their efforts. To do this, the Network provides guidance and capacity building to members on Adaptive Management in the areas of project design, management, monitoring, analysis and communication. The work of the LMMA Network, including this framework, is made possible through generous support from the David and Lucile Packard Foundation and the John D. and Catherine T. MacArthur Foundation. The opinions expressed herein are those of the authors, and do not necessarily reflect the views of the Packard or MacArthur Foundations.

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Chapter 1 – INTRODUCTION

Over the past decade, there has been growing interest in working with local communities to establish marine protected areas to help conserve dwindling marine resources. Given the urgent nature of this problem, it is essential that project managers and communities learn how to best apply this approach and understand the conditions[1] under which this strategy will most likely achieve success. In August 2000, and again in 2003, representatives of a number projects from across the Pacific and Southeast Asia came together in Fiji and the Philippines. Each of the projects is currently using some form of a locally-managed marine area (LMMA) strategy. The meetings were designed to allow these different projects to share and discuss their experiences in using locally-managed marine areas.

From these initial meetings, representatives of some of these projects have agreed to work together and form a collaborative 'learning network' so that they can systematically share their knowledge and experiences about how to use this strategy more effectively and improve their conservation impact.[2] This network is called the Locally-Managed Marine Area (LMMA) Network.

1.1 Overview of this Framework

Specific chapters of this framework include:

Chapter 1: Introduction – This chapter, which you are reading now, provides a brief overview of the LMMA Network and background on how it was initiated.

Chapter 2: Overall Conceptual Model – This chapter provides an overview of our shared understanding of how an LMMA strategy can help maintain marine resources. It describes and defines our target, the direct and indirect threats that affect this target, the tools in an LMMA strategy, and the practitioners that use this strategy.

Chapter 3: Project and Site Definitions – This chapter provides an overview of how to define both the project and specific sites where projects are being implemented.

Chapter 4: Key Factors to Measure – This chapter provides an overview of the factors that need to be measured. These include factors related to the target, direct threats, indirect threats, and the project process.

Chapter 5: Data Management and Analysis – This chapter provides an overview of how data that are collected by project teams in the Network will be managed and analyzed.

Chapter 6: Communicating Results – This chapter describes strategies for developing a plan to effectively disseminate project results and lists various communication products and activities that the Network will be undertaking.

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[1] When new terms are first used in this framework, they are underlined and linked to a definition in the glossary.
[2] To learn more about the activities and outputs from these initial meetings, see "Fish for the Future" (Parks and Salafsky 2001), a report available online at www.LMMAnetwork.org or by contacting the LMMA Network.

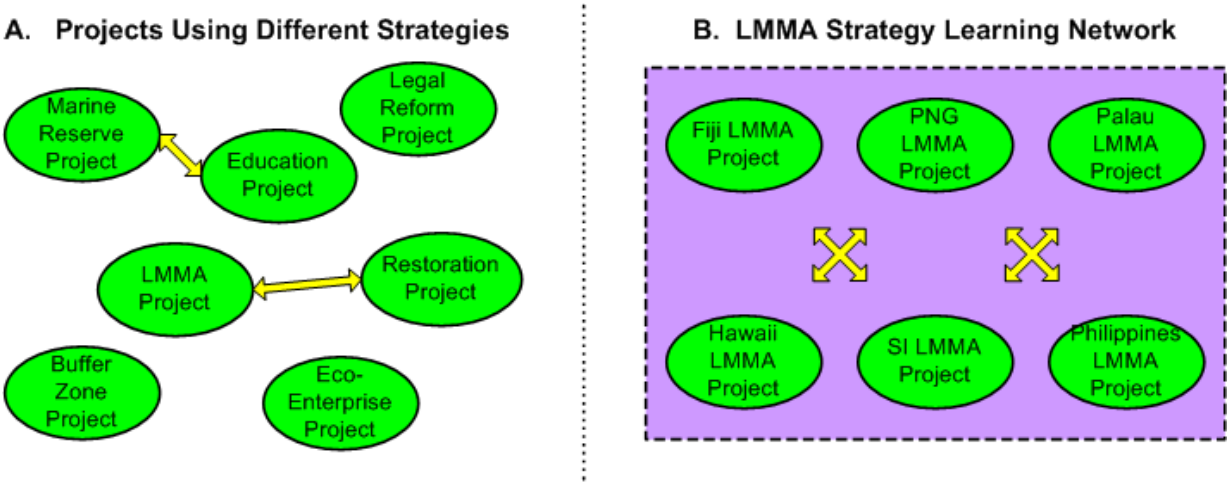
1.2 What is the LMMA Network?

The LMMA Network is a collection of projects and practitioners that all use a common strategy to achieve a common end and work together to achieve three goals:

- Implement more effective projects.
- Systematically learn about the conditions under which this strategy works best and why.
- Improve the capacity of Network members to use Adaptive Management as an approach to improving project outcomes.

A project can be defined as an undertaking by a team of people interested in achieving specific goals and objectives at a specific site or sites. As shown in Figure 1-1A below, projects often take place in isolation from one another and use somewhat different approaches. At best, there is only occasional exchange of information with other nearby projects or other projects that are part of the same organization. The LMMA Network, as a learning network, seeks to bring together practitioners from a number of projects that all use a similar strategy and regularly exchange information and experiences, as shown in Figure 1-1B.

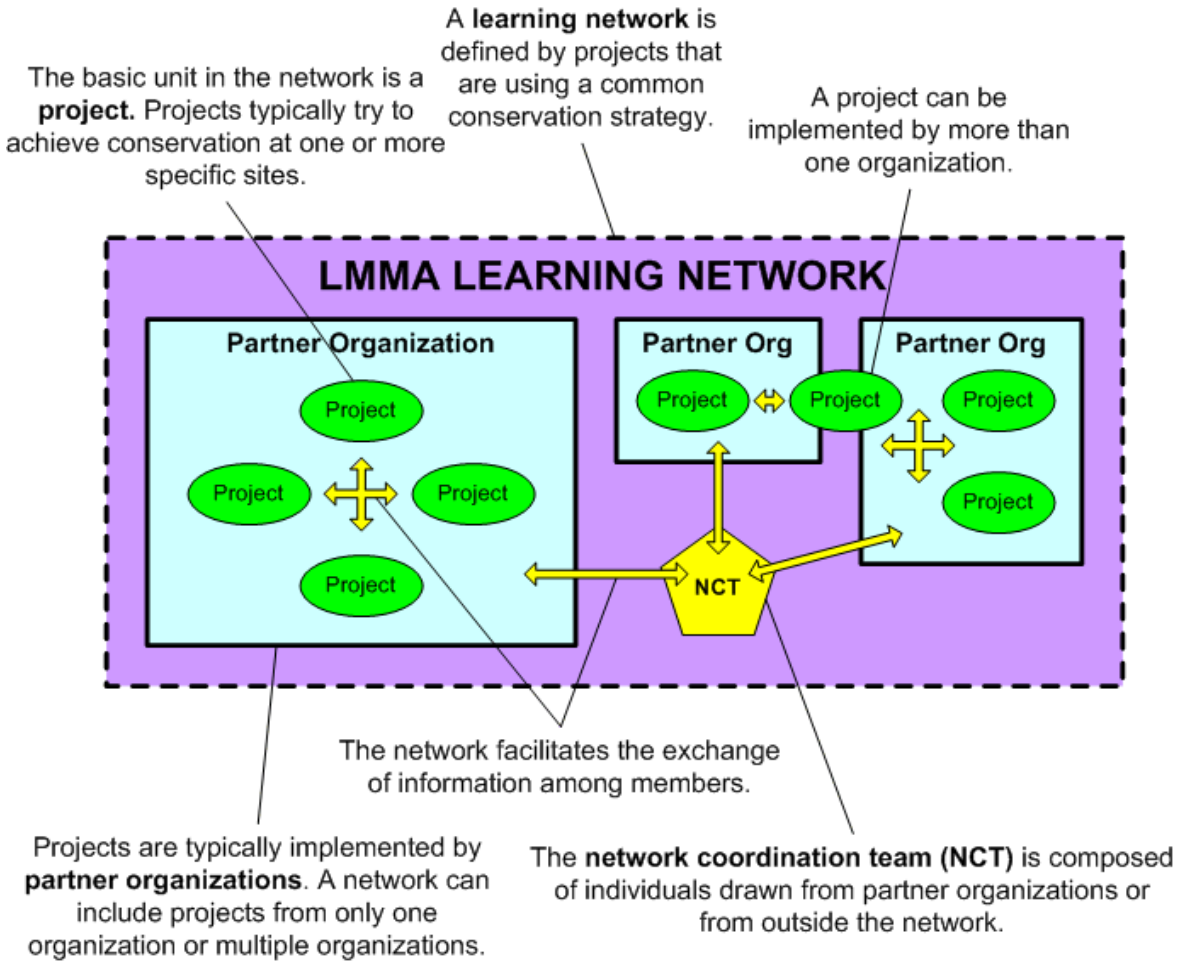
Figure 1-1. *Isolated Projects Versus the LMMA Network.* In the diagrams below, ovals represent projects and approach and arrows represent exchange of information.



Key components of the LMMA Network are shown in Figure 1-2 below. These include:

- **Projects** – Implemented by teams of practitioners interested in taking action to achieve specific goals and objectives. Project teams can include community members only, a mixture of community members and members of outside organizations, or even just members of outside organizations who then work in partnership with community members.
- **Partner Organizations** – Groups (such as non-profit organizations or government agencies) that implement projects.
- **Network Coordination Team (NCT)**– Individuals who work together to coordinate overall Network activities.
- **Project Liaison Officer** – Member of the NCT responsible for coordinating activities between the Network and specific projects.

Figure 1-2. *The Key Components of the LMMA Network.*



The LMMA Network is collectively trying to determine the conditions under which a locally-managed marine area strategy works best and why. Each project team using an LMMA strategy probably has questions about whether they are applying this approach most effectively to reach their goals. Also, project staff may not have much information about how best to learn about and adapt their use of an LMMA through time. To address these needs, ideally each participating project team in the Network will be going through a learning process that involves first describing the conditions at their site, what actions they will take to change these conditions, and what information they need to collect to monitor the results of their actions. Each project in the Network will then hopefully collect, analyze, and communicate this information so that project teams can check whether their actions worked as they had intended, judge whether their assumptions underlying LMMA use were valid, and decide whether changes need to be made in the project's design to improve results. Through this group process, each project team will learn about the actions they are taking – what works well, what doesn't work well, and why.

1.3 What is the Learning Framework?

The LMMA Network seeks to make this learning process more efficient. If a number of projects all using a similar strategy can share their findings with one another, then we should all be able to learn more rapidly and with greater reliability about the conditions under which the strategy is most effective. To make this sharing more efficient, however, the project teams need a common language that they can use to communicate with one another. In particular, they agree in advance about what strategy they will be focusing on, what questions are most important to ask about assumptions underlying this strategy, and what common sets of information they need to collect to answer these questions. This Learning Framework (LF) is a document that formally details the results of the Network's agreement on how to go about answering such questions. In this regard, the LF is the basic planning tool for the LMMA Network. It describes our current understanding of the:

- Typical conditions at the sites where projects are being implemented (Sections 2.1 and 3);
- Types of LMMA strategies that projects are using (Section 2.3);
- Assumptions of how using these strategies will change prevailing conditions (Section 2.4);
- Information that we will need to collect to test these assumptions (Section 4).

1.4 How this Framework was Created

The initial content of this framework was developed by representatives of many potential participating projects in the Network at initial meetings convened in August and November 2000. At these meetings, project teams first presented what actions they were taking at their respective sites. They then used a common approach to analyze the conditions at each of their sites and outline the challenges they were each facing using their version of a locally-managed marine protected area strategy. The teams then began to discuss what common data they might collect at each of their sites in order to test the conditions under which an LMMA works best. Finally, the teams began to discuss a social contract outlining how they might work together and what their mutual obligations and expectations might be. The group also designated a Network Coordination Team (NCT) to help carry out the planned work.[3]

Following these initial meetings, NCT representatives worked to develop the material presented in this document during 2001 and 2002. In doing this, the NCT members consulted with several experts on this subject, worked closely with a number of the project teams in the Network to test and refine this material, and had various versions of the draft framework peer-reviewed.

1.5 How this Framework Can be Used

This framework is meant to be a "living document" that records the current understanding of Network members. This framework can be used by at least three different groups as follows:

[3] To learn more about the results of these initial meetings, and to see a list of contributors and participants, see "Fish for the Future" (Parks and Salafsky 2001), a report available online at www.LMMAnetwork.org or by contacting the LMMA Network.

- **As a Learning Guide for Specific Project Teams** – First and foremost, this framework is meant to be a guide for Network members as they go through their own learning processes at their sites. We hope that it will provide project teams with ideas and inspiration for deciding how to describe the situation at their sites, what actions to take, and what information to collect.

- **As a Map for the LMMA Network** – This framework is also meant to provide a map for the learning process that project teams will be going through collectively as Network members. Based on the agreement described in our social contract, this framework represents the minimum set of information that all fully participating projects in the Network have agreed to collect. This does not mean that project teams can't collect other information as they see fit – but merely that we all agree to collect and share information on the basic points outlined here.

- **As a Resource for Other Practitioners** – Finally, this framework is meant to be a resource for other practitioners around the world who are interested in taking an LMMA approach at their sites. We hope that you will find this information useful – and if so, that you will consider sharing your results with us and joining in our collaborative effort.

Check our website at www.LMMAnetwork.org for links to the most recent updates to this document, available in Adobe Acrobat .pdf format. On the website, Network participants will be building specific and more detailed pages around each of the major sections presented here. Hopefully, over time, these pages will become focal points for discussion of key issues around these topics and prove useful to even non-LMMA practitioners.

Chapter 2 - OVERALL CONCEPTUAL MODEL

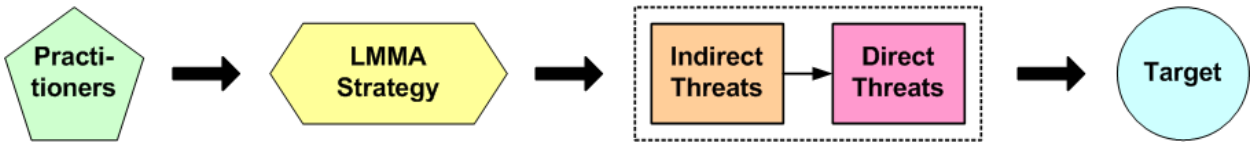
As we discussed above, the LMMA Network is trying to determine the conditions under which a locally-managed marine area works best. To this end, we need to have an understanding of the conditions at the project sites where we are working before we use this strategy. We also need to agree upon our assumptions as to how using an LMMA strategy will then change these conditions. Our conceptual model presents our current understanding of these conditions and assumptions.

A conceptual model is a diagram that shows the relationships between certain factors that are believed to impact or affect one another.[4] It is not meant to show every factor or relationship, but only to represent the most important ones. The conceptual model presented in this document is a representation of general conditions, factors, and assumptions within the context of coastal resource management and conservation in Asia and the Pacific. As such, the model aims to provide an overall framework of broad relationships that may be encountered at various project sites using the tools of an LMMA strategy. Each project team in the Network should also develop a more specific conceptual model, situation analysis, project map or other model that reflects the specific conditions at their project site.

As shown in Figure 2-1, a general model for a project includes:

- **Target** – The condition that the project is focusing on and is trying to affect through its activities. Represented in diagrams by a circle.
- **Direct Threats** – Factors that immediately affect the target. Represented by a rectangle.
- **Indirect Threats** – Factors that underlie or lead to the direct threats. Represented by a rectangle.
- **Strategies** – The actions being taken to address the threats and achieve the target. Represented by a hexagon. In the Network, all projects use at least one LMMA strategy. They may use other conservation and/or resource management strategies and tools as well.
- **Practitioners** – Individuals and organizations that have the skills and capacity to implement these strategies. Represented by a diamond.
- **Assumptions** – Links between parts of a model showing how they affect one another. Represented by arrows. The direction of the arrow indicates the primary direction of causality. Large arrows represent general links to a suite of factors.

Figure 2-1. *Components of the General LMMA Model.*



[4] See *Measures of Success* (Margoluis and Salafsky 1998) for a detailed discussion of conceptual models and how to build them.

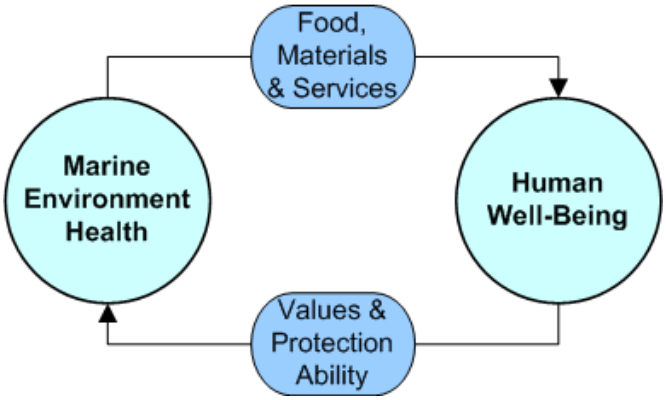
2.1 Target

The target describes the factor the project is focusing on and is trying to influence through its activities. Project teams involved in the LMMA Network typically describe two main conditions that they are trying to affect:

- *Marine environment health*
- *Human well-being*

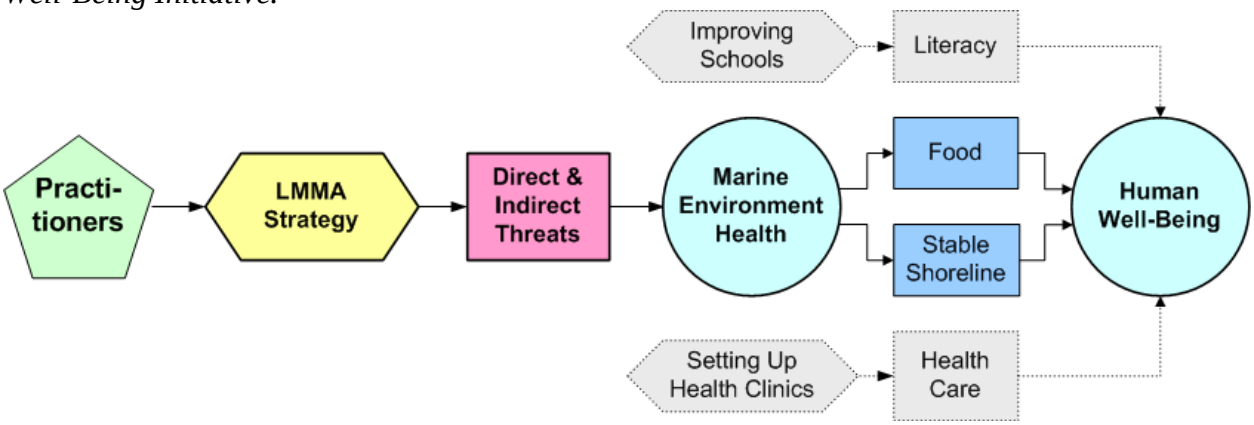
As shown in Figure 2-2 below, these two conditions are closely related to one another. Human well-being depends on the marine ecosystem, which provides food and income from resources such as fish or clams, materials such as mangrove wood used for construction and other purposes, and services such as protection against high storm surges. Likewise, the health of the ecosystem depends on the extent to which humans value marine ecosystems and the goods and services they provide, as well as the ability of humans to protect the environment from various damaging threats.

Figure 2-2. *The Human Well-Being and Marine Environment Health Inter-Dependency.*



One assumption that is drawn by project teams from this relationship is: *if marine environment health is maintained or improved, then human well-being will be maintained or improved.* Based on this assumption, the LMMA Network is choosing to focus on factors of human well-being linked to marine environment health. Therefore, while *human well-being* may be considered the ultimate goal, *marine environment health* is the primary conservation target that participating projects are focused on improving. In other words (as illustrated in Figure 2-3 below), for the purposes of this framework, we will only focus on the ways in which an LMMA strategy affects marine environment health (shown by the solid lines in the diagram). We will not be considering other factors that might affect human well-being such as illiteracy or the lack of health care or the strategies that might be used to address these problems (shown by the dotted lines). Note, however, that individual projects in the Network may choose to consider and address some of these other factors using different strategies – these factors are just not being considered as part of the overall framework for the LMMA Network.

Figure 2-3. *An LMMA Project Focusing on Marine Environment Health as Part of a Human Well-Being Initiative.*



2.2 Direct and Indirect Threats

The next part of our model identifies the threats that affect a project's target. In this model, we explicitly assume that all threats to marine resources are linked to human activities; natural processes, such as droughts or hurricanes, are expressly not included as threats. Human beings are a part of the natural world and its ecosystems, and the current levels of stress placed on marine resources are considered to be largely caused only by humans.[5] Thus, if marine resources are our target, we can consider human activities as the underlying cause of impacts occurring on these resources and their ecosystems.

In our general model in Figure 2-1, direct threats are the factors that negatively affect marine resources (for example, pollution or over-harvesting of marine resources by local users). Later on, when it comes time to counter the threats, it will be important to know who or what is causing which threat. Thus, in listing direct threats, it is important to specify who or what is behind them – fishing by local people for subsistence is a different threat than fishing by large industrial companies – even if it is the same people doing the work in each case.

Behind (underlying) these direct threats are indirect threats, which are the causes that lead to the direct threats (for example, poverty or people's lack of education and awareness). There are literally hundreds of potential indirect threats. The challenge in this process is to determine which of these indirect threats are most relevant to the actions that project teams are planning to take.

We provide a more detailed discussion of the direct and indirect threats and their relationship to one another in Chapter 4.

[5] Human activity may also influence or be a root cause of impacts; natural phenomena (weather, climate) may be influenced by human activity.

2.3 LMMA Strategy and Tools

A project seeks to take action to counter some of the direct and indirect threats that have been identified. These actions are typically related to one or more strategies. An LMMA is merely one example of such a strategy.

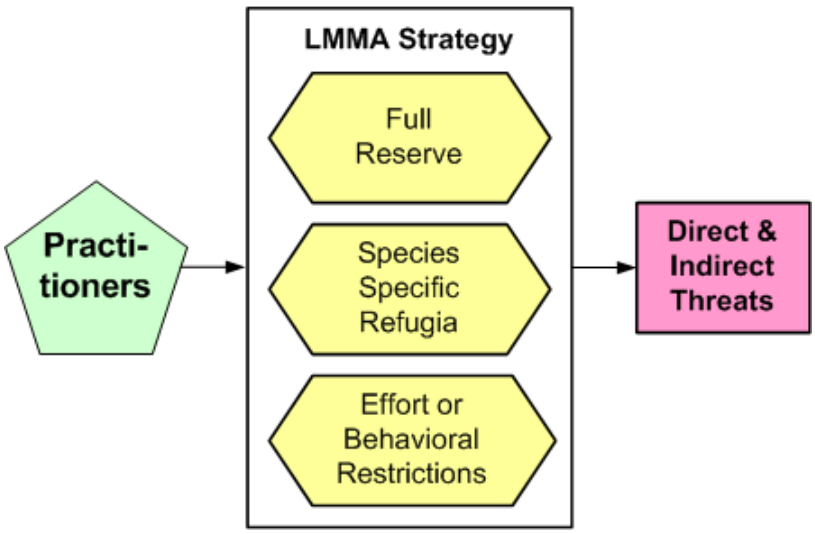
As the name implies, an LMMA is an area of marine habitat that is managed by resident communities, either on their own or in conjunction with other organizations and/or collaborative arrangements with government agencies. Within an overall LMMA strategy, there are a number of specific tools that can be used to manage resources (see Figure 2-4, below). Specific types of LMMA tools include:

- **Full Reserve** – Complete protection of all natural resources in a defined area. Often called a "sanctuary," "no-take area," or "fully-protected area."

- **Species-Specific Harvest Refugia** – In a defined area, the ban on the harvest of one or more species or individuals of a certain size and/or sex.

- **Effort or Behavioral Restrictions** – Regulations limiting harvest effort or particular uses in a defined area. Mandated by local authority or passed through legislation, these can include restrictions on the type of fishing technology used, limitations on the degree of fishing effort (e.g. number of fishers, number of boats, quotas on the amount of catch), seasonal restrictions, type of behavior allowed/disallowed (e.g. recreational diving, no anchoring), and licensing limitations. While such effort restrictions are not traditionally thought of as 'protected areas' *per se*, recognizing that they do offer marine resources a degree of protection from harvest pressure or other threats, they are recognized as a distinct management tool.

Figure 2-4. *Categorization of Tools within an LMMA Strategy.*



These tools can be applied at different spatial scales and over different timeframes within the overall LMMA, as illustrated in Figures 2-5A and 2-5B, below.

- **Spatial Scale** – The specific tools described above can be used at different scales within the overall site being managed. A tool can be applied across the entire site or different tools can be applied to different parts of the overall site.

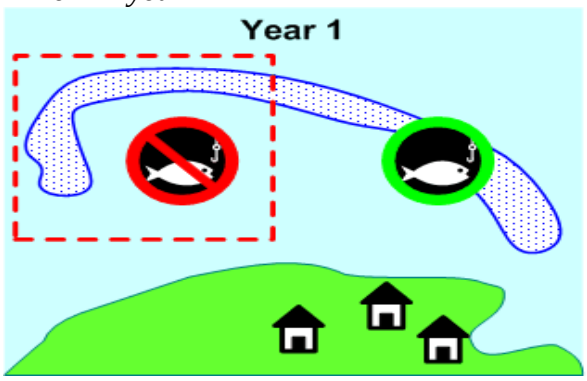
- **Timeframe** – The tools can be implemented either permanently or for temporary periods. If LMMA tools are used temporarily, they may be shifted or rotated from one area to another across the overall site through time, as illustrated in Figure 2-5 below.

Specific LMMA tools can also be used at different levels of intensity and implemented with different levels of effectiveness. As shown in Figures 2-5A and 2-5B below, a typical LMMA project will use combinations of different tools over different time and spatial scales. A given project's ability to successfully implement an LMMA tool will depend on the specific ecological, social, economic, and institutional conditions present at the site.

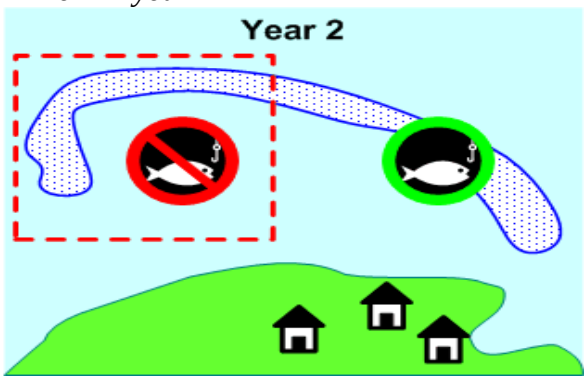
Figure 2-5. *Examples of how LMMA tools can be used over time.*

A) *Protection of a permanently designated area within an LMMA site through time.*

Time = 1 year

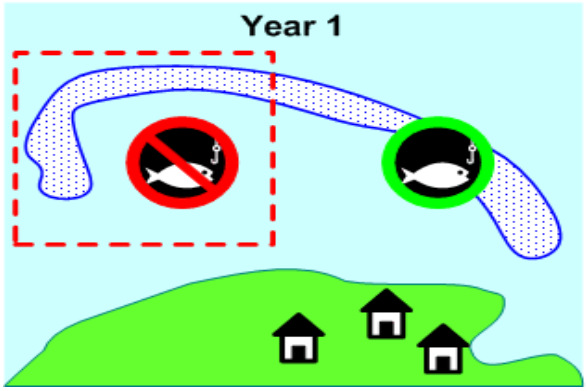


Time > 1 year

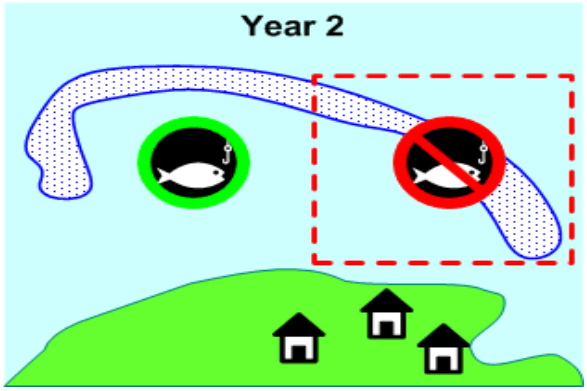


B) *Rotating harvest effort within an LMMA site through time.*

Years 1-3 and 7-9



Years 4-6 and 10-12



2.4 Assumptions Related to LMMA Tools

There are four overall assumptions about how using LMMA tools will lead to improved marine environment health and enhanced resource yields at the project site. In particular, we assume that if the above tools are implemented effectively in the appropriate areas for a sufficient period of time, then any or all of four benefits could occur:

- **Safe Haven** – The LMMA will serve as a sanctuary for biodiversity**,** acting as a place where relevant species and individuals (both young and adults), habitat, and (in the case of reserves) ecosystem functions in the defined area are (to some degree) protected, maintained, and/or allowed to recover.

- **Seeding** – The LMMA will serve as a source of eggs, larvae, and/or juveniles for relevant species. This assumed effect is important in that it allows for the transport of these eggs, larvae, and juveniles to adjacent areas where they can be harvested as they mature.

- **Spill-Over** – The LMMA will serve as a source of mature individuals of certain species. As their population density increases in the protected area, these species will move – or "spill-over" – into adjacent areas where they can be harvested.

- **Successional Yield** – In cases where specific tools within an LMMA are moved over time (as in Figure 2-5 B), the LMMA will enable species (especially sedentary, or non-moving, ones) to replenish themselves during the "fallow period," thus leading to enhanced yields once the area is shifted away and harvests are resumed in a formerly protected area. Using the appropriate number of LMMA tools for an adequate period of time in an area(s) that are to be re-opened for harvest in succession of one another through time, the idea is that a series of high yields could be encouraged while the overall population is being managed for adequate replenishment.

Chapter 3 - PROJECT AND SITE DEFINITIONS

A key step in the learning process is to determine the specific units that we will be working with. In the LMMA Network, the units consist of projects and the specific sites where these projects are working.

3.1 Defining Projects

For the purposes of this network, a project is an undertaking by a team of people who are working to implement or enhance an LMMA strategy at one or more specific sites. In most cases, the people involved in the project (the project team) are drawn from one or more organizations and from the local communities. The LMMA Network is a group of practitioners and project teams using one or more LMMA tools that have voluntarily chosen to participate in the Network to share information and ideas as outlined in the social contract.

3.2 Defining the Sites

A given project team will be working at one or more specific project sites. Since project sites will generally be the unit of analysis for the Network, we need to collect data for every specific site where a project is working.

A site is an area where an LMMA is physically located and includes the habitats and resources present in the area, as well as any village or community that is adjacent to the LMMA and whose members use or impact its resources. A project may involve just one site or multiple sites. For the purposes of the Network, a site also includes a temporal dimension, which pertains to the timescale of the project or project activities.

We can thus define each site where a project is working along three dimensions:

a. **Managed Area** – The overall marine area(s) being used and actively managed by local stakeholders, including key plants, animals, and habitats.

b. **Stakeholders** – People who impact or influence the overall marine managed area.

c. **Timeframe** – The time period over which we are assessing the project.

In the following sections, we describe each of these dimensions in greater detail, focusing on defining the dimension, outlining methods for assessing it, and describing the Network-associated outputs that participating project teams have agreed to produce. We recognize that in general, it is hard to come up with specific rules for defining each of these dimensions. Instead, this framework can only provide general guidelines that can help the project team at each site make a final decision. Part of the learning process will be discussing with other Network members how and why the three dimension definitions were made.

Managed Area Dimension

What is the 'Managed Area' of a Site?

Given that we are focusing on the health of the marine environment as our target, we will define the managed area as the overall marine area being used and actively managed by local stakeholders. Note that this means that human settlements will be excluded from the defined managed area unless they are physically located within it.

Mapping the managed area and the overall project site is an important and often difficult task that is done by all participating Network project teams. In addition to determining and outlining the boundaries or extent of area under local stakeholder influence for the overall site and managed area(s), where relevant we also want to determine: a) the location and size of specific habitat types (for example, mangrove forest, seagrass beds, beaches, and coral reefs) found at the site, b) political jurisdictions and traditional tenure boundaries, c) fishing and marine resource use areas, and d) other physical and oceanographic boundaries. Finally, we want to determine the location and coverage of the LMMA tools currently being used or planned for the future. By documenting and visually overlaying this information, the project team can begin to build a map of the area where an LMMA strategy and tools are being undertaken (see Figure 3-1 at the end of this section).

The marine resources at the site are the key plants and animal populations found within the overall managed area. Some animals may be resident whereas others may seasonally use the habitats within the managed area.

Methods for Defining 'Managed Area' of a Site

The managed area of a site can be defined by using the best available map of the region to sketch out the overall marine area that the community is using and/or actively managing, including the specific habitats and locations of LMMA management strategy/tool use within.[6] In some cases, the project team may be able to very accurately plot this area on an existing map of the region using previously gathered information or a hand-held global positioning system (GPS) device to determine the precise boundaries. In other cases, the project team may have to rely on asking community members and fishermen to draw lines on a printed map of the area with a pen based on their first-hand knowledge. Either method may equally produce an accurate map, depending on the conditions at hand – the key is to use whatever works best and most accurately for the project.

For defining the marine resources of a managed area, sit down with key informants and list the important plant and animal species found within the area. Ask the informants to estimate the health of the population at the present time and (if possible) in the past, where in the managed area the species is found, and the times during the year that the species is present or has important life history events (if any). Also discuss key ecological or behavioral aspects of the species in question that might influence the successful management of the LMMA (e.g., required or critical habitat, spawning locations, etc.).

[6] This map can include nearby coastal or terrestrial areas if they are included in the management strategies of the project.

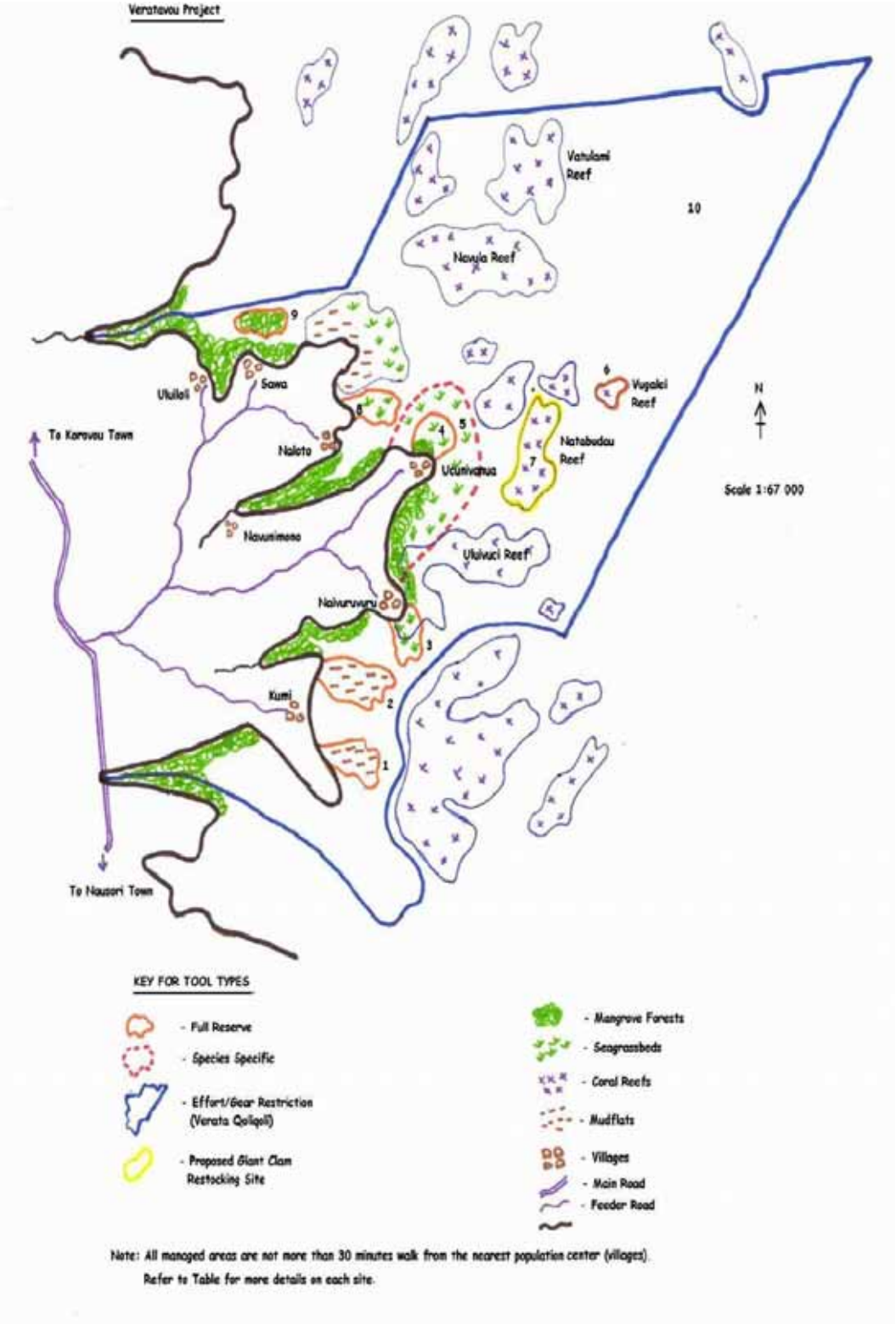
Since the managed area dimension is related to target elements, it is recommended to undertake key informant interviews as part of a process in which different stakeholders participate in this marine resource assessment exercise. One useful and engaging way to do this is through a Planned Participatory Marine Resource Assessment.[7] If quality information or publications already exist on the marine resources found at or around the managed area, use this background information to compare with key informant input. Results can be compared across groups and relevant perceptions, differences, and issues discussed.

Outputs

- For each site and managed area within, develop a map showing as accurately as possible the location and area (in hectares) of each, along with the geographical coordinates and a one-paragraph description of the general features of the site. If at all possible, try to include the boundaries of the different marine habitats at the site, the location of human settlements, and the boundaries of different LMMA tools that have been established, used in the past, or planned for the future (see Figure 3-1 below for an example). A hand-drawn map is perfectly fine; as projects develop capacity, they may wish to develop computer-based maps based on global positioning system referenced data.
- Estimate the distance (in kilometers and travel time) from the nearest population center (village or settlement) to the LMMA and the location of each specific LMMA tool.
- Regarding the marine resources at a site, make a list of important species, where they are found, an assessment of their status (health), and a brief description of their population characteristics and life history (see Table 3-1 below for sample).

[7] Learn more about this method in the *LMMA Guidebook* currently in preparation. See the website at www.LMMAnetwork.org for updates on the Guidebook's completion.

Figure 3-1. *Site map of the Veratavou LMMA Project, Fiji.*



(source: Tawake et al. 2003)

Table 3-1. *List of the key marine resources of Helen Reef, Hatohobei State, Republic of Palau.*

Common Name	***Name in Hatohobeian***	***Latin Name***	***Perceived Status***	***Comments (life history, seasonality)***
Clams	*Hie*	*Tridacna and Hippopus spp.*	Fair	High illicit harvest by poachers; some species (e.g., *gigas*) suffered large depletion over past decades.
Trochus	*Semum*	*Trochus niloticus*	Poor	Once abundant, now overharvested by foreign fishers.
Sea Cucumbers	*Periper*	*Holothurian spp.*	Poor	Once abundant, now overharvested by foreign fishers.
Groupers	*Harie*	*Epinephalus and Cephalopholis spp.*	Fair	Grouper generally high, but subject to live reef fish trade. Spawn at predicable places and times.
Bumphead Parrotfish	*Hamesuhur*	*Bolbometopom muricatum*	Good	Common on reef flat, easy to deplete.
Humphead Wrasse	*Maami*	*Cheleinus undulates*	Good	Subject to illicit live reef fist trade in the past.
Green Turtle	*Worr*	*Chelonia mydas*	Fair	One of highest nesting population in Palau; subject to subsistence harvest and use; now protected at Helen, state law and management plan allows taking of five green turtles a year for community functions.
Hawksbill Turtle	*Hachaob*	*Eretmochelys imbricata*	Fair	Relatively large foraging population; harvested in past for shell material.
Black-naped terns	*Kaingau*	*Sterna sumatrana*	Good	Seasonal; generally subject to human disturbance and rats, but improving.
Great Crested Tern	*Menarihots*	*Sterna bergii*	Fair	Seasonal; generally subject to human disturbance and rats, but improving.
Black Noddy	*Sewesaw*	*Anous Stolidus*	Fair	Seasonal; generally subject to human disturbance and rats, but improving.
Boobies	*Habang*	*Sula spp.*	Poor	Sensitive to human presence and rats; most now nesting on ship wrecks.

(source: HRRMP 2003)

Stakeholder Dimension

Who are the 'Stakeholders' of a Site?

Since conservation and resource management is largely a social process, in addition to defining the area of marine resources being conserved, it is also necessary to define the stakeholders of these resources. In general, the stakeholders will be local residents who have an actual or potential impact on the marine resources of the site. These stakeholders may or may not actually live within the site, but are people who have an interest in or influence on these resources.

Methods of Defining 'Stakeholders' of Sites

A good starting point in stakeholder analysis is first-hand knowledge from individuals or published data of the population at a site. Different groups of stakeholders can be defined by sitting down with key informants and using the site map and other resources, determining which people have an interest in the marine resources of the site. Here again, this process may involve some arbitrary decisions. For example, at a given site, two households regularly use the site, another household technically has a share in the resources, but never uses them, and a fourth household is a migrant family that has no rights to use the resources. In this case, we might initially choose to include the first three households but exclude the fourth. If, however, the migrant family uses these resources (although illegally) then we should consider them as stakeholders. If there are "local people" who have moved permanently to urban centers, it becomes even more complex to determine who may or may not be considered stakeholders. As a result, each project team will have to make specific decisions as to who to count and who not to count as stakeholders.

Besides identifying stakeholders, it is necessary to know how many there are. Population figures can be obtained from a variety of sources including government census figures, surveys that the project team conducts, or other estimates. The key here is to make sure it is clear what was measured and how. For example, do individuals include only adults over a certain age or do they include children as well? Are households simple nuclear families? Or do they include complex social arrangements living under one roof?

Finally, at each site, it is helpful to get some sense of who the different groups are at the site. Key divisions include male/female, old/young, rich/poor, caste, tribe, clan, religion or language group, and indigenous/migrant.

Outputs

- For each site, make a list of the stakeholders identified (see example in Table 3-2).
- Develop a description of who the key stakeholder groups are.
- If possible, develop a table showing the total stakeholder population as well as the sub-populations divided by different groups.
- Briefly describe the organizations and agencies that have a stake in the marine resources of the site and the roles they play.

Table 3-2. *List of stakeholders in the Verata LMMA Project, Fiji.*

Key Stakeholders	Types	Roles
Paramount Chief of the *Vanua* Verata *(Koya na Ratu mai Verata)*	Individual	Have the sole authority to direct or redirect decisions on issues related to the fishing ground. Empowers and reassures communities in the district on the benefits of such initiative offers. Enforcement of the management plan in the district.
Villages' chiefs (*Komai ni Veikoro*)	Individual	Decision making at village-level. Ensures the enforcement of the management plan and management tools used is followed.
Villages' headmen (*Turaga ni Koro*)	Individual	Link between villagers and project team. Responsible for the welfare of project team members (accommodation etc.). Policing the managed areas. All headmen in the district are part of the monitoring team.
Women's Group (*Soqosoqo Vakamarama*)	Village group	Most activities and projects promote the success of LMMAs. For instance, project like the proper management of wastes (both biodegradable and non-biodegradable) would enhance the reduction of marine pollution (Factor D4 of the LF). Members of the group are frequent fish-goers so proper training and knowledge in responsible fishing would assist in maintaining a sustainable fishery.
Youth Group (*Soqosoqo ni Tabagone*)	Village group	Assist in monitoring surveys.
Community Project Leader	Individual	Organize community project team if activities are to be done. Informing the paramount chief and the *Tikina* council on the progress of the project and also inform partner organization on project needs. Sharing the Veratavou experience to other parts of the country that are still in the process of developing LMMAs.
Verata Community Monitoring team	District	Implements monitoring, evaluates results and proposes further management actions. Also responsible for policing fishing ground.
Verata Trust Fund Committee	District	Manages the trust fund for Verata development projects and including LMMA work.
Primary Schools	District	"Knowledge in conserving marine resources leads to responsible fishermen in the future".
Verata Tikina Council, Verata villages and members (Ucunivanua, Kumi, Naigani, Naivuruvuru, Sawa, Navunimono, Uluiloli and Naloto)	District and villages	Implementing management plans and overseen by the district council which also ratifies proposed decision by the monitoring team.
IAS-USP, SPACHEE, FLMMA Network, LMMA Network	Local and international institutions	Facilitates awareness programs, provides technical advice for monitoring techniques including LF implementation and support for management activities
Fisheries Department, Environment department, Fijian Affairs Board and Tourism department	Government	Provides legal advice and support for awareness programs and implementation of activities.

(source: Govan et al. 2001)

Timeframe Dimension

What is the 'Timeframe' of a Site?

A key aspect of this work is determining the time period over which we are considering the use of the LMMA tool. Some projects may have been operating for many years prior to joining the Network, while others may be only now just getting underway. To control for these differences, it is important to set a date for the start of the overall project and the use of each LMMA tool. In an "ideal" situation, all projects would start and end at the same time to facilitate comparisons across projects. In the real world, however, many projects have been underway for a long time and will continue into the indefinite future. Although projects begin employing LMMA tools and collecting data on them at different times, we still can compare them if we know what the start dates are and over what time period we are collecting information.

Methods for Defining 'Timeframe' of a Site

The starting evaluation point can be determined by deciding on the dates on which implementation of the LMMA activities began. Ongoing evaluation points will generally be determined by a cut-off period after which data are analyzed.

Outputs

- A brief paragraph defining the starting point for and extent of the project's activities.

Chapter 4 - KEY FACTORS TO MEASURE

This chapter is the primary focus of this document. It contains a listing of the key factors that we believe are important to understanding the conditions under which an LMMA strategy can lead to resource protection and conservation. The factors in this section are divided into five main categories as shown below and in Table 4-1. These categories correspond to the main parts of the general conceptual model discussed in Chapter 2 (Figure 2-1).

1. **Targets** – The factors or elements that the project team is hoping to manage, conserve, or otherwise influence through project activities.
2. **Direct Threats** – Factors that immediately affect the target.
3. **Indirect Threats** – Factors that underlie or lead to the direct threats, also referred to as the "root causes" driving direct threats.
4. **Strategies** – Factors related to how actions or interventions are taken to address the threats and manage or influence the target.
5. **Practitioners** – Factors related to the individuals and organizations that implement the strategies.

For each category, we first provide a brief introduction to the overall category and list the specific factors considered. We then provide a 1-2 page discussion of each specific factor that covers the following points:

- ***What is the Factor?*** – A definition of the factor and explanation of some of the terms related to it.
- ***How Do We Assume the Factor Affects Other Factors*** – A description of the conventional wisdom about the relationship of this factor to other factors including especially, where relevant, how the factor influences LMMA success.
- ***How Do We Measure/Describe the Factor*** – A description of what information project teams might collect to measure this factor (indicators), a discussion of how to collect this information (methods), and suggestions as to when and by whom data should be collected and what the outputs for each factor should be.

Upon first glance at Table 4-1, it may seem like this is an overwhelming list of factors. As you will see, however, many of these factors are fairly straightforward and easy to measure accurately. Others are more difficult, but still can be measured or at least approximated. Each project team should work with their local partners and their project liaison officer to figure out which factors apply to their project and what the most effective and efficient way to go about assessing these factors might be. The project team will likely choose a combination of household surveys, key informant/focus group discussions, and assessments.

As a general rule, the Network has agreed to use simple and straightforward ways of measuring these factors. In many cases, these methods include qualitative ranking techniques and the collection of anecdotes and stories. We recognize that there are often more precise and accurate ways of assessing the identified factors. However, these more precise measurements also tend to be more complex and/or expensive to use. Another benefit of simple methods is that community members can be actively involved in information gathering and analysis. Our experience shows this can be a key factor in continued community interest in the project and best for ongoing

Table 4-1*. Overview of Factors, Example Indicators, and Method and Survey Type. (Note that there may be some overlap across factors within a single survey.)*

CATEGORY **Factor**	**Example Indicators**	**Survey**		
		Biological	**Catch/ Creel**	**Socio-Economic**
TARGET				
T1. Species Health	Abundance (per area or time). Life-stage information (e.g. size, weight).	X		
T2. Habitat Health	Area of habitats. Quality of habitats.	X		
T3. Ecosystem Health	Presence and status of ecosystem benefits.	X		X
T4. Reduction of Threat	Reduction of Threat			X
T5. Human Well-Being	Material benefits of LMMAs. Non-material benefits of LMMAs (list). Overall well-being (needs refinement…).			X
DIRECT THREATS				
D1. Local Marine Resource Harvesting	Catch per unit effort. Type of fishing method.		X	
D2. Commercial Marine Resource Harvesting	Catch per unit effort. Number of licenses. Average number of days operating. Average daily catch. Degree of destructive fishing.		X	
D3. Habitat Loss and Degradation	Types of habitat degradation. Estimates of area and rate of habitat degradation and loss.	X		X
D4. Pollution of the marine environment	Presence/frequency of incidents of pollution at site. Severity of pollution problem.	X		X
D5. Invasive Marine Species and Disease	Presence/absence or degree of invasive species and disease.	X		X
D6. Climate Change	Rate and degree of coral bleaching (collected under Factor T2). Water temperature. Number of cyclones. Regional phenomena.	X		
INDIRECT THREATS				
Human Population				
H1. Number of People at Site	Number of full and part-time residents. Number of visitors per year. Number and type of users.			X
H2. Human Migration	Number of immigrants. Number of emigrants. Number of migrants who use marine resources. How migrants harvest resources. For what purpose do migrants harvest resources.			X
H3. Human Population Diversity	Relative number of different types/groups of people.			X
H4. Degree of Consensus	Degree of consensus among population.			X

Livelihood		
L1. Economic Status	Economic Status (wealth, income, expenditures). Average and variance across households.	X
L2. Dependence on Marine Resources	Percentage of stakeholder livelihood derived from marine resources. Availability of alternative livelihood not related to marine resources.	X
L3. Market for Marine Products	Type of market. Accessibility of markets. Strength of market (demand).	X
L4. Infrastructure and Technology	Degree of communications and transport infrastructure. Overall level of economic development.	X
L5. Formal Education	Average and Variance in formal education among stakeholders.	X
L6. Environmental Knowledge and Awareness	Level of environmental knowledge. Environmental attitudes.	X
Governance		
G1. Governance Institutions	Credibility of governance institutions.	X
G2. Marine Resource Rights	Specific rights that the local stakeholders have over the different marine resources in the project site. Strength of these rights.	X
G3. Resource Rules	The degree to which local stakeholders: (a) are aware of resource rules (b) feel the rules have involved their input, and (c) think the rules are clear and fair.	X
G4. Compliance and Enforcement of Rules	Number of incidents of violations. Degree to which LMMA rules are enforced. The probability that a violation will be reported and punished. Severity of the punishment for violating the rules. Credibility of and respect for enforcers.	X
G5. Political System	The type of political system, at local, provincial and national levels. Degree of democracy. Frequency of change in government.	X
G6. Cultural Values and Beliefs	Cultural values and beliefs of the local stakeholders with regard to marine resources and their management. Degree of compatibility between local cultural values and beliefs and the goals of the LMMA projects. Degree to which stakeholders value nature for non-material reasons.	X
G7. Leadership	The relative strength of key leaders involved in the implementation and management of the LMMA. Distance from leaders seat to LMMA.	X
G8. Resource Conflict	The types and nature of conflicts over marine resources that exist Relative intensity of conflicts. How conflicts are resolved.	X
STRATEGIES		
S1. LMMA Tools	Type(s) of tools used, area in hectares under each tool, time each tool is applied, and species and effort restrictions in place. The time from the village center to the LMMA via typical transport methods. Degree of regular community presence at the LMMA (from interviews/observation).	X
S2. Other Conservation Tools	Non-LMMA tools used at a project site.	X

S3. LMMA Benefits	The type and level of LMMA benefits sharing among stakeholders at a site. The degree of distribution of benefits among stakeholders at project site.	X
PRACTITIONERS		
P1. Local Participation	Strength and distribution of local participation in the project.	X
P2. Project Team	Number of staff assigned to the project. The percent of time that they spend at the project site. The number who speak the local language. Overall skills of the project staff. Interest of the project staff in adaptive management.	X
P3. Project Investment	Amount of money in project budgets. Amount of volunteer time invested.	X
P4. Project History	Length of time project has been active in site. Degree of local origin of project idea. Experience with projects at site or nearby. Community material and non-material expectations at start of project.	X
P5. Project Partnerships	Number of partner organizations with substantial involvement. Number of government agencies with substantial involvement. Number of partners with expertise in adaptive management. Number of traditional leaders and/or groups with substantial involvement.	X

adaptive management. If, however, a given project team decides that it is important for them to invest in a more precise method, we would certainly not discourage this. As we view the LF as a "living" and adaptable document, factors may be added/subtracted from time to time if considered beneficial/not useful by Network members.

In the interest of readability, this guide provides only brief details about methods for data collection. For more information about the methods discussed in this document as well as alternatives, please consult the LMMA website at www.LMMAnetwork.org.[8] You can also contact other members of the LMMA Network or your project liaison officer to arrange training or technical support for different methods.

This guide also assumes that you know some basic research concepts such as how to define units of analysis, how to select a sample from a population, how to develop a survey questionnaire, how to select key informants, and how to do basic statistical procedures such as calculating an average or standard deviation. A brief primer on these topics is provided in Chapter 5 - Data Management and Analysis. Again, contact other members of the LMMA Network or your project liaison officer to arrange additional training or technical support in these areas.

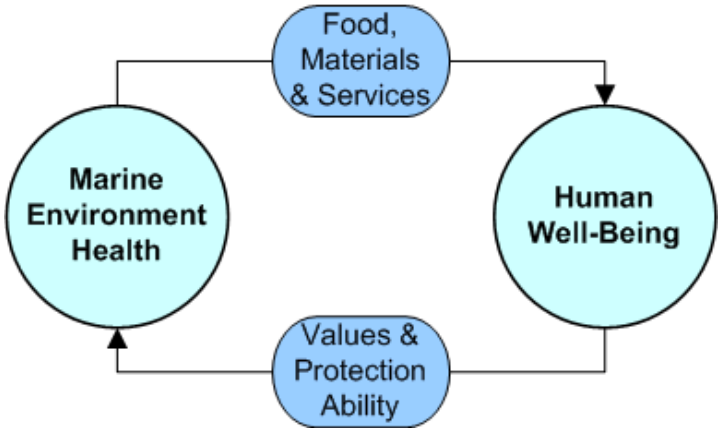
Finally, although these factors are presented separately, you will see that data collection efforts can often be combined across factors. For example, information about the stakeholder dimension, the human population, and stakeholder livelihoods, among others, can all be collected through a single household survey. Some suggestions about how to combine data collection efforts are also presented in Chapter 5.

[8] As of April 2004, these sections of the website have not yet been constructed. They will be put into place over the coming months.

4.1 Factors Related to the Target

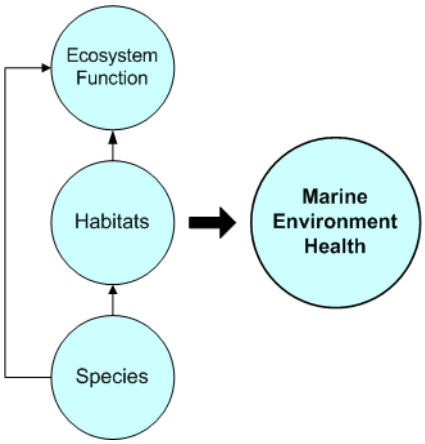
The target describes the marine resources that the project team is trying to influence through its activities – the overall goal of the project. Therefore, measuring change in the target over time is vital to inform project teams whether their actions are having the desired effect – whether they are achieving success or not. In scientific language, the target is called the dependent variable.

As we discussed in Section 2.1, LMMA projects generally have goals related to both human well-being and the marine environment. For the purposes of the LMMA Network and for focusing our evaluation, however, we will consider the marine environment as an intermediate target linked to human well-being as our ultimate target as shown in the diagram below.



Promoting a healthy marine environment is understood as the aim of most projects using an LMMA. We can define a healthy marine environment at a project site as: *a system in which the populations of all naturally-occurring organisms are able to replenish themselves through time in a natural setting that is capable of withstanding disturbance*. A healthy marine environment is one that provides many goods and services to the people living near or at the site. The marine environment can thus be evaluated under three component factors as shown in the diagram on the next page (Figure 4-1).

Figure 4-1. *Relationship among Species, Habitats, and Ecosystems contributing to overall Marine Environment Health.*



T1. Species Health – The status of populations of all naturally-occurring marine organisms, both plant and animal. Includes harvested species (used by humans) and non-harvested species.

T2. Habitat Health – The status of "natural settings" of the marine environments including coral reefs, seagrass beds, mudflats and mangroves.

T3. Ecosystem Health – The ability of the marine environment to provide natural functions, including the overall level of goods and services through time.

By measuring these factors, the community can learn whether the health of the marine environment and resources are being maintained or even enhanced and thus can see whether their LMMA is working or not. Unfortunately, it is often difficult to get reliable measurements of all important species, habitats and ecosystems. To supplement this information, we can use measurements of the reduction of threats as a proxy indicator of changes in the marine ecosystem. This requires another factor:

T4. Reduction of Threat – A measure of the change in the level of threats to the ecosystems in the project site. This factor is closely linked to the direct threats measured in Section 4.2.

Finally, although we have agreed to focus on the marine environment as the primary conservation target for the Network, we also want to track changes in our ultimate target to ensure that our primary assumption about the link between marine environment health and human well-being holds. This requires one additional factor:

T5. Human Well-Being – Welfare of local stakeholders.

Factor T1: ***Species Health***

What is 'species health'?

Species include nearshore fishes (such as parrotfish, trevally, and mullet), other marine animals (such as sea turtles, sea cucumbers, clams, and sea birds), and marine plants (such as algae and mangroves). A 'healthy' species can be defined as one whose population is able to replenish itself through time and maintains a genetic diversity that would be found under natural conditions. We are interested in species health because there are many important species that people use from the marine environment for food, income, and cultural purposes. Other species, although not directly used by humans, are also important to a healthy marine environment. For many communities, promoting healthy species populations at the site is the most important thing to achieve from an LMMA.

It is almost never possible to count or measure all of the species of interest in a given area. We thus tend to select one or more specific indicator species. These species can be either species particularly valued by humans or species thought to reflect the overall health of the environment.

How do we assume that LMMAs affect 'species health'?

- LMMAs can provide a safe haven to species inside the LMMA.
- LMMAs lead to increased populations of species in adjacent areas through seeding and spill-over effects (see Section 2.4 for more details).

How can we measure/describe 'species health'?

What do we measure/describe?

The abundance (sometimes referred to as species density) and size (or age class) distribution of the population of specific species at key locations within the overall managed area.

What method should we use?

First determine which indicator species you wish to monitor. Selection of the species will be based on a discussion between the project team, community members, and project liaison officer. Ideally, projects should have at least one indicator species for each major habitat type in your project site.

Using your map of the managed area and your assumptions about the types of LMMA tools that you are using, determine where you want to sample the indicator species within the range of each habitat type. For example, if your project is using a full reserve or species refugia you probably will want to describe the conditions and collect a range of measurements both inside and outside the LMMA tool(s) being evaluated to help determine possible safe haven, spillover, and/or seeding effects.

The next step is to actually sample the species. There are a number of methods that have been developed for sampling various types of organisms. One common method involves counting and sizing species along transects. For mangroves and sea grass species, a line transect method could

be used, collecting information on target species within quadrats[9] or plots. For species found in coral reef habitats, a 'belt' transect typically would be used.[10] Where possible, the project team should attempt to carry out subsequent measurements at or very close to previous sampling locations (using permanent markers, GPS, and/or compass bearings) in order to reliably sample the same area (and the resident species found there) through time, so that temporal changes (those that occur over a period of time) can be detected.

When and by whom are data collected?

The first measurement of important species should be done prior to LMMA implementation. If this is not possible (the LMMA is already underway and no baseline information on the species of concern had been collected), an attempt should be made to both measure the population as soon as possible and estimate the degree to which, if at all, the species of concern have recovered since instituting the LMMA(s). Thereafter, species health measurements should preferably be done once a year, at a minimum.

For participation within the LMMA Network, species monitoring is best done by community members in conjunction with project staff. Initially, community members may require substantial assistance from project teams. Over time, however, community members can take on full responsibility for this work. Outside project staff or partner scientists can also assist with resource monitoring in the area to see if different approaches provide similar results.

Outputs

- A record of the raw data from the project's sampling efforts, including:
  - The name (local, common, and scientific, if possible) of each species in question.
  - The sampling location(s).
  - The date, time, and data collectors' name(s).
  - The total number of individuals found per unit area (or unit time in a swim).
  - The average number of individuals found per unit area (or unit time in a swim).
  - The size-class distribution of the population sampled (graph).
  - Stories and anecdotes of target species and population health.
- After your first monitoring, use information from previous monitoring efforts to calculate the percent change in species numbers and build a profile of how your indicator/target species are changing through time.

[9] A quadrat defines a small area (for example, $1m^2$) to be sampled, and is placed along a transect at specified intervals (usually every 10 m). This is repeated along several 100 meter-long transects laid out either systematically or randomly within the habitat being surveyed, depending on the amount of target habitat being managed. Within each quadrat, the desired information on species (and habitat) status is then collected.

[10] Belt transects are either proportionally or randomly laid out within the habitat being studied in 50 to 100 meter-long increments. Desired information on the species and habitat are then sampled within the width (typically 2m-5m wide) of the entire transect as one swims along it.

Factor T2: ***Habitat Health***

What is 'habitat health'?

Habitats include coral reefs, seagrass beds, mangrove forests, estuaries and wetlands, and closely associated terrestrial habitats. A healthy habitat is one that is capable of withstanding moderate disturbance and is able to provide a home for the many species that depend on it. For the purposes of the LMMA Network, measurement of habitat health includes both the *quantity* (total area of the habitat within the project site) and *quality* (the relative condition of the habitat).

How do we assume that LMMAs affect 'habitat health'?

- Establishing and maintaining an LMMA helps protect habitats from negative human activities, such as trampling, destructive fishing, or over-harvesting.
- Protecting key species (such as large predators or herbivores) helps to maintain natural balances of other species and the full range of feeding relationships so that habitats remain healthy and in a more 'natural' state.

How can we measure/describe 'habitat health'?

What do we measure/describe?

The quantity and quality of habitat within the overall project site.

What method should we use?

First identify the habitat(s) in your overall project site. This step should have been done as part of the definition of your project site (see Section 3.2).

To measure the quantity of habitat for each type identified, using your base map, draw the boundaries of living habitat (to a reasonable level of accuracy) and then calculate/estimate the total area of living habitat in hectares. To measure the quality of each habitat, a measurement is made of how much healthy living material exists in samples of the habitat, using methods described below for each habitat type.[11]

- In mangrove habitats, count the number of mangrove trees and measure each tree's diameter at breast height across the area of forest defined under the project site definition. This is done using an appropriate sample method. For example, for large trees you might sample within 50 m^2 plots at a distance of 200 m apart along multiple line transects. For small trees, you might sample within 5m^2 quadrats placed every 10 m along multiple line transects. Describe the general health of each tree (healthy, diseased, dead) and note any interesting changes in the appearance of the trees encountered.

- In seagrass and mud flat habitats, count both the number of living seagrasses (grouping of blades from a single root) and the number of healthy, living blades per each grouping across the area of seagrass/mudflat habitat defined under the project site definition. Also describe the substrate type(s) observed and estimate the extent of substrate type(s) coverage found

[11] You may also wish to consider specific techniques developed for sampling various habitats such as the Reef Check methodology or the Sea Grass Watch Program.

(closest to 0, 25, 50, 75 or 100%). In this case you might sample within 1 m^2 quadrats placed at 10 m apart along multiple 100 m-length line transects. Describe any interesting changes in the appearance of the grasses, diseases encountered, or areas of increased seagrass predation, plus the presence and abundance of major lifeforms such as seahorses, sea stars, sea urchins and mollusks.

- In coral reef habitats, it recommended that you measure the percent (closest to 0, 25, 50, 75 or 100%) of live coral cover found within 1 m^2 quadrats placed at 10 m apart along multiple 100 m-length line transects. Describe any interesting changes in the appearance of the corals, diseases encountered, or areas of increased coral predation. Also describe any substrate type(s) observed within the quadrat other than live coral (e.g. rock, sand, sponge, algal growth), and estimate the extent (closest to 0, 25, 50, 75 or 100%) of substrate type(s) coverage found. You may also use other standard and more technical methods such as the ones recommended by Global Coral Reef Monitoring Network (GCRMN) and Reef Check.

Where possible, the project should attempt to carry out subsequent measurements at or very close to previous sampling locations (using permanent markers, GPS, and/or compass bearings) in order to reliably sample the same area through time. You may also want to collect qualitative data (stories and anecdotes) about the present and past condition of the habitat(s) from local knowledgeable individuals.

When and by whom are data collected?

The first measurement of habitat(s) should be done prior to LMMA implementation. If this is not possible (the LMMA is already underway and no baseline information on the habitat(s) had been collected), an attempt should be made to both measure the habitat(s) as soon as possible and estimate the degree to which, if at all, the habitat(s) have changed in quantity and quality since the outset of instituting the LMMA(s). Thereafter, habitat health measurements should preferably be done once a year, at a minimum.

Habitat monitoring is best done by community members in conjunction with project staff. Initially, community members may require substantial assistance from project teams. Over time, however, community members can take on full responsibility for this work. It is recommended that outside project staff or partner scientists also do monitoring in the area to see if different approaches provide similar results.

Outputs

- Date, time, and data collectors' name(s).
- A map of living habitat(s) boundaries and sampling location(s).
- Estimates of area of each habitat type within the managed area.
- Estimate measures of habitat quality.
- Stories and anecdotes of habitat quality.
- After your first monitoring, use information from previous monitoring efforts to calculate the change in habitat health.

Factor T3: ***Ecosystem Health***

What is 'ecosystem health'?

Ecosystems are broad units of ecological classification, which include assemblages of populations of species (Factor T1), communities or assemblages of these species, and their habitats (Factor T2) as represented in Figure 4-1. Intact coastal ecosystems provide a myriad of functions (e.g., primary productivity, energy flow between tropic levels, etc.) and services (e.g., food production, storm protection, pollutant filtering, conditions for biodiversity maintenance, etc.), from which humans benefit at many levels. An ecosystem's functioning, along with its component parts (measured through Factors T1 and T2), and the benefits and services it provides to people are important to measure in terms of LMMA use and successful application. The ability of the marine environment to provide natural functions, including the overall level of benefits and services that it is able to provide through time is used as a proxy of this degree of this functioning.

How do we assume LMMAs affect 'ecosystem health'?

- Development of a healthier ecosystem – including its species and habitats – will result from the effective application of an LMMA.
- Coastal residents will receive enhanced benefits and services generated from healthy ecosystem functioning and biodiversity will be conserved as a result of the effective application of an LMMA.

How can we measure/describe 'ecosystem health'?

What do we measure/describe?

As healthy, fully functioning coastal ecosystems provide benefits and services to coastal residents, a simple qualitative checklist of categories of benefits/services should be able to be assessed and monitored through time. Changes in the degree and frequency of such benefits/services through time can serve as an indicator of the status of overall ecosystem functioning.

What method should we use?

The first step is to ask focus groups (and households, if desired) to identify the type of benefits and services observed and valued as a result of a healthy marine environment. Define and describe each benefit/service identified. Examples include:

(a) storm surge and wave protection
(b) coastal erosion protection
(c) primary productivity and biomass accumulation (i.e., fisheries productivity)
(d) presence of top predators (highest trophic levels within a climax community)
(e) filtering of storm water, human waste, and other pollution discharge
(f) non-commercial and non-food resource use (e.g., construction materials, traditional medicines)

From this list and local conditions, develop an annual checklist of ecosystems benefits and services at your site that can be easily observed and reported on by respondents. Assess the frequency with which each is observed. Ranking of the degree (1-3: low, medium, high) of

benefit/service observed and the most important goods and services may also be helpful for evaluation of each through time. An aggregate score of the degree of benefits and services can also be compared to other known healthy ecosystems.

If these benefits/services can be monitored scientifically using the methods listed under other factors (e.g., Factors T1 and T2), triangulate the frequency of respondent reports against observations and measurements. You may also be able to develop an index measurement of Factors T1 and T2 as a proxy indicator of ecosystems functioning and compare trends/changes in index against trends/changes in this factor.

When and by whom are data collected?
Evaluate annually (keeping in mind that ecosystems take time to change and services take time to observe) to assess the degree of benefits/services changed. Monitor changes in rankings through time. By project staff, possibly in conjunction with researchers if available.

Outputs

- Rankings of perceived ecosystem benefits and services.
- Comparisons of perceived benefits and services with actual measurements from other factors.
- Anecdotes or stories of ecosystem condition, functions, benefits and services.

Factor T4: ***Reduction of Threat***

What is 'reduction of threat'?

Even though they are the most direct measurement of our target condition, it is often difficult to get reliable measurements of all species, habitats, and ecosystem health. To this end, it is often easier to look at the reduction of direct threats as a proxy measurement of conservation success. A Threat Reduction Assessment (TRA) is an analytical tool that can be used to evaluate the reduction of threat at project site.[12]

The logic behind TRA is that if a project team can identify the threats to the biodiversity of a region, then the team can assess its progress in achieving conservation by measuring the degree to which these threats are reduced. These threats include both internal threats (caused by local stakeholders) and external threats (caused by outside parties). The TRA approach to measuring project success is based on three key assumptions:

1. *All biodiversity destruction is human induced.* Loss of species/habitats due to natural causes, such as fires or hurricanes, is not included as a threat to biodiversity. Human-induced increases in the magnitude or frequency of catastrophic events, however, can be.
2. *All direct threats to biodiversity at a given site can be identified, distinguished from one another, and ranked in terms of their scale and intensity of impact and their urgency.* At any given point in time, project teams can determine all the *direct* threats to biodiversity that exist at the project site. The teams can also separate the effects of different threats and can rank them in terms of their magnitude, degree of impact, and timing.
3. *Changes in all threats can be measured or at least estimated.* Project teams or outside observers will be able to systematically (either quantitatively or qualitatively) assess the degree of reduction of all threats at any given time.

How do we assume that LMMAs affect 'reduction of threat'?

- Maintaining a successful LMMA will reduce the key internal and external threats facing marine resources.
- LMMAs will be more successful at reducing internal threats as opposed to external threats.

How can we measure/describe 'reduction of threat'?

What do we measure/describe?

We want to describe the reduction of threats to biodiversity and resources at a site over time. There are a number of ways to do a threat reduction assessment; we suggest the following procedure, which produces a "TRA index" (see examples to follow). This index is designed to identify threats, rank them according to their relative importance, assess progress in reducing each of them, and then pool the information to obtain an estimation of actual threat reduction as a percentage of total potential threat reduction so that meaningful comparisons can be made across different projects.

[12] Detailed guidance for using the Threat Reduction Assessment can be found in Margoluis and Salafsky 2001. A theoretical discussion of the TRA methodology can be found in Salafsky and Margoluis 1999b.

What method should we use?
The TRA procedure involves six steps.

1. **Develop a list of all direct threats to the biodiversity at the project site present at the start date (Column 1).** For each threat identified, define what totally (100%) reducing this threat will entail.

2. **Rank each threat based on three categories: area, intensity, and urgency.** Area refers to the percentage of the habitat(s) in the site that the threat will affect - will it affect all of the habitat(s) at the site or just a small part? Intensity refers to the strength of impact of the threat - will the threat completely destroy the habitat(s) or will it cause only minor changes? Urgency refers to the immediacy of the threat - will the threat occur tomorrow or in 25 years? Count the total number of threats and assign this number (n) to the highest ranking threat in each category (Columns 2 - 4). For example, if there are five threats and subsistence hunting is the most serious threat, then its rank is five. Assign the next highest ranked threat in each category the score n - 1. Continue ranking the threats until you get to 1, which is assigned to the lowest ranked threat. It is often helpful to write all the threats on separate slips of paper which can then be moved up or down relative to one another to create the rankings.

3. **Add up the score across the three categories.** Add the three rankings for each threat together to get the total ranking (Column 5).

4. **Determine the degree to which each threat has been reduced.** At the end date of the assessment period, work with the project team to determine the degree to which each threat has been met, based on definition of 100% threat reduction devised in step 1. These assessments can be made either quantitatively or qualitatively depending on the type of threat and the data available. In either case, the reduction in threat should be expressed as the percent change in the original threat identified at the start of the project (Column 6).

5. **Calculate the raw score for each threat.** Multiply the total ranking (Column 5) by the percentage calculated in step 4 (Column 6) to get the raw score for each threat (Column 7).

6. **Calculate the final threat reduction index score.** Add up the raw scores for all threats (Column 7), and divide by the sum of the total rankings (sum of Column 5) and multiply by 100 to get the final threat reduction assessment index for the project (Column 8).

When and by whom are data collected?
Steps 1-3 should be done during the initiation of project monitoring to create a baseline data set. If this is not possible, then it can be done retrospectively. Steps 4-6 should be done every two years and at the end of the project assessment period by the project team and key informants.

Outputs

- A completed TRA index table. See examples from Palau and Indonesia below.

Example: *TRA Index example from Palau.*

Threat Reduction Analysis - Helen Reef, Republic of Palau

	THREATS	AREA	INTENSITY	URGENCY	TOTAL RANKING	THREAT REDUCED	RAW SCORE
1	sea temperature rise (coral bleaching)	10	10	3	23	0	0.00
2	illegal poaching	9	9	10	28	100	28.00
3	commerical local overfishing	8	3	4	15	100	15.00
4	chemical poison fishing	7	6	8	21	100	21.00
5	overfishing for subsistance	6	4	9	19	99	19.19
6	bomb fishing	5	8	6	19	100	19.00
7	invasive/alian species	4	5	7	16	70	22.86
8	ship grounding	3	7	1	11	0	0.00
9	habitat disturbance on island	2	2	5	9	-20	-45.00
10	pollution (oil, human wastes)	1	1	2	4	0	0.00
	Total	**55**	**55**	**55**	**165**	–	**80.05**

TRA INDEX calculation: (total raw score / total ranking) x 100 = (80.0 / 165) x 100 = **48.5**

(source: HRRMP 2003)

Example: *TRA Index example from Indonesia.*

FACTOR T-4: MENGURANGI ANCAMAN (Threat Reduction)

Site Name: Meos Mangguandi

THREATS	CRITERIA RANKINGS			TOTAL RANKING	THREAT REDUCED	RAW SCORE
	AREA	INTENSITY	URGENCY			
1. Over fishing	1	1	1	3	50	1.50
2. Non selective harvesting	2	2	2	6	25	1.50
3. Non resident fishing	3	3	3	9	100	9.00
TOTAL	**6**	**6**	**6**	**18**		**12.00**
TRA INDEX	**66.6 %**					

Site Name: Auki

THREATS	CRITERIA RANKINGS			TOTAL RANKING	THREAT REDUCED	RAW SCORE
	AREA	INTENSITY	URGENCY			
1. Over fishing	3	2	2	7	20	1.40
2. Bomb and potash	2	3	3	8	65	5.20
3. Non selective fishing	1	1	1	3	100	3.00
TOTAL	**6**	**6**	**6**	**18**		**9.60**
TRA INDEX	**53.3 %**					

Site Name: Saba-Marau

THREATS	CRITERIA RANKINGS			TOTAL RANKING	THREAT REDUCED	RAW SCORE
	AREA	INTENSITY	URGENCY			
1. Over fishing	3	2	1	6	20	1.40
2. Non selective fishing	2	1	2	5	25	1.25
3. Potash and root of *Tuba*	1	3	3	7	75	5.25
TOTAL	**6**	**6**	**6**	**18**		**7.70**
TRA INDEX	**42.7%**					

(source: *Marlessy et al. 2003*)

Factor T5: ***Human Well-Being***

What is 'human well-being'?

Human well-being is the overall standard of living and quality of life of the people residing in and near the project site. It includes both material benefits (such as personal goods and income) and non-material benefits (such as cultural, spiritual, and intellectual development).

How do we assume that LMMAs affect 'human well-being'?

- Successful LMMAs can improve human well-being by providing both material and non-material improvements in local stakeholders' lives (see Section 2.1).
- On a much larger scale, LMMAs can contribute to the conservation of biodiversity that benefits all people.

How can we measure/describe 'human well-being'?

What do we measure/describe?

For local stakeholders (both as individuals and as a community) we need to assess:

- Material benefits (including resources, cash, physical structures) provided by LMMAs.
- Non-material benefits (including non-cash, cultural, psychological) provided by LMMAs.
- Overall well-being.

What method should we use?

Material benefits provided by LMMAs are largely captured in the measurements of household economic status (Factor L1). In addition, there may be other material benefits that come to the community as a whole rather than to individuals. Non-material benefits and overall well-being are difficult variables to assess quantitatively; however, by using various qualitative methods, these conditions can be estimated by the project team.

Begin documenting the level of human well-being by simply making a list of the material and non-material benefits experienced as a result of the LMMA project. For example, have key informants list the resources, money and/or infrastructure (a school, a church, a health center, a boat or truck), or changes in diet that have resulted at least in part through funds raised from the harvest and sale of marine resources.

Next, you will want to develop a series of statements that you can ask stakeholders which they might agree or disagree with. Project teams will have to develop the specific questions that make sense in their context and that are neutral in presentation. In this type of survey research, it is also important to ask questions on the same topic in different ways so that you can validate the results. Examples of types of questions that might be asked include the following:

1. My family gets cash benefits from our marine resources

1	2	3	4	5
strongly disagree	Disagree	Neutral	Agree	strongly agree

2. My community gets cash benefits from our marine resources

1	2	3	4	5
strongly disagree	Disagree	Neutral	Agree	strongly agree

3. It is an important part of our culture to have a healthy marine environment

1	2	3	4	5
strongly disagree	Disagree	Neutral	Agree	strongly agree

4. It doesn't matter what happens to our marine environment

1	2	3	4	5
strongly disagree	Disagree	Neutral	Agree	strongly agree

5. I enjoy going out on a boat and watching fish swim around the coral reef

1	2	3	4	5
strongly disagree	Disagree	Neutral	Agree	strongly agree

6. My family's health and well-being is linked to the health of our marine habitats

1	2	3	4	5
strongly disagree	Disagree	Neutral	Agree	strongly agree

7. My life is good compared with people in the capital city

1	2	3	4	5
strongly disagree	Disagree	Neutral	Agree	strongly agree

Questions can be asked as part of the overall household survey that you conduct. For each ranking, you will want to capture any relevant stories or anecdotes that respondents make when answering these questions.

When and by whom are data collected?
At least every two years. Project staff.

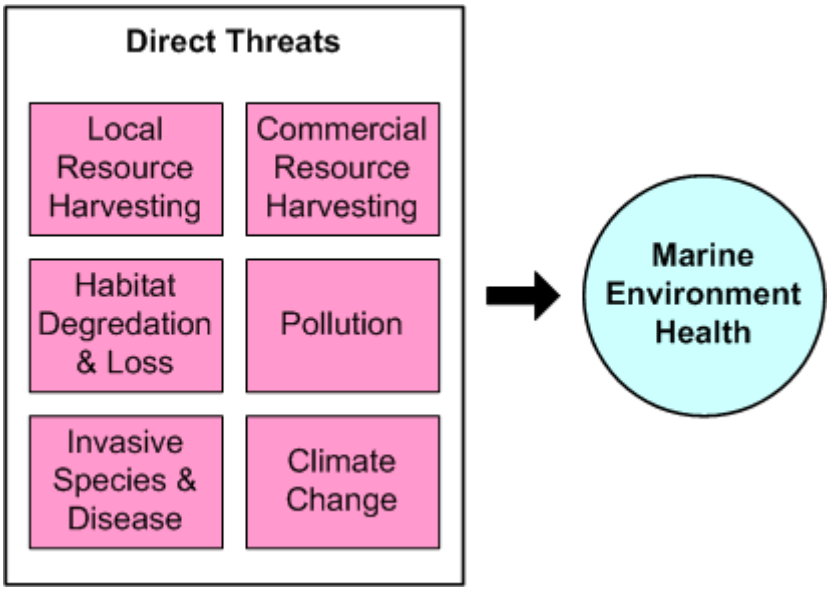
Outputs

- List of material and non-material benefits.
- Records of individual responses to the questionnaire.
- Any relevant stories or additional information related to human well-being.

Report the results for the population as a whole and also for men versus women, young versus old, and across different ethnic, cultural, or religious groups as appropriate.

4.2 Factors Related to Direct Threats

Direct threats are the factors that negatively affect marine resources (for example, pollution or over-fishing by local community members). Direct threats are thus the problems that projects are trying to overcome – they are clearly factors that affect our target. At the same time, however, they can also be viewed as proxies of the target – that measuring the status of the direct threats becomes a way of measuring success in reaching the project's goal (see Factor T4: Reduction of Threat). Direct threats can be divided into six main categories as shown in the diagram below.



D1. **Local Marine Resource Harvesting** – Removal of marine resources for subsistence and small-scale commercial or artisanal use.

D2. **Commercial Marine Resource Harvesting** – Removal of marine resources for medium- to large-scale commercial sale.

D3. **Habitat Degradation and Loss** – Human activity that destroys, alters or degrades habitat.

D4. **Pollution of the Marine Environment** – Unwanted material entering the marine environment due to human activity. May not be relevant at some sites.

D5. **Invasive Species and Disease** – Plants and animals that are introduced into an ecosystem from other places in the world. May not be relevant at some sites.

D6. **Climate Change** – Effects of climate (severity of weather), sea surface temperature, and sea-level rise caused by human production of carbon dioxide and other gases that traps the sun's heat in the atmosphere.

Factor D1: ***Local Marine Resource Harvesting***

What is 'local marine resource harvesting'?

Marine resource harvesting involves local stakeholders taking animals and plants from their habitat for subsistence, cultural, construction, and small-scale commercial or artisanal uses (including what is known as fishing, gleaning, and trapping). Harvesting is affected by the number of resource harvesters, the amount of time each person spends harvesting resources, and the power of the technology they are using (such as using outboard motors rather than canoes or spear-guns rather than hook and line). There are two primary ways in which marine resource harvesting can affect the marine environment:

- *Species Impact* – Marine resource harvesting affects the populations of the animal or plant that is being collected.
- *Ecosystem Impact* – Besides affecting the population of the species harvested, ecological impacts of marine resource harvesting can include unanticipated, cascading changes in the marine environment or between organisms. For example, reducing a population of fish through commercial over-harvesting that eat sea urchins can lead to an over-abundance of urchins that in turn eat all of the seaweed that is taken for local consumption. Also, certain kinds of destructive harvesting practices can change the habitats where target species live. Examples include using poisons that damage coral reefs or trawl nets that destroy the bottom living organisms. Finally, another problem is "by-catch" – when other animals are caught and killed along with the target animals.

How do we assume that 'marine resource harvesting' influences LMMA success?

- As levels of resource harvesting increase, it becomes more difficult to implement or maintain a successful LMMA.
- Implementing a successful LMMA strategy will increase the sustainable yield of marine resources over time.
- As the power of the harvesting technology increases, it becomes more difficult to maintain a successful LMMA project.
- A high or increasing use of destructive harvesting methods increases the difficulty of implementing a successful LMMA project.

How can we measure/describe 'marine resource harvesting'?

What do we measure/describe?

Specific variables that we need to measure include:

(1) Basic catch data about marine resources removed by local stakeholders from the managed area. In particular, species composition, the size of individuals in selected species, the total weight of the catch (in kg), and the total value of the catch (in local currency).

(2) Basic effort data for local stakeholders. In particular, the number of boats and fishers, number and type of harvesting used, number of engines and other various technologies used.

(3) From numbers 1 & 2, we also want to calculate catch per-unit-effort (CPUE) which is typically measured in weight or number of key species caught per hour spent harvesting for each fishing method/technology.

(4) A description of fishing technologies used and their potential for habitat destruction. If possible, estimates of the frequency of destructive actions such as cyanide fishing.

What method should we use?

Much of this information should be collected by interviewing and working with resource harvesters. For example, for brief periods each year, project team members could meet all returning resource harvesters and interview them about their catch and the effort expended. Additional catch and effort data can be collected by asking and training harvesters to record their total catch and the time spent fishing for selected indicator species. A supplemental method is to interview harvesters during the household survey to determine approximately how often they go to harvest resources and what their typical catch is.

Finally, the amount of destructive fishing effort present can be estimated by talking to key informants. Since destructive fishing techniques are often illegal, it may be difficult to get good estimates; project teams should carefully select their key informants and be aware of any potential biases. Ask each informant to rank the prevalence of destructive fishing efforts using the following scale. Record any relevant stories or anecdotes.

Level of Destructive Harvesting

1 = few or no incidents of destructive harvesting techniques being used
2 = limited incidents of destructive harvesting techniques being used
3 = some incidents of destructive harvesting techniques being used
4 = frequent incidents of destructive harvesting techniques being used
5 = constant incidents of destructive harvesting techniques being used

When and by whom are data collected?

Work with harvesters to collect data should take place for at least two two-week periods each year. If possible, try to collect data the same time of year from year to year. Harvesters should be encouraged to report their basic catch effort on a continuous basis. You may wish to also conduct additional surveys that take into account irregularities in fishing patterns.

Outputs

- Basic catch and effort data about marine resources removed by local stakeholders from the LMMA site (see sample from Indonesia, below).
- Estimates of total amounts of catch of different species for the project site over time (for example, on a weekly or monthly basis). Try to plot long-term trends on a simple graph.
- Rankings and descriptions of the level of destructive fishing resulting from local marine resource harvesting activities.

See sample output below.

Example: *Local Marine Resource Harvesting data, Auki Islands, Indonesia.*

Factor D-1: Local Marine Resource Harvesting at Auki Islands, Indonesia

Date: 12 November 2002
Sample site: Bosnik fish market, East Biak, West Papua
Respondents: 10 fishers from the Auki Islands
Catch data:

(a) Total fishing time (1 day): 6 to 9 hours = 7.5 hrs of average total fishing time.
(b) Total catch: 113 individuals of various sizes (caudal length, in cm; see below).
(c) Catch composition: 3 species (*samandar, sakuda, kakap merah*).

NO	KIND OF FISH	TOTAL CATCH	Lenghts (CM)							FISHING GROUND
			0-4,9	6,0-9,9	10,0-14,9	15,0-19,9	20,0-24,9	25,0-29,0	> 30,0	
1	Samandar (Indos)	47		6	6	9	9	10	7	500 - 1.000 meter from the village/beach
2	Sakuda (Insamen)	38		4		11	11	8	4	
3	Kakap merah (inpekem)	28				9	10	9		

Catch per unit effort (CPUE) on 12 Nov. 2002:
CPUE of 10 fishers = 113 fish/7.5 hrs = **15 fish/hr (for 10 fishers)**
CPUE of each fisher = 15/10 = **1.5 fish/hr (for each fisher)**
Total average catch per fisher for 1 day (7.5 hours of fishing effort) = **11 fish/fisher/day**

Catch Value:
From household surveys completed in Auki, it is estimated that an average weekly catch of economically valuable fish sold in the market will produce Rp.663.541/week (US$ 80.43) or Rp. 221.180/day (US$ 26.81), assuming 3 days fishing per week, for 6 to 9 hours of fishing using a hand line and small net in a paddle canoe.

The daily value of fish consumed within Auki households is estimated at Rp. 322.500,- /week (US$ 39,09) or Rp 46.071,-/day (US$ 5.58) and caught in 6 to 9 hours of fishing using a hand line in a paddle canoe. Most of the consumption fish it is not a commercially valuable fish.

(source: Marlessy et al. 2003)

Factor D2: ***Commercial Marine Resource Harvesting***

What is 'commercial marine resource harvesting'?

Commercial marine resource harvesting is similar to local resource harvesting, except that the harvesting is done by companies, typically for sale to urban centers or overseas export. Commercial marine resource harvesting typically uses more sophisticated technology that has greater power. Note that if local stakeholders are doing the harvesting work, but they are working for a commercial company, then this still qualifies as commercial rather than local marine resource harvesting.

How do we assume that 'commercial marine resource harvesting' influences LMMA success?

- As commercial marine resource harvesting increases, LMMA success decreases. (This occurs because it is hard for local stakeholder groups to stop the threats posed by over-harvesting by commercial firms, unless they have substantial governmental and legal support.)

How can we measure/describe 'commercial marine resource harvesting'?

What do we measure/describe?

An estimate of effort and harvest by commercial operations in the project site. If available, the number of licenses issued for commercial resource harvesting, the number of boats operating, the number of days on average they operate, and their average daily catch. Also attempt to describe the level of destructive fishing.

What method should we use?

One method for estimating effort and harvest is to collect data from government records if they exist and if you can get access to them. These records may contain descriptions of permits granted and amount of catch landed. Another method is to observe or sample the amount of time that commercial harvesting operations are active in the project site. For example, you might record sightings of commercial vessels fishing in local waters. You can then try to interview workers or observe harvesting to try to get an estimate of the amount of resources harvested. Even rough estimates are better than nothing.

Finally, the level of destructive fishing effort present can be estimated by talking to key informants. For commercial activities this might be trawling or fisheries by-catch. Since destructive fishing techniques are often illegal, it may be difficult to get good estimates; project teams should carefully select their key informants and be aware of any potential biases. Ask each informant to rank the prevalence of destructive fishing efforts using the following scale. Record any relevant stories or anecdotes.

Level of Destructive Harvesting

1 = few or no incidents of destructive harvesting techniques being used
2 = limited incidents of destructive harvesting techniques being used
3 = some incidents of destructive harvesting techniques being used
4 = frequent incidents of destructive harvesting techniques being used

5 = constant incidents of destructive harvesting techniques being used

When and by whom are data collected?
Depends on the choice of method used and situation at the site. Inquire with local fisheries officers or NCT members for advice on different methods or approaches. See previous section (Factor D1: Local Marine Resource Harvesting) concerning aspects of data collection and frequency. If possible, should be compiled annually.

Outputs

- Basic harvest and effort data of commercial operations.
- If possible, estimates of the total amounts of harvest of different species from the project site.
- Rankings and descriptions of the level of destructive fishing resulting from commercial activities.

Factor D3: ***Habitat Loss and Degradation***

What is 'habitat loss and degradation'?

Habitat loss and degradation is the alteration or destruction of marine habitats by human activities. These activities result in the changes in habitat measured in Factor T2. Human activities that cause habitat loss and degradation include:

- Habitat conversion such as cutting down mangroves for coastal development, mariculture (e.g., shrimp farming) and population expansion or seagrass destruction by landfill and coastal development and dredging.
- Physical damage associated with both extractive (trampling by gleaners; anchor damage) and non-extractive (tourist/diver trampling, tourboat anchor damage) resource use.
- Destructive fishing techniques such as dynamite fishing, the use of bleach, cyanide and traditional poison, and trawling and drag-netting.
- Mining such as coral mining for use as concrete (building materials), lime, septic field stone, or the live rock trade (curio and aquarium trade) or sand removal.

Note that habitat loss and degradation resulting from natural disasters is not taken into consideration under this factor because we assume this is part of a natural and ongoing process in these ecosystems and the project cannot address natural change.

How do we assume that 'habitat loss and degradation' influences LMMA success?

- The greater the degree of habitat loss at a site, the less likely the success of the LMMA.

How can we measure/describe 'habitat loss and degradation'?

What do we measure/describe?

Descriptions of the types of habitat loss or degradation, estimates of the area and rate of degradation and loss of different types of habitats.

What method should we use?

Identify and describe the major causes of habitat degradation and loss that are occurring at your site. For each cause, determine how you can reasonably estimate the change in this activity over time. For instance, you may wish to design a method to track incidents of destructive fishing. Or you may wish to map the presence of development efforts. Alternatively, you can ask key informants to help you estimate the rate of change of each activity.

When and by whom are data collected?

Data should be collected at the start of the project and every year thereafter by project staff working with key informants.

Outputs

- Descriptions of the major causes of habitat loss and estimates of their change over time. If possible, depict these activities on your map of your project site. Data and maps should be combined with measurements of habitat area as outlined in Factor T2.

Factor D4: ***Pollution of the Marine Environment***

What is 'pollution of the marine environment'?

Pollution of the marine environment is unwanted material entering the marine environment resulting from human activities. Specific examples of types of pollution may include:

- *Sewage and nutrient loading* – Human and animal waste or nutrients such as phosphates, nitrates, ammonia, and iron.
- *Siltation and erosion* – Soil and other materials that erode from farmlands, forests, etc.
- *Fresh water runoff* – Increased levels of fresh water caused by human intervention.
- *Toxins* – Harmful chemicals, including oil spills, non-sewage wastes from households, industries and farms, and radioactive materials.
- *Debris* – Plastics, abandoned fishing nets, and other materials.

Sometimes, pollution can be divided into:

1. *Point-source pollution* – Pollution coming from an identified source (e.g., a sewage pipe).
2. *Non point-source pollution* – Pollution coming from a large area (e.g., soil erosion or acid rain).

How do we assume that 'pollution of the marine environment' influences LMMA success?

- Pollution of the marine environment will negatively affect species, habitats, and ecosystem health and thus negatively influence the success of LMMAs. (High nutrient levels are especially implicated in declines of coral reefs and sea grass beds.)

How can we measure/describe 'pollution of the marine environment'?

What do we measure/describe?

The degree of different types of perceived pollution of the marine environment at a site.

What method should we use?

Work with community members to identify the major sources of pollution (if any) affecting the marine habitats in the managed area and rank each one on the following scale:

Area of Pollution			*Severity of Pollution*		
1	=	none	1	=	none
2	=	a few areas	2	=	minor
3	=	several areas	3	=	somewhat
4	=	most areas	4	=	considerable
5	=	entire site	5	=	serious

One way to determine the severity of the pollution is to monitor its effects on living organisms (for example, fish that are killed by industrial waste).

For types of pollution that you suspect are at least somewhat of a problem or where your project interventions are trying to reduce pollution, it is useful to obtain a more systematic measurement of the pollution level by measuring samples from the managed area. Sewage is best measured by analysis for total and fecal coliform bacteria. Most hospitals and other laboratories can conduct this analysis for water samples. Sedimentation is difficult to accurately measure, but can be assessed with the use of sediment traps. Nutrients and toxins need to be measured by a chemical laboratory. Floating material can be measured over time by visual means.

When and by whom are data collected?
Rankings should be done by project staff at least once a year. More specific measurements will generally have to be made by professionals as described above.

Outputs

- List of types of pollution and rankings of area and severity.
- Laboratory data if collected.

Factor D5: ***Invasive Species and Disease***

What is 'invasive species and disease'?

Invasive species are plants and animals whose populations rapidly expand and take over an ecosystem at the expense of other plants and animals. They often are "exotic species" (including both non-native and/or genetically modified organisms) that are introduced into an ecosystem from other localities around the world. They include "large-sized" organisms like clams or fish, "medium-sized" organisms like barnacles and insects, and "small-sized" organisms such as bacteria and other disease causing agents. Species invasions often occur when the predators are removed from a system, or when exotic species are introduced that have no natural predators. Diseases are naturally-occurring conditions caused by bacteria, viruses, and other pathogens, and often appear in stressed ecosystems. In some cases, disease can be made worse by prevailing environmental conditions and, in the marine environment, can include sickness in fish or ailments of coral.

How do we assume that 'Invasive Species and Disease' influences LMMA success?

- LMMAs provide a strengthened ecosystem and thus resilience to invasive species effects.
- Organisms within a ecosystem protected by an LMMA are less likely to be diseased.
- An invasion of a species or disease will lessen the chance of LMMA success.

How can we measure/describe 'Invasive Species and Disease'?

What do we measure/describe?

Presence/absence or degree of invasive species and disease.

What method should we use?

In combination with surveys undertaken for Factor T1 and T2, observe the presence or, if possible, frequency of invasive species and disease within the LMMA and outside it.

Work with community members to identify the major sources of such problems (if any) affecting the marine habitats in the managed area and rank each one on the following scale:

Area of Invasive Species or Disease			*Severity of Invasive Species or Disease*		
1	=	none	1	=	none
2	=	a few areas	2	=	minor
3	=	several areas	3	=	somewhat
4	=	most areas	4	=	considerable
5	=	entire site	5	=	serious

When and by whom are data collected?

Project staff in association with community members. At least once a year.

Outputs

- Summary rankings and descriptions of major problems.

*Factor D6: **Climate Change***

What is 'climate change'?

Recognized as a global crisis, climate change is defined as broad changes in climate and associated regional/global climate patterns that have impacts on the natural system. Climate change is increasing through human activities that release "greenhouse gases" into the atmosphere. Possible effects of human-induced climate change on the marine environment include sea level rise, changes in ocean currents, and elevated sea surface temperatures that contribute to coral bleaching. These impacts can negatively effect the local marine environment (such as habitat degradation from coral bleaching) and its resources (such as changes and reductions in the abundance and movement of fishery resources). In particular, project teams are concerned with the effects of elevated sea surface temperatures as a main cause of coral 'bleaching' and sea level rise. These effects cause coral death, changes to mangrove forests, and increases the rate and degree of coastal erosion. Climate change is also thought to affect the intensity of cyclones. Although there is little an LMMA project can do to lessen climate change itself, it may be that an LMMA can lessen some of the negative impacts of climate change on the local marine environment and the resources therein. It is important to track climate change to account for effects which may otherwise be interpreted as success or lack thereof of the LMMA.

How do we assume that 'climate change' influences LMMA success?

- A successful LMMA with its low-stressed natural communities can therefore promote an increase in the recovery rate of bleached corals located within it. (New studies suggest that effective management and protection of coral reefs may help these systems to be more resilient in recovering from the effects of sea surface temperature rise and coral bleaching.)

How can we measure/describe 'climate change'?

What do we measure/describe?

Rate and degree of coral bleaching (collected under Factor T2). Water temperature. Number and intensity of cyclones/year (maximum wind speed, total rainfall) that have affected the project site. Note whether regional phenomena (e.g., El Niño Southern Oscillation) are present.

What methods should we use?

Coral bleaching can be measured through live coral reef cover surveys (see Factor T2). Triangulate with qualitative data and local observer estimates. Water temperature can either be measured on site, or in some cases data can be obtained from government records.

When and by whom are data collected?

Project staff on a regular basis.

Outputs

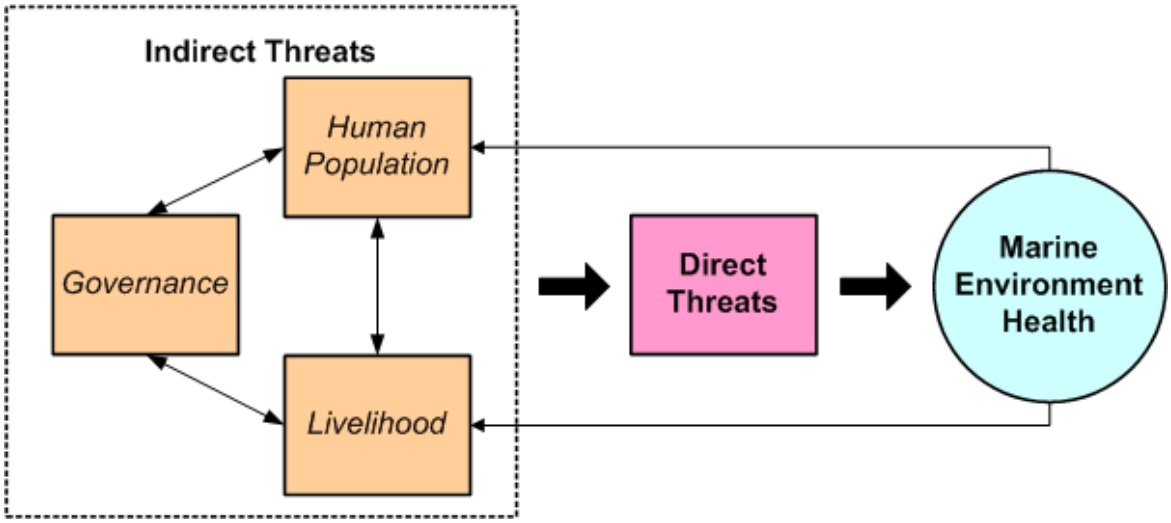
- Map showing extent and intensity of bleaching.
- Records of sea surface water temperature.
- Cyclone number and intensity chart and Southern Oscillation Index (SOI) status.

4.3 Factors Related to Indirect Threats

Indirect threats are the factors that lead to or cause the direct threats. There are dozens if not hundreds of potential indirect factors that might influence a site. As shown in the following diagram, these factors can be conveniently divided into three main categories:

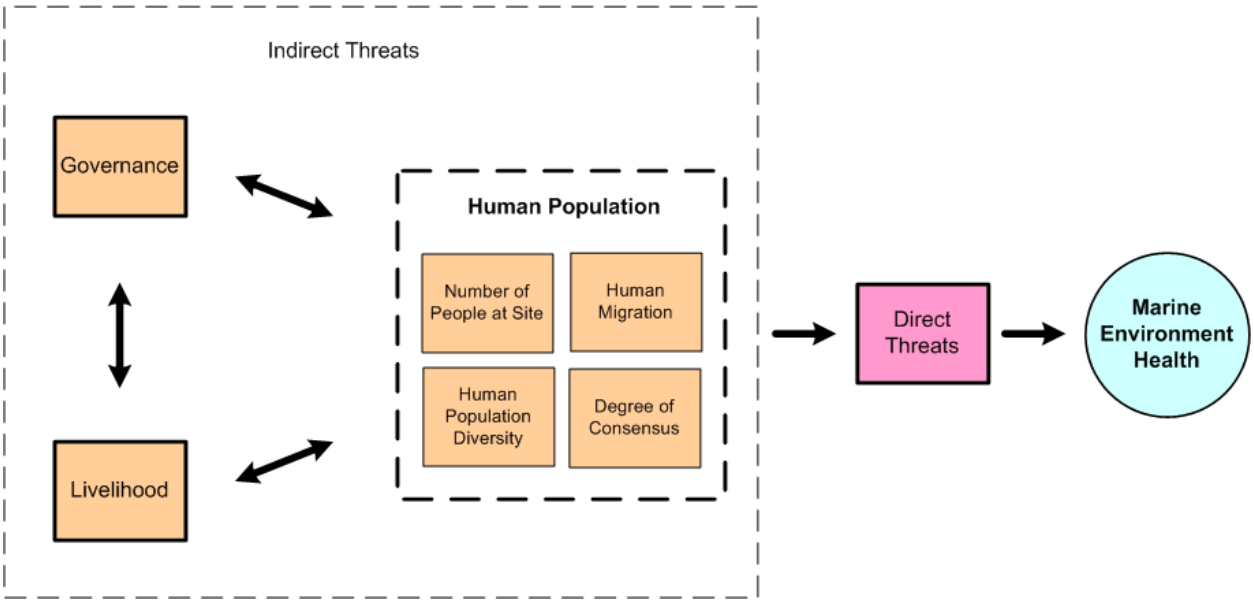
- Human Population
- Livelihood
- Governance

In this section, we discuss the specific factors in each of these categories. Note that these categories tend to be interrelated with one another as shown by the arrows.



Human Population Factors

The first set of indirect threat factors that project teams in the Network will need to consider are those related to the human population at the site. Human population factors influence other indirect and direct threats to marine environment health in a variety of ways as outlined in the diagram below.



H1. Number of People at Site – Number of people who occupy the defined area of a project site (as defined by the site description) over a specified period of time.

H2. Human Migration – Number of people moving into (immigration) or out of (emigration) the project site over a specified period of time.

H3. Human Population Diversity – Number and proportion of different types of people living in the project site.

H4. Degree of Consensus – Agreement among the members of the population at the project site about natural resource use policy and practice that impact marine environment health.

Factor H1: ***Number of People at Site***

What is the 'number of people at site'?

The 'number of people at site' is the human population in the project area at a specified period of time. This includes full- and part-time residents, as described under the stakeholder dimension of the site description (Section 3.2). Full-time residents are people who reside in the project area for most of the year. Part-time residents include people who may live away from the site (for example, in a city), but still maintain strong connections to their home village in the project site. In addition to the resident human population, it is also helpful to have estimates of the number of visitors to the site. Visitors include outsiders who substantially affect the condition or management of marine resources of the project site, such as neighboring groups who fish in the project site or tourists who come to dive at the site. Population size can be reported as density, the number of people per unit area.

How do we assume that 'number of people at site' influences LMMA success?

- As population increases, it becomes more difficult to maintain a successful LMMA. (More people place a greater pressure on marine resources. Greater numbers of people also increase the complexity of governance of an LMMA.)

How can we measure/describe 'number of people at site'?

What do we measure/describe?

The number of full- and part-time residents in the LMMA project site (this should also be captured as part of the site description). The number of visitors per year. The number and type of users within the human population at the site.

What method should we use?

For small villages, it is probably easiest to count (census) and describe all of the people in the village. For larger villages or towns you will have to sample a subset of the overall population. It is typically easiest to count both households and the number of people in each household (for example, people who eat meals or sleep in the house, whether it is one family or more). For each person in the household, you should record their name, sex, age, occupation, and education level (note that some of these data will be used for other factors as well). In many cases, you may find that the government has already conducted a census of the population, in which case you can merely use the government data if you can get it and you believe it is fairly accurate. You should also divide the number of people by the area of your site (from site description) to obtain a measure of population density.

If your site has seasonal or periodic visitors who are not tourists but arrive from outside of the area who harvest or use substantial resources from an LMMA, you will need to design a simple method specific to your site for recording the number of people who participate in each of these harvesting activities. If there are tourists at your site, you should consult with the local chamber of commerce or hotel and guesthouse operators to obtain a record of the annual number of visitors. You should try to obtain estimates of the number of tourists, their major activities, and how long they stay at (or near) the LMMA site.

When and by whom are data collected?
Every two years. If there are substantial visitors, they should probably be counted at least every year.

Outputs

- A table including information on the number of households, average household size, total resident population, and gender as shown in the sample below. Additional information to be used for other factors that can be collected at this time includes information on education level and livelihoods.
- A measure of human population density.
- Include information on number of visitors or tourists a year, major activities, and duration of stay. Where possible, provide the actual data as well as basic descriptive statistics (average, range, variance).

Example: *'Number of People at Site' table.*

Number of Households
Average Household Size
Number of People
Sex
Men
Women
Age Classes
0-15
16-25
26-50
51+
Highest Education Level Reached
None
Primary School
Secondary School
University
Visitors
Dive Tourists
Others

*Factor H2: **Human Migration***

What is 'human migration'?

Migration is the number of people moving into (immigration) or out of (emigration) the project site over a specified period of time. The exact definition of a resident varies from site to site; a good rule of thumb is someone who has lived in the site for 3 years or more.

How do we assume that 'human migration' influences LMMA success?

- As human immigration increases, it becomes more difficult to maintain a successful LMMA. (Greater immigration leads to an increase in human population. It may also increase the diversity of the population. Finally, migrants may not understand the ecosystem of their new home or may not have as strong an interest in long-term resource management and thus may harvest natural resources in a more unsustainable fashion.)

- If LMMAs are successful in promoting short-term resource improvements, over time they may actually end up attracting migrants to the area. On the other hand, if resources decline, then people may emigrate from the area.

How can we measure/describe 'human migration'?

What do we measure/describe?

The number of people who have moved permanently into or out of the project site since the last population census or survey was conducted. The number of migrants who use the marine resources, how they harvest resources, and for what purposes.

What method should we use?

For project teams conducting a census, determine how many people have immigrated into the project site by noting for each individual whether he or she was residing in the project site on the date of the previous population census. To determine how many people emigrated out of the project site, compare the names of households in the previous population census with the current census, noting which differences were due to deaths. Alternatively for projects not conducting censuses, you may be able to collect information on migration by interviewing community key informants or by checking with the government office that conducts the census to see if they record and calculate migration rates.

When and by whom are data collected?

Every two years.

Outputs

- The number of people who have moved in or out and the percentage this is of the total population.
- Descriptions of why people are moving in or out.

Factor H3: ***Human Population Diversity***

What is 'human population diversity'?

Human population diversity is the number or proportion of different types of people living in the project site. The types will vary from site to site; common divisions include clans, ethnic and/or religious groups. Note that in small island communities, population diversity may not be marked.

How do we assume 'human population diversity' influences LMMA success?

- As human population diversity increases, the complexity of governance of an LMMA increases thereby increasing the difficulty in maintaining a successful LMMA.

How can we measure/describe 'human population diversity'?

What do we measure/describe?

The number of different types of people and the relative population size of each group (i.e., the proportion of the total population). In the case that there is little or no population diversity, focus instead upon how different groups within the society (such as men, women, and youths) use marine resources.

What method should we use?

First, work with one or more key informants to decide what the major divisions are among the population at your site. Next, as you conduct your census or survey, assign each household to the appropriate division. If there is a mix of divisions, classify according to the majority.

You may also want to interview key informants from each group to get their perceptions as to how well the different groups work and get along with one another and any differences in use of marine resources or land/water ownership rights. This information can be recorded as stories or anecdotes.

When and by whom are data collected?

Every two years.

Outputs

- Descriptions of the different groups and the percentage of the total population in each group.
- Descriptions of ownership rights and marine resource uses by different groups.

Factor H4: ***Degree of Consensus***

What is 'degree of consensus'?

Degree of consensus is the level of agreement among the members of the population at the project site about LMMA policies and practices. For example, this may include decisions about the location and duration of species no-take areas, the size and type of fishing gear that is permitted, and the number of hotels and homes that are built along the coastline.

How do we assume 'degree of consensus' influences LMMA success?

- As degree of consensus increases, it becomes easier to maintain a successful LMMA.
- If there is high consensus, then governance becomes much simpler and more effective.

How can we measure/describe 'degree of consensus'?

What do we measure/describe?

The degree of consensus among the stakeholders at the project site.

What method should we use?

Interviews with key informants who represent different factions within the local community. Once you have identified the key informants, ask them to describe the level of consensus around LMMA management decisions. Record any stories or anecdotes that illustrate their thoughts and the ranges of conflicts or issues within or regarding the site area. Ask each informant to rank the degree of consensus on the following scale:

Degree of Consensus Among Stakeholders About LMMA Policies and Practices

1 = no consensus
2 = limited consensus
3 = moderate consensus
4 = strong consensus
5 = absolute consensus

Precise measurement may be difficult unless there are very specific and clearly defined management strategies involved in resource use and relevant disputes.

When and by whom are data collected?

Every two years. By project team.

Outputs

- Summary rankings (see example, below).

Example*: Degree of community consensus at the Votua LMMA Project, Fiji Islands.*

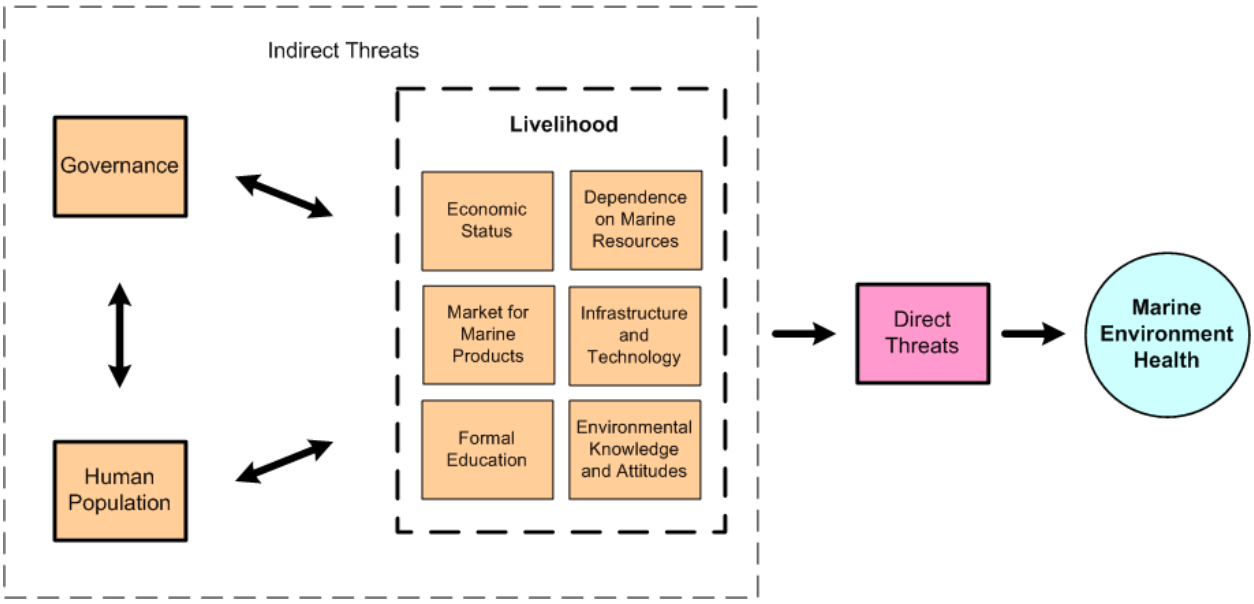
Village	***Start 2000***	***Mid-2003***	***Comments***
Votua	3 (moderate consensus)	3 (moderate consensus)	Community has some agreement about ways of managing their LMMA sites.

(source: Tawake and Caucau 2003)

Livelihood Factors

The second set of factors that project teams in the Network need to consider are those related to the livelihoods of residents of the LMMA site.

Livelihood is defined as the human activities undertaken to maintain life, standards of living, and lifestyle. Livelihood includes both subsistence and income-generating activities. Subsistence activities involve directly providing food, shelter, clothing, and other basic household needs. Income-generating activities involve raising money. (Note that subsistence versus income-generating activities is often not clearly separated). Livelihood factors influence other indirect threats and direct threats to marine environmental health in a variety of ways as outlined in the diagram below.



L1. Economic Status – Relative wealth of local stakeholder households and their society.

L2. Dependence on Marine Resources – The degree to which the local stakeholders gain their income and subsistence from marine resources associated with the availability of alternative sources of livelihood.

L3. Market for Marine Products – The demand for marine resources from the project site.

L4. Infrastructure and Technology – The degree of economic development in an area.

L5. Formal Education – The education that local stakeholders have received.

L6. Environmental Knowledge and Awareness – The degree to which local stakeholders understand basic ecological relationships and the effects that human activities can have on the natural environment, as well as local stakeholders attitudes towards the natural environment.

Factor L1: ***Economic Status***

What is 'economic status'?

The factor 'economic status'generally describes community wealth, including both the overall level of wealth and the distribution of wealth among households in the community. Economic status includes the combination cash income, savings, assets, and the outputs of subsistence activities.

How do we assume that 'economic status' influences LMMA success?

- As the economic status of a community increases, it becomes more difficult to maintain a successful LMMA. (This occurs because higher status leads to greater material expectations, which leads to greater pressure on marine resources.)

- Another opposite assumption holds that as the wealth of a community increases, they have more alternative income sources and thus are less dependent on marine resources, making it easier to maintain a successful LMMA.

- If local economic status levels exceed the national average, then we might expect migration to the site and thus difficulties in maintaining a successful LMMA over the long-term. If local economic status levels are less than the national average, then we might expect migration away from the site.

How can we measure/describe 'economic status'?

What do we measure/describe?

To gain an understanding of economic status at the community level, we can either look at the amount of wealth that households have, or we can track income and/or expenditures (cash and or non-cash) over a defined period. We want to know both the average as well as the variance in economic status across households. To gain an understanding at the national level, we can look at average national economic status.

What method should we use?

Accurate direct measures of household economic status are some of the most difficult and sensitive types of data to collect. As a result, there are a number of different methods that have been developed. Project teams should determine the most appropriate method for measuring household economic status in their local area. If needed, project teams can consult with the LMMA NCT for assistance in determining the best method to use at their sites. Some suggested options for measurement of household economic status at the community level include:

- Add questions about income to your household census or survey. If necessary, work with respondents to estimate income from different sources.
- Conduct structured interviews with key informants to estimate income from different sources.
- Estimate economic status based on material wealth (e.g., presence of appliances, housing materials, and other assets) or spending patterns.

If it is difficult to get respondents to provide their exact income, you may wish to consider having them estimate a range of income. National economic status data can generally be obtained from government statistics or international agencies, such as the World Bank. All projects in a country can share this data – it only needs to be collected one time.

When and by whom are data collected?
Every two years by project staff.

Outputs

- Average household economic status.
- Variance across households.

Factor L2: ***Dependence on Marine Resources***

What is 'dependence on marine resources'?

Dependence on marine resources is a function of two variables: (a) the degree to which the local stakeholders gain their income and subsistence from marine resources, and (b) the degree of availability of alternative sources of income and subsistence. If local stakeholders derive almost all their livelihood from marine resources, then they are likely to be highly dependent on them. If most of their livelihood comes from other sources, then they are not likely to be very dependent on them. Alternative livelihood sources also need to be understood so as to distinguish whether stakeholders are obtaining most of their livelihood from marine resources because: (a) they have no other options, or (b) they do have other options, but prefer livelihoods based on marine resources.

How do we assume that 'dependence on marine resources' influences LMMA success?

- As dependence on marine resources increases, it becomes easier to maintain a successful LMMA. (This would occur because an understanding of greater dependence on marine resources leads to better resource management and greater interest and support for LMMAs.)

- An alternative assumption holds that a high degree of dependence on marine resources makes it more difficult to maintain a successful LMMA. (This would occur because if people are highly dependent on marine resources and have no alternative sources of livelihood, it may be hard for them to forego resources in set aside no-take areas of resources that they are currently using in the short-term, even if it may lead to increased resources over the long-term.)

How can we measure/describe 'dependence on marine resources'?

What do we measure/describe?

1) The percentage of local stakeholder livelihood that comes from marine resources relative to other sources.
2) The degree of availability of alternative livelihood activities that don't involve marine resources.

What method should we use?

As part of your census or sampling of stakeholder households, ask each responding household to estimate their total cash income and subsistence needs and the percentage that comes from marine resources. This may be easiest to do by working with each household to estimate the amount of money or food and resources they get from each particular source.

Alternatively, if it is not possible to get income data, conduct interviews with key informants and ask them to rank the proportion of livelihood that local people get from marine resources on the following scale. Record any stories or anecdotes that illustrate their thoughts.

Proportion of Livelihood From Marine Resources
1 = almost none of their livelihood from marine resources
2 = little of their livelihood from marine resources
3 = about half their livelihood from marine resources
4 = most of their livelihood from marine resources
5 = almost all of their livelihood from marine resources

Next, ask informants to rank the degree of availability of non-marine livelihood activities. Record any stories or anecdotes that might illustrate why people are or are not using marine resources for their livelihood activities.

Availability of Non-marine Livelihood Activities
1 = almost no non-marine livelihood options available
2 = limited non-marine livelihood options available
3 = some (moderate) non-marine livelihood options available
4 = many non-marine livelihood options available
5 = very many non-marine livelihood options available

When and by whom are data collected?
Every two years during human population census or survey.

Outputs

- Percentage or rankings of stakeholder livelihood derived from marine resources.
- Ranking of degree of availability of alternative livelihood activities.

Factor L3: ***Market for Marine Products***

What is the 'market for marine products'?

The market for marine products factor describes the general demand for marine resources from the project site. One variable under this factor refers to where these resources are consumed or sold. – Are they primarily used for local stakeholder consumption? Are they traded to neighboring villages or sold in urban markets? Or are they commodities that are traded on a regional or global market? A second variable refers to the accessibility of the market. – Is it close by and easy to reach? Or is it difficult to bring the product to the market? Finally, a third variable has to do with the prices and strength of demand for marine resources. – Are there established market prices for the resources? Will the market take as much of the resource as is available? Or is it difficult to find someone to buy the resources?

In most cases, the market may vary from product to product. This means that you may have to estimate market demand for specific products being produced from the local marine resources. You can also estimate variables for services like ecotourism – in this case, the demand refers to the types of tourists who come to the area (local vs. international), the degree of difficulty in getting to the site, and the price that tourists are willing to pay to stay.

How do we assume that 'market for marine products' influences LMMA success?

- As market demand increases, it becomes more difficult to maintain a successful LMMA. (This occurs largely because the high value of the resources makes it difficult to limit harvesting in the short-term, putting more pressure on the resource.)

- However, if we compare a situation where there is no market demand for a product to one in which there is limited demand, it may be easier to maintain a successful LMMA in the second case because people can see the potential value of increasing supplies of these resources.

How can we measure/describe 'markets for marine products'?

What do we measure/describe?

A description of the type of market (first point of sale and beyond, if possible) for major marine products from the project site. Estimates of the accessibility of markets from the project site to these markets. Rankings of the strength of demand of these markets.

What method should we use?

The project team in conjunction with key informants (if necessary) should first decide what are the major products from the marine resources at the site, how perishable these products are, and where the markets are for these products (e.g. village, town, city, national, international).

For each major product, also try to estimate both the time (in hours or days) and distance required to transport the product to the market (first point of sale). Estimate the cost (both in monetary terms and as a percentage of the overall final cost of the product) for this transport.

For each major product, work with key informants (if necessary) to describe where these products are consumed or sold and what the average price for the product in these markets is. Record any stories or anecdotes that illustrate their thoughts.

Next, for each product, ask the respondent to rank the degree of demand for the product using the following scale (note that this ranking should not be based on whether you can get the product to the market or whether there is competition limiting sales by any one person or firm, but rather based on the preferences of consumers in the market):

Demand for Marine Products
1 = little or no established market exists for the product; never sold or traded
2 = limited demand for the product; can occasionally sell some
3 = some demand for the product; can sometimes sell it
4 = strong demand for the product; can usually sell it
5 = very strong demand for the product; can always sell it

Finally, for each product, ask the respondent to rank the degree of market competition for the product using the following scale:

Market Competition for the Product
1 = lots of other suppliers of the product
2 = many other suppliers of the product
3 = moderate other suppliers of the product
4 = limited other suppliers of the product
5 = few or no other suppliers of the product

When and by whom are data collected?
At the start and end of the project evaluation period.

Outputs

- A summary description for each major marine resource product.
- Market information and rankings for each product.
- An overall ranking for all marine resources from the project site.
- Any relevant stories and anecdotes.

Factor L4: ***Infrastructure and Technology***

What is 'infrastructure and technology'?

Infrastructure and technology describes the degree of economic development in an area. A simple way to categorize various aspects of infrastructure and technology is: (a) communications infrastructure such as telephones, televisions, radios; (b) transportation infrastructure such as roads or shipping docks and routes; and (c) overall level of modern technology such as motors, tools, generators, and computers.

How do we assume 'infrastructure and technology' influences LMMA success?

- In some cases, having good infrastructure will place higher demands on marine resources because it is easier to access them and bring them to market, making it more difficult to maintain a successful LMMA.

- In some cases, however, having good infrastructure might lead to establishing alternative income generating activities (such as tourism), thus making it easier to maintain a successful LMMA.

How can we measure/describe 'infrastructure and technology'?

What do we measure/describe?

Rankings of the degree of communications and transport infrastructure, as well as overall level of technology (*e.g.*, motors, generators, computers, tools).

What method should we use?

Project team talk to key informants or do direct observations to make the following rankings:

Communications Infrastructure

1 = no telephone, no postal service, few radios
2 = some telephone access, postal service, some radios
3 = regular telephone service, postal service, radios
4 = common televisions, radios, and phones, some internet and email
5 = same as urban center (e.g., well-accessible cell phones, faxes, internet and email)

Transportation Infrastructure

1 = difficult to reach outside world; human powered only (canoe, walk, etc.)
2 = rough dirt roads or sporadic marine/air connection to outside world
3 = gravel roads or moderate connections to outside world
4 = paved roads or frequent connections to outside world
5 = well maintained and efficient paved roads or regular connections to outside world

Transportation infrastructure can also be measured by the number of hours to reach the closest urban center that provides useful markets and services. Additionally, the cost to transport 100 kg of product to the nearest urban center can be estimated. This information is also being collected as a part of Factor L3: Market for Marine Products.

Overall Level of Technology
1 = basic traditional subsistence technology
2 = very limited modern technology
3 = limited modern technology
4 = some modern technology
5 = full modern technology

When and by whom are data collected?
At the start and end of project evaluation period. By project staff.

Outputs

- A profile (description) of the infrastructure and technology found at the project site (see Example A, below).
- Rankings from individual key informants on communications and transportation infrastructure as well as an overall level of technology ranking for the project site (see Example B, below).
- Any relevant stories or anecdotes.

***Example A**: A profile of the existing infrastructure and technology at Biga LMMA, Philippines.*

LMMA Project: Barangay Biga Marine Sanctuary, Philippines Municipality: Lobo Batangas

Existing Road Network:

(1)	National Road: Asphalt = 8.656 kms Concrete = 4.294 kms Gravel = 6.8 kms	(2)	Municipal Road: Asphalt = 8.656 kms Concrete = 2.87 kms Gravel = 0.0936 kms

Transportation: All routes from, within and outside Lobo are serviced by passenger jeepneys, tricycles and other private vehicles. Ferry boats and other water crafts connect Lobo and Mindoro.

Communication Facilities: Philippine Long Distance Telephone; RCPI Bayantel

Power Supply / Electrification:
Source of Power Supply: National Power Corporation
Implementing Agency: Batangas II Electric Cooperative
Number of Power Connections: 2,156 residential units, 25 public buildings, 78 Commercial

Lobo Water District (LWD): The LWD started its operation on July 1, 1997. Now it has over 800 connections in seven barangays including the Poblacion, Banato, Masaguitsit, Fabrica, a portion of Balatbat, Tayuman, and Mapalad na Parang.

Existing Health Facilities: Municipal hospital (10 bed capacity), Rural Health Unit, 5 Barangay Health Stations, 2 private medical clinics, 1 private dental

(source: LGULB 2003)

Example B: *Key informants ranking on communications and transportation infrastructure as well as an overall level of technology ranking at Biga LMMA, Philippines.*

o *Variables*	o *Ranking*	o *Comments*
Communications infrastructure	2 = some telephone access, postal service, some radios	- Only 15 % of household have cell phones (no land line available)
Transportation infrastructure	4 = some modern technology	- It takes approximately 2 hours to reach the market center by paved road. - It costs around US$10 to transport market produce from the community to the market and fare is approximately US$ 1 per person. - Power (generator) is available but computer and access to internet is not available.
Overall level of technology	3 = limited modern technology	

(source: LGULB 2003)

Factor L5: ***Formal Education***

What is 'formal education'?

This factor describes the education that local stakeholders have received in terms of the years of attendance in schools.

How do we assume that 'formal education' influences LMMA success?

- Greater average schooling will result in greater LMMA success because people with more formal education have a greater awareness of environmental issues (Factor L6) and tend to have jobs that are not dependent on marine resources (Factor L2).

- Alternatively, greater average schooling will result in reduced LMMA success because people with more formal education are less connected with marine ecosystems, have less knowledge of marine issues, and show less support of LMMAs.

How can we measure/describe 'formal education' levels?

What do we measure/describe?

Average and variance in level of formal education among local stakeholders.

What method should we use?

This data should be collected as part of the population census or sampling efforts. For each person censused or surveyed, record the highest level of education attained.

When and by whom are data collected?

Every two years as part of the census or survey. By project team.

Outputs

- Provide a table showing the distribution of population members.
- Estimate the average and standard deviation of the education level for the population as a whole, for men versus women, and among relevant ethnic groups.

Factor L6: ***Environmental Knowledge and Attitudes***

What is 'environmental knowledge and attitudes'?

'Environmental knowledge' describes the degree to which local stakeholders understand both basic ecological relationships and the effects that human activities can have on the natural environment. This knowledge can be either in the form of local cultural beliefs and traditions or in terms of formal education. 'Environmental attitudes' describes local stakeholders' feelings towards the natural environment, their social customs or beliefs regarding resource management, and their perceptions as to whether they believe their actions either positively or negatively affect the environment.

How do we assume that 'environmental knowledge and attitudes' influences LMMA success?

- Increased environmental knowledge and positive attitudes will lead to increased LMMA success. (In order for people to take action to protect and manage the environment, they need to understand how the natural ecosystem works. We also assume that they have to have positive attitudes towards the environment and believe that their actions can make a difference.)

How can we measure/describe 'environmental knowledge and attitudes'?

What do we measure/describe?

The level of environmental knowledge and the level of environmental attitudes.

What method should we use?

The project team in conjunction with key informants should use the Brief Easy Attitude and Numbers Survey (BEANS) method to determine the strength and distribution of environmental knowledge among local stakeholders. Ask the key informant to envision five boxes numbered 1 through 5. Each numbered box refers to a level of local stakeholder environmental knowledge (knowledge about basic ecological processes and human impacts on them). Discuss the levels with the informant and make sure you agree what each level means. Record any stories or anecdotes that the informant might have about the different levels.

Environmental Knowledge of Stakeholders

1 = little or no environmental knowledge
2 = limited environmental knowledge
3 = some environmental knowledge
4 = good environmental knowledge
5 = excellent environmental knowledge

Once you have agreed on the different levels, give the key informant 10 beans, pebbles, or other markers. Tell them that each marker represents 10% of the local stakeholders. Ask them to place the markers in the boxes corresponding to how they view the level of environmental knowledge in the overall population. Use the BEANS method with 3 to 5 key informants. If rankings come out fairly uniform, you are fine. If not, then you may need to include this topic as a question in your household census/survey or survey more key informants. The project team

should also gain knowledge of information about community knowledge and attitudes through the workshops they conduct.

Next, use the BEANS method to determine the strength and distribution of ecological attitudes among local stakeholders. In this case, the boxes should refer to the following rankings where ecological attitudes is defined as local stakeholders feelings towards the natural environment and the belief that their actions can make a difference. Capture any stories or anecdotes that informants have when discussing the rankings.

Environmental Attitudes of Stakeholders
1 = strongly negative environmental attitudes
2 = negative environmental attitudes
3 = neutral environmental attitudes
4 = positive environmental attitudes
5 = strongly positive environmental attitudes

When and by whom are data collected?
At the start of the project and every two years thereafter. By project staff.

Outputs

- Rankings from individual key informants, recorded as the number of markers in each box.
- An overall score for the level of environmental knowledge, calculated by multiplying the number of markers in each box by the number of the box and summing up the results.
- The level of environmental awareness, obtained by using a similar calculation.
- Any relevant stories or anecdotes.

***Example**: Environmental Knowledge and Attitudes at the Votua LMMA Project, Fiji Islands.*

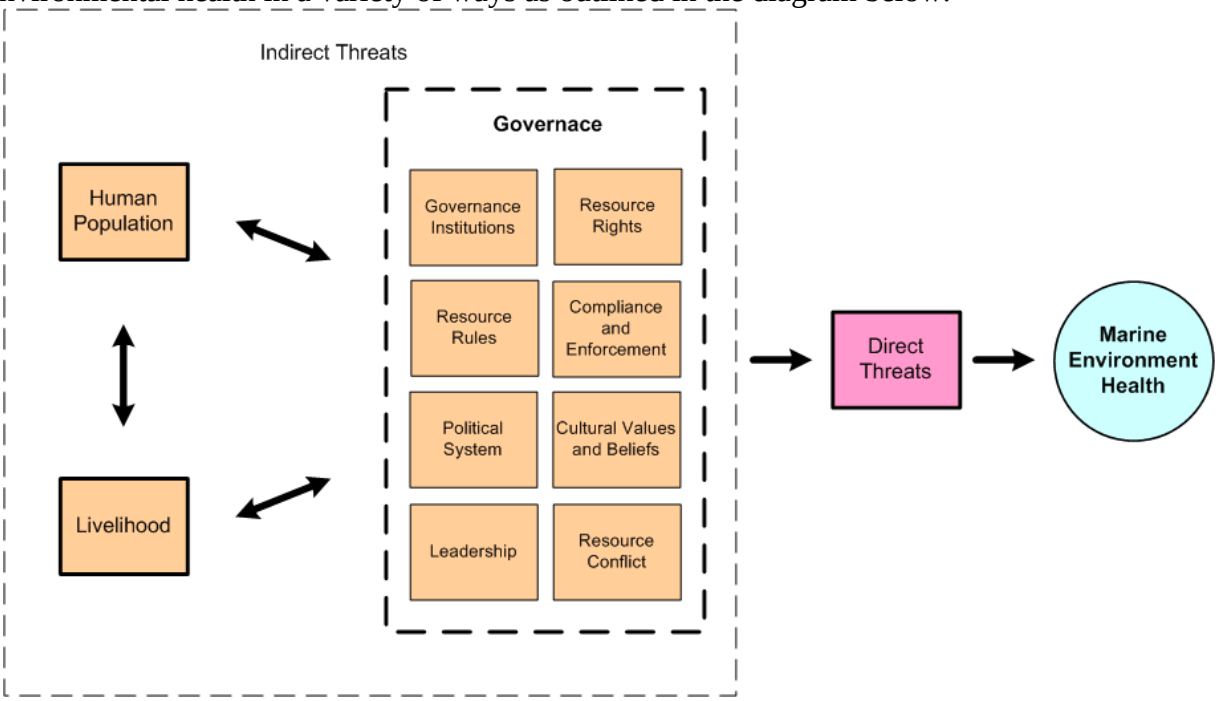
Factor L6 - Environmental Knowledge and Attitude

Site	*Questions*	*Start 2000*	*Mid-2003*	*Comments*
Votua	1.Environmental knowledge	3	4	Members including chiefs are increasingly aware of the linkages between healthy marine resources and their daily needs and have increased their investment
	2.Environmental attitude	3	4	

(source: Tawake and Caucau 2003)

Governance Factors

The third set of indirect threat factors that project teams in the Network will want to measure are those related to the governance of local marine resources and the LMMA. Governance refers to the particular set of institutions, rights, and rules operating within and guiding a society. For the purposes of the LMMA Network, we are particularly interested in the governance of marine resources. Resource governance takes place at four related levels: local, provincial, national, and international. Governance factors influence other indirect threats and direct threats to marine environmental health in a variety of ways as outlined in the diagram below.



G1. Governance Institutions – Individuals or groups within a society that regulate how members of the society behave.

G2. Resource Rights – Privileges that specific individuals or groups have over natural resources.

G3. Resource Rules – Laws or codes of conduct that define how resource rights are put into action.

G4. Compliance and Enforcement – Degree to which resource users follow stated rules and actions taken to get resource users to comply.

G5. Political System – The network of institutions that govern the overall society.

G6. Cultural Values and Beliefs Regarding Marine Resources – Shared understanding by members of a society about what is good, desirable, or just and how the world works with regard to marine resources.

G7. Leadership – Individuals or groups who take responsibility and action and who have influence over other people's behavior.

G8. Resource Conflict – Competition between users of marine resources within a site.

Factor G1: ***Governance Institutions***

What are "governance institutions"?

Governance institutions are individuals or groups within a society that regulate how members of the society behave, typically through the establishment of behavioral rules and regulations. Institutions can be either formal (legally recognized) or informal (not legally recognized). They are found at all levels of society from local to national.

In an LMMA context, we are most concerned with institutions that govern how marine resources are managed and used. Examples of marine resource governance institutions include a village's fishing grounds management committee, a provincial government fisheries department, and a conservation non-government organization. Other institutions, while not specifically focused on marine issues, may still influence LMMA management (such as a local chief or magistrate or the national ministry of finance).

How do we assume that 'governance institutions' influence LMMA success?

- As the strength of governance institutions increases, it becomes easier to maintain a successful LMMA project.

- It is most effective to have local traditional institution (such as a clan) work collaboratively to manage the LMMA with an outside institution (such as a university or government agency) with scientific and regulatory expertise. (In general, it is often believed that it is important to have strong local governance institutions. But this may not be sufficient for success since local marine resource institutions may not always have the scientific and regulatory knowledge needed to best manage the LMMA.)

There is also recognition that an institution might be credible and respected, but that if it is not active in the area then there might not be influence. In such cases, the success of the LMMA may not therefore be correlated with the strength and credibility of the institution.

How can we measure/describe 'governance institutions'?

What do we measure/describe?

The "credibility" of the various institutions that have some level of control over the marine environment within the project site. "Credibility" is defined on a scale of three criteria: (1) institution has authority, (2) institution has the ability/mandate to act on their authority, and (3) the institution has successfully demonstrated their ability to take action through their authority, and continues to do so.

What method should we use?

Interviews with key informants who represent different factions within the local community as determined in stakeholder analysis. Ask each informant to list and briefly define/describe the institutions that he or she believes control the marine resources at the project site. Next, ask the informant to rank the level of credibility on the following scale. Record any stories or anecdotes that illustrate their thoughts.

Level of Credibility

1 = institution does not have authority (is not credible)
2 = institution has authority, but not the means and/or history of acting on this authority (has low credibility)
3 = institution has authority and the means to act on their authority, but not the demonstrated history of doing so (has moderate credibility)
4 = institution has authority and the means and history of demonstrating their ability to act on their authority (has high credibility)

Assuming that an institution is found to be moderately to highly credible (score of 3 or 4 above), then ask key informants of the percent of local population who are in compliance/obey the institution's decisions and rules, as follows:

0 to 33% = There is a low level of local respect for the institution
34 to 66% = There is a moderate level of local respect for the institution
67 to 100% = There is a high level of local respect for the institution

Also, with active institutions operating in the area, ask the key informants to run down and select all of the applicable items on the following list with respect to how much support is given by the institution toward local management efforts:

___ finances provided
___ person hours committed
___ expertise provided
___ advise provided
___ equipment provided
___ logistical support provided

When and by whom are data collected?

At the start of the project and every two years thereafter. By project staff members.

Outputs

- A list and descriptions of the different institutions and an average or mode (majority) strength ranking for each (see example below).
- Any relevant stories or anecdotes.

***Example**: Rankings in 2003 of the credibility and respect for various governance institutions at the Votua LMMA Project, Fiji Islands. Note the two six-month time periods of data collected.*

Factor G1 - Governance Institutions (Yavusa)

Site	***Governance Institution***	***Start 2000***	***Mid-2003***	***Comments***
Votua	Yavusa (Clan)	3	4	One of the highlights of the re-introduction of the Bai kei Votua concept was that it brings the three heads of the Yavusa's together to focus positively on the issue.
	Komiti ni Qoliqoli	3	4	The committee are not well versed with their roles and responsibility therefore training is needed in this area.
	Provincial Council Office	3	3	The provincial office has limited degree of influence on this but we have been trying to give our cooperation all along since the conception of the project.
	Fisheries	3	4	The fisheries have been very cooperative to the project.
	Commissioner	3	4	Since this an important exercise as far as the economy of the country is concerned (We should include the commissioners office into the team).
	USP	4	4	They have been doing an excellent job. Without the provision of their staff etc, the bai kei Votua project would not have been where it is today.
	Community members	3	3	We need full corporation from them to make the exercise a reality. More visitation is needed to Votua to do monitoring and training to the villagers.

(source: Tawake and Caucau 2003)

*Factor G2: **Marine Resource Rights***

What are 'marine resource rights'?

Marine resource rights are the privileges (both *de jure* and *de facto*) that specific individuals or groups have over natural resources. These rights are established for individuals and groups in society by formal and informal governing institutions, such as a national government or a clan's leadership. The strength of marine resource rights ranges from full ownership and control over the use and allocation of marine resources to the rights to access and use resources to no legal rights.

In an LMMA context, we are most concerned with rights over nearshore marine resources such as the right to fish in certain areas of water, the right to harvest specific species, or the right to prohibit other people from fishing in a certain area. We are interested in learning about the existence, nature, and strength of rights that the local stakeholders have in areas where LMMAs are operated.

How do we assume that 'marine resource rights' influence LMMA success?

- As the strength of marine resource rights of local stakeholders and co-managing partners increases, it becomes easier to maintain a successful LMMA project. In particular, if an LMMA strategy is to be effective, then local stakeholder marine resource rights must be:

  - Clearly understood and widely recognized by all users;
  - Able to effectively limit access and use to the LMMAs that have been declared; and
  - Recognized by customary practice and/or national law so that they are enforceable.

  There is recognition that even when local stakeholders have rights to marine resources, they may not necessarily have access to them (such as in the case of a remote reef).

How can we measure/describe 'marine resource rights'?

What do we measure/describe?
The specific rights that the local stakeholders have over the different marine resources in the project site and the strength of these rights.

What method should we use?
Interview key informants who represent different groups and interests within the local community. Ask each informant to describe who holds the rights to use different marine resources in different areas of the project site. In particular, determine whether the right is legally recognized or has a basis in customary practice. Finally, ask each informant to rank the strength of the marine resource rights of local stakeholders on the following scale. Record any stories or anecdotes that illustrate their thoughts.

Marine Resource Rights of Local Stakeholders
1 = local stakeholders have no rights
2 = local stakeholders have limited rights
3 = local stakeholders have some rights

4 = local stakeholders have some, customarily recognized ownership rights to marine resources
5 = local stakeholders have full, legally recognized ownership rights to marine resources

In addition, ask whether or not local stakeholders have access to marine resources (yes/no).

When and by whom are data collected?
At the start of the project by project staff members, and periodically (every two years) thereafter. Usually, marine resource rights do not change dramatically within short time frames (less than 5 years). You may, however, want to revisit this question every couple of years to make sure that the situation has remained constant. Also, you may want to flag and briefly describe major political, economic, or cultural events that arguably have influence over changes in marine resource rights.

Outputs

- Descriptions of the rights over different resources.
- Provide the strength of rights rankings from individual key informants and then try to provide a summary (majority or average) ranking for overall local stakeholder marine resource rights at the project site.
- Any relevant stories or anecdotes.

See sample output below.

Sample Data for Factor G2: Presence and Strength of Marine Resource Rights

Resource	Type	Source of right/privilege	Strength Rank	Comment
Shellfish	Individuals have assigned areas	Local clan leader	4	Areas assigned to families
Reef fish	Open to all local stakeholders	Local clan leader	4	A few stakeholders gave a rank of 3, but most said 4.
Overall marine habitats at site	Open to all local stakeholders	National government	5	Rights specified in constitution

Anecdote:
In an interview with Mr. Tamaru of Western Village, he said, "When I was a child, my grandfather told me that when he was a boy, people could harvest shellfish from wherever they wanted to. We even let residents of the neighboring village [outside the project site] come and harvest shellfish. Once they became more scarce, however, the chief decided that different households would have specific shellfish beds that they would have rights to. We had some fights when we told the neighboring village members they could no longer come and share our shellfish."

(source: Tawake and Caucau 2003)

Factor G3: ***Resource Rules***

What are 'resource rules'?

Resource rules are laws or codes of conduct that define how resource rights are put into action. Rules specify who can harvest which resources, when they can do so, and what methods they can employ.

In an LMMA context, we are most concerned with the rules that are used to establish and manage specific marine areas. We are interested in learning whether local stakeholders are aware of these rules and whether local stakeholders perceive them as fair.

How do we assume that 'resource rules' influence LMMA success?

- As awareness and perceived fairness of resource rules by local stakeholders increase, it becomes easier to maintain a successful LMMA project. In particular, if an LMMA strategy is to work successfully, then resource rules regarding the LMMA must be:

  - Simple, clearly understood, and widely recognized by all users.
  - Created with the full participation of local stakeholders.
  - Perceived as fair by local stakeholders.

How can we measure/describe awareness and fairness of 'resource rules'?

What do we measure/describe?

The specific rules that govern LMMAs at the project site, and the degree to which local stakeholders: (a) are aware of them, (b) feel the rules have involved their input, and (c) think the rules are clear and fair.

What method should we use?

Interview key informants (at least one person per stakeholder group) who represent different groups and interests within the local community. First, list and briefly describe the relevant marine resource use rules that apply within the project site (this description should overlap with the description of the LMMAs done as part of the site definition in Section 3.2). Also, document which institution(s) declares each rule or set of rules.

Next, ask each informant to describe the percentage of local stakeholders who are aware of the rules using the following scale. Record any stories or anecdotes that illustrate their thoughts.

Awareness of Rules

1 = no local stakeholders aware of the rules
2 = a few local stakeholders aware of the rules
3 = some local stakeholders aware of the rules
4 = most local stakeholders aware of the rules
5 = all local stakeholders aware of the rules

Next, ask each informant to describe whether local stakeholders regard the resource rules as being simple and clear. Also note who sets the rules, and whether or not there is the presence of resource users and local stakeholders in the group and process that sets the rules. Record any stories or anecdotes that illustrate their thoughts.

Complexity of Rules
1 = rules are very complex and difficult to understand
2 = rules are complex and difficult to understand
3 = rules are of average complexity
4 = rules are simple and easy to understand
5 = rules are very simple and easy to understand

Next, ask each informant to describe whether local stakeholders (including resource users) were involved in establishing the resource rules. Record any stories or anecdotes that illustrate their thoughts.

Involvement of Local Stakeholders (including resource users) in Establishing Rules
1 = no local stakeholders involved in establishing rules
2 = a few local stakeholders involved in establishing rules
3 = some local stakeholders involved in establishing rules
4 = most local stakeholders involved in establishing rules
5 = only local stakeholders involved in establishing rules

Then note the case where only a single (e.g., chief) or small group (e.g., council of chiefs) of stakeholders establishes the rules. Also, identify who (by stakeholder group) was involved.

Finally, ask the local community to describe whether they think local stakeholders regard the rules as being “fair." Record any stories or anecdotes that illustrate their thoughts.

As a proxy for the “fairness” of rules, determine the local agreeability of the rules, as follows:

0 to 33% = There is a low level of local agreeability to the rules
34 to 66% = There is a moderate level of local agreeability to the rules
67 to 100% = There is a high level of local agreeability to the rules

When and by whom are data collected?
At the start of the project and every two years thereafter. By project staff.

Outputs

- A list and descriptions of the rules for different LMMAs and their implementing institution(s).
- Rankings from individual key informants and a summary (majority or average) ranking for the rules at the overall site (see example below).
- Any relevant stories or anecdotes.

***Example**: Rankings in 2003 of the awareness, complexity, involvement, and fairness of resource rules at the Votua LMMA Project, Fiji Islands. Note the two six-month time periods of data collected.*

Factor G3 - Resource Rules Rankings

Site	***Questions***	***Start 2000***	***Mid-2003***	***Comments***
Votua	1. Degree of awareness of rules…	3	3	A program for the awareness of rules is a **MUST** for the sake of the local stakeholders.
	2. How simple and clear the resource rules are?	3	3	Most rules including fisheries regulations are traditionally imposed. The rules are quite simple but everyone needs to know them.
	3. Involvement of local stakeholders in the establishment of rules…	3	3	We must involve many local stakeholders for the establishment of the rules.
	4. Fairness of rules…	3	3	Commercial fishers find it hard to accept decision.

(source: Tawake and Caucau 2003)

Factor G4: ***Compliance and Enforcement***

What are 'compliance and enforcement'?

Compliance is the degree to which resource users follow stated resource rules. Enforcement is an action taken by representatives of an institution to get resource users to comply with the stated rules. Enforcement depends on identifying and reporting violations of the rules and then taking action to punish the people violating the rules.

In an LMMA context, enforcement can be done by representatives of government institutions (a policeman or fisheries officer) or local community institutions (a village chief). Enforcement punishments can range from shaming violators in a public meeting to making them pay fines and even arresting them and putting them in jail. In many LMMA settings, enforcement is based on voluntary compliance with stated (and unstated) rules as opposed to coercive compliance.

How do we assume that 'compliance and enforcement' influences LMMA success?

- As compliance increases, it becomes easier to maintain a successful LMMA project. In other words, LMMAs that experience high rates of rule violations are less likely to be successful.

- As enforcement becomes more effective, it also becomes easier to maintain a successful LMMA project. For enforcement efforts to be effective:

    - Compliance with rules needs to monitored;
    - Resource users must believe that the consequences of violating the rules are not worth the risk of being caught; and
    - The enforcement agency must be recognized by resource users as having the appropriate authority to enforce the rules.

How can we measure/describe 'compliance and enforcement'?

What do we measure/describe?

For this factor, it will be helpful to describe or estimate the total number of incidents of violations of the rules of the LMMAs established in the project site. Also, you may be able to collect information on and rate the degree to which LMMA rules are: (a) enforced, (b) the probability that a violation will be reported and punished, (c) the severity of the punishment for violating the rules, and (d) the credibility of and respect for enforcement personnel.

What method should we use?

Try to get a direct count of the number of incidents of violations within the LMMAs by talking to local authorities. In some cases, violation records will be kept by the enforcers and can be consulted to determine the amount of violations over time. Then talk with other key informants to see if you can obtain an estimate of the percentage of actual incidents of rule violations that are reported to the authorities, compared to those that aren't. Ask about the overall level of compliance with rules at the project site using the scale below. Attempt to validate these results with information from other sources, such as anecdotal accounts.

Compliance with LMMA Rules

1 = almost no compliance with LMMA rules (numerous violations reported or known)
2 = limited compliance with LMMA rules
3 = moderate compliance with LMMA rules
4 = good compliance with LMMA rules
5 = excellent compliance with LMMA rules (almost no violations reported or known)

Also, identify the enforcement actors; who are they, where does their jurisdiction come from (traditional, state, elected), and what is the process of enforcement they are involved in?

Identify the jurisdiction of the local enforcers within the site area:

1 = the enforcer has only internal jurisdiction (within the community); example: local fish wardens
2 = the enforcer has only external jurisdiction (with outsiders); example: police
3 = the enforcer has both internal and external jurisdiction

If possible, record the number of violations reported against the number of violations that have been punished/prosecuted, from which a rate (%) of follow through on violations can be determined.

In some cases, it may be hard to determine how reliably violations are followed up on and prosecuted. In such cases, it will be useful to determine the level of respect that local stakeholders have for the enforcers as a proxy of how reliably they follow thorough with violators to ensure punishments are given. Ask each informant to describe the reliability that an actual violation will be reported and punished, recording any stories or anecdotes that illustrate their thoughts.

Also, use the following scale to determine local respect for the enforcers:

0 to 33% = There is a low level of local respect for the enforcer
34 to 66% = There is a moderate level of local respect for the enforcer
67 to 100% = There is a high level of local respect for the enforcer

You should also ask informants what the punishment is for being caught violating the rules and whether or not they perceive the consequences of violating LMMA rules are worth the risk of being caught.

Finally, you should ask key informants whether they believe the resource users recognize the authority of the enforcement agency using the following scale. Record any stories or anecdotes that illustrate their thoughts.

Credibility of Enforcers

1 = enforcer does not have authority (is not credible)
2 = enforcer has authority, but not the means and/or history of acting on this authority (has low credibility)
3 = enforcer has authority and the means to act on their authority, but not the demonstrated history of doing so (has moderate credibility)

4 = enforcer has authority and the means and history of demonstrating their ability to act on their authority (has high credibility)

For each rule or set of rules, determine the perceived scale of severity/coercion of penalties by local stakeholders, using the following scale:
1 = punishment is small/token (no or little incentive to obey rules)
2 = punishment is moderate (moderate incentive to obey rules)
3 = punishment is maximum allowed under law (large incentive to obey rules)

When and by whom are data collected?
At the start of the project and every year thereafter. By project staff members.

Outputs

- Descriptions of the enforcement mechanisms.
- An estimate of the violations that are reported by enforcement agencies and your best estimate of the total number of violations that occur and a description of how you arrived at this number.
- Rankings from individual key informants regarding general compliance, the probability of actual violations being reported and punished, and severity of punishment.
- Rankings of the degree of credibility and respect of the enforcement agencies.
- Any relevant stories or anecdotes.

***Example**: Rankings of compliance and enforcement violations and credibility during 2003 at the Votua LMMA Project, Fiji Islands. Note the two six-month time periods of data collected.*

Factor G4 - Compliance and Enforcement of Rules

Site	***Questions***	***Start 2000***	***Mid-2003***	***Comments***
Votua	1.Violations of LMMAs	3	3	Chiefly title dispute have led to several reported cases of poaching.
	2.Credibility of enforcers	2	3	More powers to be given to local law enforcement so that they carry out their jobs properly

(source: Tawake and Caucau 2003)

Factor G5: ***Political System***

What is the 'political system'?

The political system is the network of institutions that govern the overall society. These institutions can be found at local, provincial, and national levels. Types of political systems can range from varying levels of citizen participation as in democracies to very low or no citizen participation as in dictatorships. The stability of the system refers to the frequency with which governments change either through regular (e.g., elections, chiefly successions) or irregular (e.g., coups) means.

How do we assume that the 'political system' influences LMMA success?

It is not completely clear how the type of political system will influence LMMA project success.

- A perhaps more Western assumption holds that as the degree of democracy increases, the easier it is to maintain a successful LMMA project.

- On the other hand, a more hierarchical or chiefly approach may be associated with some of the successes attributed to traditional management in the Pacific.

- We also assume that as the systems become more stable, it becomes easier to maintain a successful LMMA project (at least up to a point – if governments are entrenched in power, it may lead to corruption and thus be harder to maintain successful LMMAs).

How can we measure/describe the 'political system'?

What do we measure/describe?

The type of political system, the degree of citizen participation, and the frequency of change in government. This information should be recorded at local, provincial, and national levels.

What method should we use?

Interview key informants. For local, provincial, and national levels, describe the current type of government and categorize it as closely as possible using the following scale:

Type of Government

1 = imposed leader
2 = king, chief, or other hereditary rulers
3 = limited citizen participation, strong hereditary rulers
4 = partial citizen participation, but some hereditary rulers
5 = complete citizen participation (officials are elected by people)

Ask each informant to estimate how many times the government has changed in the past 10 years. Note whether these turnovers have been due to regular (agreed and acceptable) or irregular means.

When and by whom are data collected?
At the start and end of the project evaluation period. If there are major shifts during the life of the project, you may need to collect interim data. By the project team. National level data may be collected by the country network.

Outputs

- Descriptions of the types of government and rankings of the degree of democracy at different levels (see sample below).
- Estimates of the number of times the government has changed in the past 10 years.

***Example**: Rankings of type of government in 2003 at the Votua LMMA Project, Fiji Islands. Note the two six-month time periods of data collected.*

Factor G5 - Political Systems

Village	***Start 2000***	***Mid-2003***	***Comments for degree of democracy at national level***
Votua	5	4	After the democratically elected Peoples Coalition Government was forcefully removed during the 2000 coup, the SDL party then was appointed as a caretaker government.

(source: Tawake and Caucau 2003)

Factor G6: ***Cultural Values and Beliefs***

What are 'cultural values and beliefs'?

A cultural value is a shared understanding by members of a society of what is good, desirable, or just. A cultural belief is a shared understanding by members of a society of how the world works.

In an LMMA context, we are most interested in cultural values and beliefs related to marine resources and customary resource use and management practices. For example, in some locations, local people do not eat sharks because their culture believes that sharks are ancestral protectors. These people believe that if they injure or take sharks, their children will be born abnormal. This belief is so strong that it holds even when challenged by the church. In this case, this belief has led to the customary practice of shark protection.

How do we assume that 'cultural values and beliefs' influence LMMA success?

People make choices and undertake actions based on their values about what is good, desirable, and just as well as their beliefs of how the world works. Cultural values and beliefs therefore influence people's behavior and assist in forming customary practices. Depending on the structure and orientation of these values and beliefs, this may undermine or enhance efforts to manage marine resources and use LMMAs.

- Where cultural values, beliefs, and practices encourage resource stewardship and are supportive of protection, it becomes easier to maintain a successful LMMA project.
- If the majority of local stakeholders value nature for reasons in addition to those related to material use, it also becomes easier to maintain a successful LMMA project.

How can we measure/describe 'cultural beliefs and values'?

What do we measure/describe?

The cultural values and beliefs of the local stakeholders with regard to marine resources and their management. The degree of compatibility between local cultural values and beliefs and the goals of the LMMA projects. The degree to which local stakeholders value nature for non-material reasons.

What method should we use?

Survey of households and/or interviews with key informants who represent different factions within the local community. When measuring/recording cultural values and beliefs, recognize the intellectual property rights (IPR) of information being collected (see IPR Statement on www.LMMAnetwork.org). It is recommended to use an informed consent form when there is some question as to the IPR of information collected under this factor. Three original copies of this form should be signed and provided to each of the following: (1) the community, (2) the country liaison to the NCT, and (3) the individual who is conducting the interview. Ask each informant to describe cultural values and beliefs regarding marine resources. Record any stories or anecdotes that illustrate their thoughts. Based on these conversations, use the following scale to rank the compatibility of local beliefs with the goals of the LMMA projects.

Compatibility of Local Beliefs and Values with LMMA Goals

1 = no compatibility between local beliefs and values and LMMA goals
2 = limited compatibility between local beliefs and values and LMMA goals
3 = moderate compatibility between local beliefs and values and LMMA goals
4 = extensive compatibility between local beliefs and values and LMMA goals
5 = complete compatibility between local beliefs and values and LMMA goals

Finally, based on your conversations, use the following scale to rank the degree to which local stakeholders value nature for non-material reasons. Record any stories or anecdotes that illustrate their thoughts.

Value of Nature for Non-material Reasons
1 = no value except for material reasons
2 = some value for non-material reasons
3 = moderate value for non-material reasons
4 = strong value for non-material reasons
5 = no value except for non-material reasons

When and by whom are data collected?
At the start of the project and every two years thereafter. Project staff.

Outputs

- Descriptions of local cultural values.
- Rankings from individuals and an estimated ranking for the community as a whole regarding the compatibility between local values and beliefs and LMMA goals and the degree to which the community values nature for non-material reasons (see example below).
- Any relevant stories or anecdotes.

***Example**: Rankings for cultural values and beliefs during 2003 at the Votua LMMA Project, Fiji Islands. Note the two six-month time periods of data collected.*

Factor G6 - Cultural Values and Beliefs Regarding Resources

Village	***Questions***	***Start 2000***	***Mid-2003***	***Comments***
Votua	1.Description of cultural values and beliefs regarding resources	3	4	Imposing *tabu* on sacred fishing areas was revived again.
	2.Degree to which local stakeholders value nature for non-material reasons	3	4	All key informants strongly agree that the positive change they experiencing now is a source of pride of their village.

(source: Tawake and Caucau 2003)

Factor G7: ***Leadership***

What is 'leadership'?

Leaders are defined as individuals (such as a local chief) or groups (such as a council of chiefs) who take responsibility and action and who have influence over other people's behavior. Leaders can be either formal (part of the governance structure) or informal (outside the governance structure).

How do we assume that 'leadership' influences LMMA success?

- If traditional and local leaders are involved in the governance of the LMMA, then it becomes easier to maintain a successful LMMA project. Furthermore, if there is strong leadership that supports the project, then the project is more likely to be successful.

How can we measure/describe 'leadership'?

What do we measure/describe?
The key leaders involved in the implementation and management of the LMMA and their relative strength as a leader.

What method should we use?
First list the relevant leaders and indicate where their leadership is derived from (traditional, elected, self-initiated). In some cases, leadership will be understood (implied automatically), such as the case of hereditary leaders. Briefly describe their history and role as a leader in the LMMA effort. Identify whether or not each leader bases her/his authority through a traditional or modern role. Also estimate the distance (km) and accessibility of the leader's base location of operations from the LMMA.

Next, using a secret ballot method (sheets of paper with anonymous rankings inserted into a box), ask key informants to rank the strength of influence of each leader by her/his constituents, using the scale below. One way to see 'influence' is the extent to which you take into account what the leader says within your daily life.

Strength of Influence by Leader
1 = leader has no influence
2 = leader has minimal influence
3 = leader has a fair degree of influence
4 = leader has a large degree of influence
5 = leader significantly and consistently influences constituency

Also, use the following scale with respondents to determine the level of local respect for each leader:
0 to 33% = There is a low level of local respect for the leader
34 to 66% = There is a moderate level of local respect for the leader
67 to 100% = There is a high level of local respect for the leader

Finally, ask each informant to estimate how many times each leadership position has changed hands over the past 10 years.

When and by whom are data collected?
At the start of the project and every two years thereafter. By project staff.

Outputs

- Descriptions of key leadership roles.
- Rankings of strength of different leaders.
- Estimates of number of time each leadership role has changed in the past 10 years.

***Example**: Rankings for strength of leadership during 2003 at the Votua LMMA Project, Fiji Islands. Note the two six-month time periods of data collected.*

Factor G7 - Leadership

Village	***Start 2000***	***Mid-2003***	***Comments***
Votua	3	4	With the establishment of the Fijian court system and the introduction of the individual rights, the chiefs do not have full control in comparison to the colonial era.

(source: Tawake and Caucau 2003)

Factor G8: ***Resource Conflict***

What is 'resource conflict'?

Resource conflict is competition between users of the marine resources within a site. This conflict can be internal (among local stakeholders) or external (with outside parties).

How do we assume that 'resource conflict' influences LMMA success?

- As the degree of conflict increases, it becomes more difficult to maintain a successful LMMA project.

- Communities that are able to resolve resource conflicts are more likely to have successful LMMAs.

How can we measure/describe 'resource conflict'?

What do we measure/describe?

The types of conflicts over marine resources that exist and their relative strength. Also, how conflicts are resolved.

What method should we use?

Interviews with key informants who represent different factions within the local community. Ask each informant to describe examples of conflicts that occur over marine resources. In particular, determine whether the conflict is between internal stakeholders or with external resource users. Finally, ask each informant to rank the degree of marine resource conflict within and outside the community using the following scales. Record any stories or anecdotes that illustrate their thoughts.

Degree of Marine Resource Conflict within the Community

1 = very extensive, very frequent conflict
2 = extensive and frequent conflict
3 = moderate, moderately frequent conflict
4 = limited, occasional conflict
5 = no conflict

Degree of Marine Resource Conflict with Outsiders

1 = very extensive, very frequent conflict
2 = extensive and frequent conflict
3 = moderate, moderately frequent conflict
4 = limited, occasional conflict
5 = no conflict

Ask informants how conflicts get resolved. Also, describe the mechanism(s) used to resolve conflict. Finally, identify the level of local involvement in the conflict resolution mechanism used.

Who resolves conflict
1 = single individual with imposed authority
2 = king, chief, or other hereditary individual(s)
3 = limited participation, strong hereditary individual(s)
4 = partial participation, but some hereditary individual(s)
5 = complete, consensus-driven/democratic participation

Finally, list the institutions involved in conflict resolution and whether or not the government is involved (yes/no) in conflict resolution.

When and by whom are data collected?
Every year. By project staff.

Outputs

- Descriptions of the types of conflict over marine resources.
- Rankings of conflict intensity and frequency from individual key informants and a summary ranking for the overall project site.
- Any relevant stories or anecdotes.

***Example**: Rankings on the degree of resource conflict within the community during 2003 at the Votua LMMA Project, Fiji Islands. Note the two six-month time periods of data collected.*

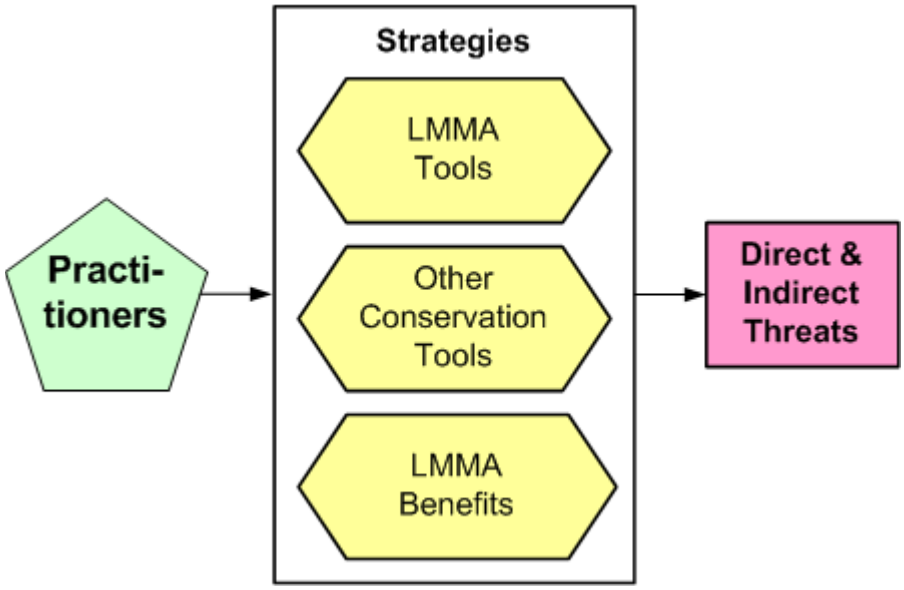
Factor G8 - Resource Conflict

Village	***Start 2000***	***Mid-2003***	***Comments***
Votua	3	4	Initially, 7 of out 11 conflicts recorded were between fishers within the village and management committee. In 2003, 8 out of 9 conflicts recorded were between fishers themselves and poachers from outside the village.

(source: Tawake and Caucau 2003)

4.4 Factors Related to Strategies

Strategies refer to the actions that the project team takes to counter the direct and indirect threats. In the LMMA Network, most actions will involve using one or more LMMA tools. Project teams may also use other conservation tools. It is thus important to track all tools being used. Furthermore, some project activities can produce a series of benefits to local stakeholders. These benefits may include increased harvest levels or an increased cash flow to a community. The way the benefits that result from particular strategies are shared can be important to the overall support and success of an LMMA project. Factors related to strategies intended to minimize the influence of direct and indirect threats are represented in the diagram below.



S1. LMMA Tools – The types of LMMA interventions being used at the site.

S2. Other Conservation Tools – Other approaches used to promote conservation and sustainable use of marine resources.

S3. LMMA Benefits – Type and level of LMMA-related benefits and their distribution.

*Factor S1: **LMMA Tools***

What are the 'LMMA tools'?

LMMA tools refer to the types of LMMA interventions being used at the site. As described in Section 2.3 of this document, three main categories of LMMA tools are full reserve, species-specific harvest refugia, and effort or behavioral restrictions. These tools can be applied at different spatial scales and over different time frames within the overall LMMA.

How do we assume that 'LMMA tools' influences LMMA success?

- More intensive types of tools (in terms of number of species protected, % area, % time) are more likely to lead to LMMA success.
- On the other hand, using too many intensive types of tools (many species protected, high % of protected area and long timeframe) may lead to less compliance and thus less LMMA success.

How can we measure/describe 'LMMA tools'?

What do we measure?

Type(s) of tools used, area in hectares under each tool, time each tool is applied, and species and effort restrictions in place.

What method should we use?

Project staff review the management plan and/or discuss LMMA implementation with key informants in the community. You should ensure that the LMMA tools being used in different locations of the managed area are included in the sketch map developed as part of the site description (see Section 3.2).

When and by whom are data collected?

At the start of the project and updated every year. By project staff.

Outputs

- A list and map of LMMA tools used and ranking of community presence at the LMMA site.

Factor S2: ***Other Conservation Tools***

What are 'other conservation tools"?

In addition to LMMA tools, conservation project teams can use many other techniques for promoting conservation and sustainable use of marine resources. Major categories of different approaches include protection & management (other than LMMA strategies), law and policy tools, education and awareness, and changing incentives (see Table 4-2 on the next page for examples of strategies under each approach).

How do we assume the use of 'other conservation tools' influences LMMA success?

- Projects that use the appropriate mixture of conservation tools are more likely to achieve success.

How can we measure/describe the 'other conservation tools' used?

What do we measure?

The type and number of non-LMMA tools used at a project site.

What method should we use?

For each tool being used in the project, find the specific category in the table below that best describes it. Make a list and briefly describe the tool currently or recently employed at the project site. Include the duration and the perceived effectiveness or thoroughness of its implementation. Then rank its perceived impact on the following scale.

Impact of non-LMMA tools

1 = negative impact
2 = no impact
3 = limited positive impact
4 = moderate positive impact
5 = considerable positive impact

When and by whom are data collected?

At the end of the project evaluation period. By project staff.

Outputs

- Descriptions of tools being used, the length of time applied, the effectiveness of its implementation.
- Ranking of each tool's impact.

Table 4-2. An Initial List of Conservation Strategies.

Protection & management [a]	Law & policy	Education & awareness	Changing incentives
Protected Areas	**Legislation & Treaties**	**Formal Education** [c]	**Conservation Enterprises**
- reserves & parks: IUCN Category I & II	- developing international treaties	- developing school curricula	- linked: e.g., ecotourism
- private parks	- lobbying governments	- teaching graduate students	- unlinked: e.g., jobs for poachers
Managed Landscapes [b]	**Compliance & Watchdog**	**Non-Formal Education** [c]	**Using Market Pressure**
- conservation easements	- developing legal standards	- media training for scientists	- certification: positive incentives
- community marine protected areas	- monitoring compliance w/ standards	- public outreach via museums	- boycotts: negative incentives
Protected & Managed Species	**Litigation**	**Informal Education** [c]	**Economic Alternatives**
- bans on killing specific species	- criminal prosecution	- media campaigns	- sustainable agriculture / aquaculture
- management of fur-bearing mammals	- civil suits	- community awareness raising	- promoting alternative products
Species & Habitat Restoration	**Enforcement**	**Moral Confrontation**	**Conservation Payments**
- reintroducing predators	- implementing sanctions	- civil disobedience	- quid-pro-quo performance payments
- recreating savannas and prairies	- military actions / nature keeping	- monkeywrenching / ecoterrorism	- debt-for-nature swaps
Ex-Situ Protection	**Policy Development & Reform**	**Communications**	**Non-Monetary Values**
- captive breeding	- research on policy options	- environmental publishing	- spiritual. cultural, existence values
- gene banking	- advocating devolution of control	- web-based networking	- links to human health

[a] *Columns contain broad categories of tools. Each column contains five broad approaches and then two examples of more specific strategies under each approach. Implementing each strategy involves using specific conservation tools (not shown).*

[b] *This category primarily includes taking conservation actions in lands managed for natural resource production that do not fall into IUCN categories I – V.*

[c] *These terms are follow Fien et al. (1999).*

(Source: Salafsky et al. 2002)

*Factor S3: **LMMA Benefits***

What are "LMMA benefits"?

The use of some LMMA tools may generate benefits easily perceived by surrounding communities. Examples of LMMA-related benefits may include revenue generated through user fees or an increased or stable catch of certain target species. Sharing and distribution of these benefits may in some cases be widespread among stakeholders or limited to a few individuals or interests. Distribution may be prescribed by rules established by customary practices (for example, via customary traditional ownership), by modern arrangements (such as the creation of a community fund designed to manage and distribute LMMA income), or a mixture of both.

How do we assume that 'LMMA benefits' influence LMMA success?

- The greater and more equitable the distribution of LMMA benefits, the more successful an LMMA will be. (This occurs because the greater the distribution of LMMA benefits, the more widely LMMA rules will be respected by stakeholders.)

How can we measure/describe 'LMMA benefits'?

What do we measure/describe?

The type and level of LMMA benefits sharing among stakeholders at a site. The degree of distribution of benefits among stakeholders at project site.

What method should we use?

Interviews with key informants who represent different factions within the local community. Ask each informant to list and briefly define/describe types and levels of benefits produced within the LMMA. Also ask informants the method or procedure by which LMMA benefits are distributed or shared among stakeholders. Next, ask the informant to rank the relative distribution of LMMA benefits using the following scale. Record any stories or anecdotes that illustrate their thoughts.

Distribution of LMMA benefits

1 = Benefits consolidated by one individual or family (no degree of distribution)
2 = Benefits largely consolidated by one stakeholder group (low degree of distribution)
3 = Benefits shared among various individual and groups (moderate degree of distribution)
4 = Benefits shared among a wide range of individual and groups (high degree of distribution)
5 = Benefits widely and equitably distributed among all stakeholders (complete degree of distribution)

When and by whom are data collected?

At the start of the project and every two years thereafter. By project staff members.

Outputs

- A list of types and level of LMMA benefits and a description of method and equity of distribution (see sample below).
- Rating of benefits distribution.
- Any relevant stories or anecdotes.

***Example**: Distribution of benefits rankings during 2003 at the Votua LMMA Project, Fiji Islands. Note the two six-month time periods of data collected.*

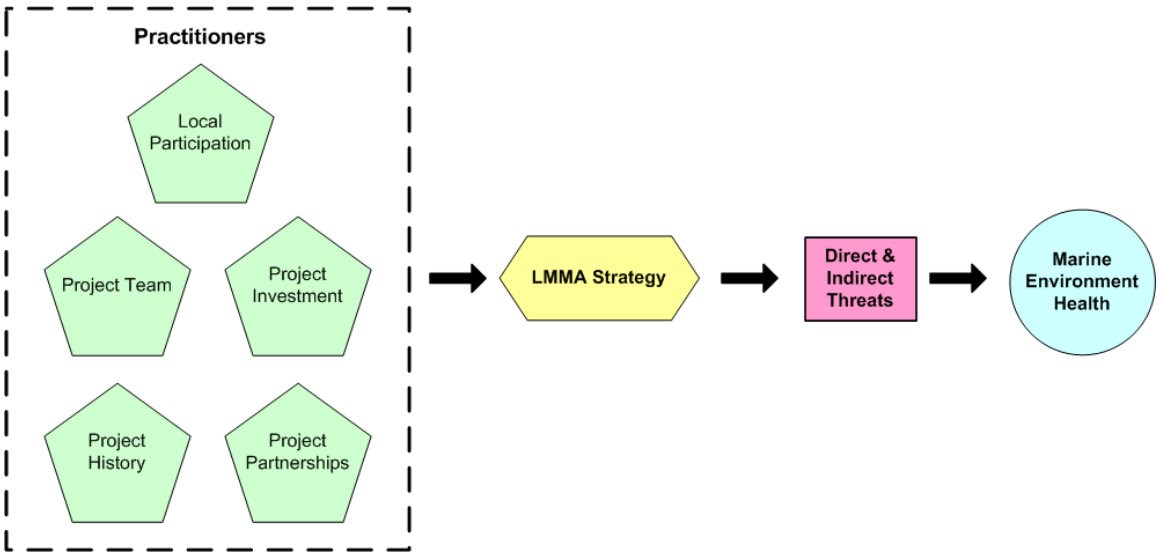
Factor S3 - LMMA Benefits and Distribution

Village	***Start 2000***	***Mid-2003***	***Comments***
Votua	3	4	People feel they are getting more income from their LMMA. These benefits are getting more widely distributed. Cash benefits from catering LMMA workshops were used to complete their village hall toilets

(source: Tawake and Caucau 2003)

4.5 Factors Related to Practitioners

Practitioners are the individuals and organizations who take action to counter threats at the site. Their ability to implement a successful conservation project depends on their levels of motivation, skills, and experience. Factors related to practitioners can influence strategies and direct and indirect threats in a variety of ways, as represented in the diagram below.



P1. Local Participation – The degree to which community members are involved in the project activities.

P2. Project Team – The ability of the project team to work with the community and meet the project objectives.

P3. Project Investment – Amount of money invested in the project site by the implementing organization(s).

P4. Project History – Experience of the community with the current project team as well as with other conservation and development initiatives at the site or nearby.

P5. Project Partnerships – Formal and informal links that the project team has with other organizations and agencies that assist in implementing the project.

Factor P1: ***Local Participation***

What is 'local participation'?

Local participation refers to the degree to which local community members are involved in the project activities. Involvement can range from passive awareness to active participation in various aspects of the project's work including planning, implementing activities, and monitoring results.

How do we assume 'local participation' influences LMMA success?

- As participation in the project increases, LMMA success will also increase. (If local people are involved in the project and feel ownership, they are more likely to support the project's work. In addition, if local people are involved in a project and like it, they will be more likely to agree with and act on conservation objectives.)

How can we measure/describe 'local participation'?

What do we measure?

Determine the strength and distribution of local engagement in the project.

What method should we use?

The project team in conjunction with key informants should use the BEANS method (described previously), a technique to determine the level and distribution of attitudes across a group of people. Ask the key informant to envision five boxes numbered 1 through 5. Each numbered box refers to a level of local stakeholder participation as shown below. Discuss the levels with the informant and make sure you agree what each level means. Record any stories or anecdotes that the informant might have about the different levels.

Level of Local Stakeholder Participation

1 = No awareness of project
2 = Received information about project
3 = Received and contributed information to project
4 = Involved actively in discussions, planning and decision-making
5 = Stakeholder empowered to carry out management actions

Once you have agreed on the different levels, give the key informant 10 beans, pebbles, or other markers. Tell them that each marker represents 10% of the local stakeholders. Ask them to place the markers in the boxes corresponding to how they view the level of local involvement in the project. Use the BEANS method with 3-5 key informants. If rankings come out fairly uniform, you are fine. If not, then you may need to include this topic as a question in your household census/survey or increase number of key informants.

When and by whom are data collected?

Every year or during key phases of the project. By project staff.

Outputs

- Rankings from individual key informants, recorded as the number of markers in each box as shown in the example below. Also, an overall score for the level of stakeholder involvement, calculated by multiplying the number of markers in each box by the number of the box and summing up the results. See example below.
- Any relevant stories or anecdotes.

***Example**: Local participation during 2003 at the Votua LMMA Project, Fiji Islands. Note the two six-month time periods of data collected.*

Factor P1 - Local Participation in the Project

Village	***Start 2000***	***Mid-2003***	***Comments***
Votua	4	4	The involvement of the community is highly enlightened by the frequent visits and seminars from the members of project partners who are the real strengths in this project.

Informant	**Rank 1**	**Rank 2**	**Rank 3**	**Rank 4**	**Rank 5**	**Total Score**	**Avg Score**
Informant 1	1		2	4	3	1+0+6+16+15=38	38/10=3.8
Informant 2		1	3	4	2	0+2+9+16+10=37	37/10=3.7
Informant 3			2	7	1	0+0+6+28+5=39	39/10=3.9
						Overall Avg	*3.8*

(source: Tawake and Caucau 2003)

Factor P2: ***Project Team***

What is the 'project team'?

The project team is composed of the people whose role it is to carry out project activities. It generally includes key community members and staff of partner organizations and agencies who are actively carrying out project activities and are responsible for the outcomes of a project. Their level of involvement, time at project site, and effectiveness are key aspects to be considered.

How do we assume the 'project team' influences LMMA success?

- Projects with a more effective team are more likely to have a successful LMMA. In particular, projects that have staff who are on site for greater periods of time, speak the local language, and have skills, commitment, and experience relevant to their work are more likely to succeed.

How can we measure/describe 'project team'?

What do we measure?

Number of people actively involved in carrying out project activities, the time that they spend at the project site, and the number who speak the local language. Also, a qualitative ranking of the overall skills of the project team and their interest in adaptive management.

What method should we use?

Number of people assigned to the project, percent of staff time spent at the project site, and the number who speak the local language can be obtained from project records or from key informants.

- *Project Team Composition* – Record the names and organizations of the project team members.
- *Number of people* – Record as full-time equivalents (for example, two people working 50% each on the project is equal to one full time person).
- *Time spent working at site* – Record as sum of individual person-years spent working at the site (for example, one person working 50% of their time at the site and another working 25% at the site is equal to 0.75 person-years).
- *Language skills* – Record as the number of individuals on the project team who are fluent in a language used by most of community members.
- *Adaptive Management skills* – Ranking of the project team's ability to design, manage, monitor, analyze and communicate for the project through time.

The overall capacity and interest of the project team members to do adaptive management should be ranked on the following scales by the project liaison officer in conjunction with the project team leader(s).

Capacity of Project Team Members in Adaptive Management
1 = very limited skills and experience
2 = some skills and experience
3 = moderate skills and experience
4 = strong skills and experience
5 = excellent skills and experience

Interest of Project Team Members in Adaptive Management
1 = very limited interest
2 = some interest
3 = moderate interest
4 = strong interest
5 = very strong, demonstrated interest

When and by whom are data collected?
Every year. By project team.

Outputs

- List of names and organizations of project team members.
- Number of people working on project in full-time equivalents.
- Sum of individual person-years at site.
- Percentage of individuals fluent in local language.
- Ranking of ability and interest to do adaptive management.

Factor P3: ***Project Investment***

What is 'project investment'?

Amount of resources invested in the project site by the implementing organization(s).

How do we assume 'project investment' influences LMMAs?

- Projects that invest more resources are more likely to maintain a successful LMMA, at least up to a point. There is great debate, however, as to whether it is advisable to pay community stakeholders for project work.

How can we measure/describe 'project investment'?

What do we measure?

Amount of money in project budgets. Amount of money (if any) paid to community members.

What method should we use?

Review project financial reports. Report the total amount (in local currency and US$ at the time data are collected) and the amount divided by the number of people at the project site. Also estimate volunteer (community or non-community) effort at the project (in local currency and US$ at the time data are collected).

When and by whom are data collected?

Every year. By project staff.

Outputs

- Money in project budget.
- Amount of money paid to community members.
- Estimate of volunteer time.

Factor P4: ***Project History***

What is 'project history'?

Project history can be described as the experience of the community with the current project team as well as with other conservation and sustainable development initiatives at the site or at other sites that they are aware of. Project history also involves who was involved with the initiation of the project (or management methods) and for what reasons it was created. Additionally, the level and types of expectations associated with the project are included as part of the project's history.

How do we assume 'project history' influences LMMA success?

- The longer the project team has had experience at the site, the greater the likelihood of LMMA success.
- The greater the degree of local origin the project idea, the greater likelihood of LMMA success.
- The more positive experience with previous development/conservation projects, the greater likelihood of LMMA success.
- The greater the material expectations at the start of the project, the less likelihood of LMMA success.

How can we measure/describe 'project history'?

What do we measure?

- Length of time project has been active in site.
- Degree of local origin of project idea.
- Experience with conservation/sustainable development projects.
- Community material expectations (and perhaps non-material expectations, if important) at start of project.

What method should we use?

Interview project staff and local key informants. Record length of time in years that key project organizations/individuals have been working at the project site prior to start of current LMMA project.

The degree of local origin of the project idea should be ranked on the following scale by the project team leader(s). Capture any relevant anecdotes or stories, including how and why the project was initiated.

Degree of Local Origin of Project

1 = complete external origin
2 = extensive external origin
3 = balanced origin
4 = extensive local origin

5 = complete local origin

The degree of prior experience with conservation/sustainable development projects should be ranked on the following scale by the project team leader(s). Capture any relevant anecdotes or stories.

Experience with Conservation/Development Projects
1 = highly negative history
2 = negative history
3 = no or balanced history
4 = positive history
5 = highly positive history

The degree of material expectations, if any, associated with the project should be ranked on the following scale by the project team leader(s). Capture any relevant anecdotes or stories.

Material Expectations Associated with LMMA
1 = no expectations
2 = some expectations
3 = moderate expectations
4 = high expectations
5 = very high expectations

When and by whom are data collected?
As close to start of project as possible. By project staff.

Outputs

- Length of time project has been active at project site.
- Rankings of local origin, previous project experience, and community expectations at start of project.

Factor P5: ***Project Partnerships***

What are 'project partnerships'?

Formal and informal links that the project team has with other organizations and agencies that are used to implement the project.

How do we assume 'project partnerships' influence LMMA success?

- Projects that have greater numbers of useful partnerships are more likely to maintain a successful LMMA.

- Projects that have a government agency involved in the process are more likely to maintain a successful LMMA.

- Projects that have a traditional group, leader, or group of leaders involved are more likely to maintain a successful LMMA.

How can we measure/describe 'project partnerships'?

What do we measure?

- Number of partner organizations with substantial involvement.
- Number of government agencies with substantial involvement (this is subset of above).
- Number of partner organizations with expertise in adaptive management (subset of above).
- Number of traditional leaders and/or groups with substantial involvement.

What method should we use?

Key informant interviews with project staff.

When and by whom are data collected?

Every other year. By project staff.

Outputs

- Number of partner organizations with substantial involvement.
- Number of those that are government agencies, have expertise in adaptive management, and traditional groups/leaders with substantial involvement.

Chapter 5 - DATA MANAGEMENT AND ANALYSIS

This chapter outlines a simple, logical process through which participating LMMA project teams can manage data generated from the implementation of the Learning Framework (LF) and share information across the Network.

If LMMA project teams have feedback, questions, or concerns regarding what is outlined in this chapter, please feel free to contact the appropriate country coordinator or email the NCT at: info@LMMAnetwork.org. As the aim of this chapter is to outline a simple process through which the sharing and use of collected data is possible, the country and Network coordinators are seeking input on how to improve the process.

5.1 An Introduction to Data Management

Data management is the process of submitting, entering, storing, and sharing information. The aims of effective data management are threefold: (a) to facilitate the storage and efficient retrieval of data that has been collected, (b) to facilitate the accurate and timely analysis of contributed data, and (c) to facilitate the sharing of information and results between participating LMMA sites and members. Information collected is managed and shared in data sets, which are collections of data defined through a specific process – e.g., through the use of the LMMA Learning Framework or the analysis of how two specific factors relate to each other.

Data management and sharing occurs at three different levels within the Network: (1) the site level, at (2) the country level, and (3) the Network level.

- The **site** data set – the sum of all information generated by an individual LMMA site in its implementation of the LF; this data set remains always at the LMMA site. It is managed by the practitioners, communities and project partners working at the site.

- The **country** data set – the sum of all information generated by all participating LMMA sites within a specific country from use of the LF; this data set remains always with the nominated county coordinator(s) by the participating LMMA sites. It is managed by the country coordinators with oversight from the participating country sites.

- The **Network** data set – the sum of all information generated by all participating LMMA sites across the Network; this data set is produced as a result of the sharing of data collected at participating LMMA sites. It is managed by the NCT with oversight from all participating Network sites. It is held in collective by the Network, and cannot be used for any other purpose than what has been reviewed and approved (through approval by members) by the Network participants.

With the full implementation of this framework, an LMMA site will generate two different types of information:

(1) Quantitative data – information in a numerical form. Quantitative data are generated from such measurements as counts, rankings, indices, scores, and geographic coordinates.

(2) Qualitative data – information in a descriptive form. Examples of qualitative data include written texts (reports, articles), transcribed verbal responses from interviews (both single word and multiple-word responses), and images (such as figures, photos, or maps).

Both types of information are equally important in the adaptive management of LMMAs and the use, testing, and refinement of the LF to improve our understanding of the conditions under which LMMAs work, do not work, and why. Because quantitative and qualitative data are different by nature, the analysis of each type of data are somewhat different. However, the process of managing and sharing numerical and descriptive information is nearly the same, with the exception of where and how data are stored.

5.2 The Process of Data Management

The data management process is one of the most important, and often overlooked, aspects of monitoring and evaluation. As part of the LMMA Network membership process, country and Network coordinators will work with each participating LMMA site to prepare the project team (via training) for data management. As part of this process, each participating LMMA project site (or perhaps small groups of sites) will need to elect or assign one individual from the project team to be the data manager. The ideal data manager will possess the following abilities: (1) command or fluency in the English language; (2) computer skills or familiarity, particularly with Microsoft Excel and Word; (3) a personal disposition that makes the individual naturally organized, thorough (sometimes called "detail-oriented"), and orderly; (4) experience and/or interest in data management and information systems; (5) sound time management skills. In some cases, the designated data manager will be a community representative or monitoring team member. In other cases, the data manager may be one of the project partner representatives.

Across the site, country, and Network levels, there are four distinct process elements to data management: (1) data submission, (2) data entry, (3) data storage, and (4) data sharing and use. Each of these four elements is described below. If after reading through this section you have questions regarding any of these four elements discussed below, contact your country coordinator. If the country coordinator cannot answer the question or address a specific comment, the NCT will be consulted.

Two very important points need to be made here. First, participating LMMA project teams should *not* engage in data collection before the process of data management is very clear to those involved and the data manager(s) has been trained (through the Network, if needed). Second, if there is any confusion with regard to data management or the process and steps involved, the project team should contact the country coordinator for

clarification prior to moving forward with data collection activities. When adequately prepared, a participating project team will be able to undertake data management easily and enjoyably.

Data Submission

At an individual LMMA site level, immediately after data are collected for the factors identified in the LF, these 'raw' (just collected) data should be given by the monitors (data collectors) to the designated site data manager(s). In some cases this will be a trained community representative from the LMMA site. In other cases, it may be a project partner organization representative. The important point is that as soon as data are collected, they should be submitted to the person who is in charge of overseeing the data management process at the site level. This individual should be identified and trained in data management by the project partners prior to undertaking any data collection activities.

In some cases, submission of raw data may occur at the country level if multiple LMMA sites are sharing a single data manager. Raw data are not submitted at the Network level.

Raw data submitted by data collectors will typically be provided to the data manager as completed data forms (filled out by hand) and/or handwritten notes. Raw data will also sometimes be submitted as loose images such as photos, maps, sketches, or diagrams. The data manager should learn to become familiar with the types and formats of data that will be submitted to them in order to ensure that a complete set of raw data are provided by monitors. Data managers should be sure to physically record the name(s) of the person(s) who is submitting the data and the date and time of submission. This is done for documentation purposes.

Submitting raw data to the designated data manager may sound like an obvious step in the process of data management. However, it is well known that some conservation projects go through the effort of collecting monitoring information yet never use it; it simply remains with the collectors and are never managed or analyzed. Submission of raw data to the designated data manager(s) is therefore a critical first step in the overall learning process.

Data Entry

Once data are given to the designated data manager(s), this individual will then integrate these raw data with other data previously collected (except at the baseline) by entering each datum point, or piece of data into the project's existing database. A database is simply the place where collected data are stored. In most cases, such databases are electronic, using a computer program.

Entry of each raw datum point is not as simple as merely placing submitted raw information into the database. Data entry actually requires a much more in-depth process of sorting, reviewing, coding, and then entering each individual raw datum point submitted. Note that this process is often time consuming and tedious, so the right person

and an adequate amount of time need to be provided by the project for the data management process.

5.2.2(a) Receipt and Sorting of Submitted Data

The first step in the data entry process is for the data manager to receive and thoroughly review the submitted raw data from collectors (whether this be at the site, or in some cases, national level). This begins with a simple acknowledgement (by email, phone, or in person) by the data manager to the project manager of their receipt of raw data from the LMMA site monitors (data collectors). This ensures that a record is kept of the event and date of raw data submission.

The second step is for the data manager to sort through all of the raw data that has been submitted. In this process, the data manager should attempt to organize the raw data in such a way that it will expedite the process of logically reviewing and entering the information. For example, organizing the data into categories (biological, catch, and socioeconomic) or groups of factors will assist in the data management process.

In addition, it is very important that submitted data are sorted into the appropriate context in which they have been collected. For example, some participating projects host multiple LMMAs and may be therefore submitting separate data collected at multiple LMMAs. In this case, the data manager will need to keep track of multiple sets of submitted data throughout the data management process by sorting them into separate files named by the appropriate LMMA site from where the data were collected.

Proper data sorting should allow the data manager to quickly assess whether or not they have received a complete set of raw data for the relevant LMMA site. In sorting data, it may become apparent that certain factors or groups of factors have not been submitted. In this case, before proceeding with the next steps, the data manager should check with the data collectors to determine if the missing data had not yet been collected, or had simply been forgotten to be submitted.

5.2.2(b) Review of Data Submitted

The next step is a careful review of *each* datum point (whether quantitative and qualitative) by the data manager. This review should look for two things in particular:

(1) The **accuracy** of each raw datum as recorded by the collector – For example, was the right type of information (e.g., ranking, text, or multiple-choice selection) provided given the factor being measured and the methods used? If the datum point is quantitative, is the number(s) recorded possible within the measurement used (e.g., a score of 12 on a 5-point scale would not be accurate)? If the answers to such questions indicate that the information provided for the datum point is not accurate, then the data manager will need to go back to the collector and check on the missing data before moving forward with entry of the datum point.

(2) The **completeness** of data entry – Is any information provided for the datum point or has it been left blank? If there is a missing datum point, it could mean that either the data collector: (a) missed or forgot to collect the information, (b) was unable to collect the information, or (c) perhaps no response was given. Regardless of the reason, the reason for the missing datum point ideally will have been provided when the raw data are submitted. If this is not the case, then the data manager will need to go back to the collector and check on the missing data before moving forward with entry of the datum point.

5.2.2 (c) Coding of Submitted Data

Before data are entered into their appropriate position in the database, they must first be coded. Data coding is the process of translating individual datum points into the appropriate format for entry and storage. In many cases, as raw data are collected by project monitors they are also coded appropriately. For example, when a household respondent ranks a livelihood factor, the data collector will likely record the datum point as the numerical rank of the descriptive equivalent that the respondent provides – e.g., a ranking of "3". In this case, the "3" has been pre-coded by the data collector to represent the descriptive text associated with it. In such cases of pre-coding, the data manager will not need to translate the "3" into anything else.

However, in other cases, raw data submitted will not have been pre-coded. In these cases, before the datum point can be entered, if must first be coded. In such cases the data manager will need to refer to the project's code sheet, a short document containing a summary of all the codes and their meanings that are used in data entry.[13] A generic code sheet for users of the LF will be provided to the project by the country coordinator.

Whether or not a submitted datum point has been pre-coded or needs to be done by the data manager, all data *must* be appropriately coded as it is entered into the database. Once a datum point has been reviewed and appropriately coded, it is then ready to be entered into the appropriate location within the database.

5.2.2(d) Entry of Submitted Data

Once submitted data have been reviewed, coded, and are determined to be 'fit' (ready) to be merged into the database, the data manager will next need to enter each datum point into the project's monitoring database. In the case of the LMMA Network, this will require the use of a computer and two types of software:

(1) **Microsoft Excel**, or an equivalent program that can read, write, and save Microsoft Excel files – All reviewed and coded quantitative data submitted (numbers), in addition to some specific, limited (i.e., single-word or several-word responses) qualitative data, are entered electronically into the project database in the form of a Microsoft Excel file format.

[13] The code sheet will be available at www.LMMAnetwork.org.

(2) **Microsoft Word**, or an equivalent program that can read, write, and save Microsoft Word files – All other reviewed and coded qualitative data submitted are entered electronically into the project database in the form of a Microsoft Word file format. Sentences or paragraphs of text are not the only forms of descriptive information that should be entered into the Word file. Maps, figures, photos, or other images that are relevant to the descriptive information collected for a factor or set of factors should ideally all be digitized (using a scanner that is hooked up to the project computer) so that they can then be imported (entered) into the Word file in the appropriate position.

Using these computer programs requires that the data manager have access to the project computer and either have skills in using these computer programs or the ability to work closely with someone who does. This is an important consideration when designating the data manager. If necessary, the data manager will be trained in the method of data entry using the computer (or any other steps in the data management process) by the country coordinator (or other Network representative) prior to any data collection activities.

In order to facilitate the sharing of data within the Network, all textual data entry should be done using the English language. Therefore, data managers must have an adequate command of the English language. In some cases (e.g., the Fiji LMMA country network), country-level network activities and communications may be done using the native language (other than English) of the country. In such cases, submitted data are likely to have been recorded on data forms in the native language of the country by monitors at the time of their collection. In such cases, the participating LMMA projects and their data managers will need to decide on doing one of two things: either (1) translating each datum point into English as it is entered, or (2) translating a complete copy of the Excel and Word files into English after the entry of all submitted data has been completed in the native tongue. Obviously, the latter example will take more time and effort than the former. However, some country-level networks may feel that it is important enough to have collected data remain in the native language to justify the added time and labor required to translate all entered data into English each time a new round of data are collected and submitted for entry. In any case, a copy of all entered data in English must exist in order for the Network to share information and therefore learn collectively.

Using these two computer programs, each reviewed and coded datum point must be carefully entered by the data manager into the project's designated Excel or Word file where LMMA monitoring data are stored. As this entry proceeds, the data manager should frequently save the file in order to minimize the potential loss of work in case the computer crashes unexpectedly or there is a power outage. Continue data entry until every submitted datum point has been entered successfully and accurately. Do not discard the original data submitted when this process is complete (see "Data Storage" below for details on this). Instead, place it aside somewhere safe for the moment.

It is highly recommended that, if at all possible, at this point the data manager should have a friend or co-worker briefly review through the updated electronic files, skim the

entire file and check (at random) several datum points against the original data submitted (on hard copies) to double-check for the completion and accuracy of entered data. It is absolutely essential to address any potential human errors in data entry because once the data are entered, they will next be used for analytical purposes and any erroneous entries will generate inaccurate results from which the wrong findings might be made.

5.2.2(e) Backing-Up Entered Data

Once every individual datum point submitted has been entered and saved into the two electronic files, the data manager will have successfully completed the process of reviewing and merging submitted data into the project's existing databases (the Word and Excel files). It is recommended that after the completion of such data entry, a backup electronic file be saved on floppy disk or CD-ROM and stored someplace appropriate for safekeeping on the chance that the computer that holds the two files is broken, stolen, or corrupted. Having backups of the latest version of the two electronic files will prevent the unlikely event of losing all collected and entered data.

After all submitted data have been entered and backed-up electronically, at least two copies of both electronic files should then be printed. One of these copies should be given to the data collectors or monitoring team who collected and submitted the data to the data manager. By providing printed copies of the entered data, two aims are achieved: (1) it ensures that the data collected by the monitors are returned to them – and the communities and people they represent – in a form that is easy to for them to read and understand; and (2) it encourages the monitors and community to look through the entire 'history' (time series) of data collected and thereby facilitates community analysis and interpretation of results. This is particularly important in cases where the community, its leaders, and/or monitoring team are trained in analysis and are the ones who lead the adaptive management process at their own LMMA sites and communities.

The second set of printed Excel and Word file copies should be kept by the data manager or project leaders as a hard copy back-up of the electronic files in the unlikely event that the electronic back-up versions (floppy or CD-ROM) are misplaced or damaged and the original files on the computer are also lost.

Data Storage

By this point in the data management process, all original data submitted by the collectors has been reviewed, checked for accuracy, coded, and entered by the data manager. The data manager will have also already made both electronic and printed copies of the updated Excel and Word files as back-ups of the original. As mentioned previously, the data manager was also careful not to discard the original data submitted after its entry. So, in addition to the electronic files of entered data (including back-ups), the data manager also has the original data submitted. At this stage, the next step in the overall process is data storage.

Effectively storing data is as important a component to data management as are timely data submission and accurate entry. Storing data effectively is more than just finding a

good 'home' to keep the data from being damaged or lost. It is equally about preparing entered data for ease of future retrieval when the time comes to: (a) enter (add) newly submitted data, (b) share or review previously entered data, or (c) analyze the entered information, generate results, and share findings with others.

To do all of this, data storage requires the use of databases. Databases are often thought of as 'living' files in that they regularly undergo growth (as new data are entered after collection) and change (new types of data may appear as new factors are added to the monitoring work, whereas other factors and data may be dropped). As with all other 'living' things, databases also must be nurtured and protected from harm.

5.2.3(a) Databases of Entered Data

As previously discussed, in the case of the LMMA Network, the two databases that participating projects will be storing data in are the Microsoft Word and Excel electronic files (and their back-up copies) in which submitted data have been entered. These two files are the 'homes' for all of the numerical and textual information collected. These electronic files make for good databases because they: (1) are quickly accessible and easily updated in the future using a computer, (2) can be easily shared with others who have computers or a printed version of the file, and (3) and do not take up a lot of physical space in storing all of the information.

5.2.3(b) Database of Originally Submitted Data

In addition to the Word and Excel databases, the originally submitted data (likely hard copies as completed data forms) can and should also be kept in a database of submitted data. This database is different from the two electronic files in that it requires an adequate amount of storage equipment and physical space. In some cases, the participating project may have just begun collecting data or has only a single or small LMMA site being monitored for a few factors, and thus will have a limited collection of submitted data. In such cases, a small filing box or file folder may be adequate to store the submitted data in a safe place. In this case, the database of original data is this small filing folder or box.

In other cases, a project site may have multiple years of data for all factors collected across many LMMAs, and thus will have a substantial amount of hard copies of collected data. In this situation, a filing cabinet (or two, or maybe more) that has been organized with multiple file folders will be the appropriate database for the original data and should be kept safely in a home or office building.

In either case, at this point the data manager should ensure that the originally submitted data is either: (1) returned to the community monitoring team or collector(s) who originally collected and submitted them for safe keeping in their community, or (2) be stored at a project partner office, only after being explicitly requested and approved by both the original data collection team and the community from where the data have been collected. This latter case will most likely only be relevant when, in the judgment of the data collectors and community, it is safest for the original data collected to be stored in a

database someplace other than within the community itself. For example, a coastal community that experiences frequent flooding or is positioned in a very moist environment (where mildew and mold are an issue) may decide that the original data are best kept in a nearby dry, upland office of one of the project partners that can be easily and conveniently accessed by the community and its monitoring team whenever desired. It might be advisable that a copy of raw data returned to the community be retained (with permission) by the data manager.

After the data manager has: (1) successfully reviewed, coded, and merged a participating LMMA site's submitted data set into the two electronic file databases, and (2) returned the original data to the collectors for safe keeping in the database designed to store the original database, data managers will contact the data collectors, relevant community leaders, and the rest of the project team to inform them that the latest round of monitoring data has been reviewed and entered into the database. This is will inform everyone on the project team that the most recently collected data are now available for access and have been stored adequately for safekeeping. This can be combined with a reporting of the important findings in the data.

Sharing Data in the Network

5.2.4(a) Country-level Data Sharing

At the country level, a country network will likely decide to centralize all of the data from participating sites into a single database in order to: (1) undertake cross-site analyses (as a group activity), (2) improve the power of learning across sites in-country, and (3) share this information and results with other participants in the overall Network. In this case, copies (electronic and hard) of each project's most recent version of its two electronic databases will be shared with the country coordinator who will then merge these data sets into a larger country-wide database (electronic).

5.2.4(b) Network-level Data Sharing

Occasionally all of the members of the Network will come together to discuss and decide how data sharing and analysis can be done by the group as a whole. In such cases, individual participating members (project sites) or even an entire country network may decide to volunteer to share their databases with the entire Network in order to learn across geographic boundaries. This will result in the merging of multiple site and/or country databases into a network-wide database. For example, the Fiji LMMA country network may decide to share the country database of information collected across all of its participating LMMA sites with a few sites in Indonesia and the Hawaiian Islands where specific LMMAs are interested in learning outside of their own site and country. However, such activities and data sharing will only occur when sanctioned by all parties involved, such as during full Network meetings when members from around the Asia-Pacific region come together to share and learn.

5.2.4(c) Issues and Concerns with Data Sharing and Access

As the purpose of the LMMA Network is to improve the practice of marine conservation, it is important that a participating LMMA site be allowed and encouraged to share their data with other members who are willing to do the same. To encourage the sharing of entered and stored data between participating sites within the overall initiative, participating sites that are willing and offer to share their data with other participating Network members will be able to do so knowing that their data will be shared with others as "read-only" files, meaning that only opening, viewing, and sorting of entered data is allowed, and no one but those with password-protected permission from the project itself can alter or save the data file being shared.

In such a case, the data file can be shared by the willing site with other Network members in one of two ways: (1) through an online-accessible but "members only" (password-protected login) area within the LMMA Network website; and (2) as electronic files shared by email or disk sent by the willing member site to others upon request.

Results from data sharing of site and multi-site/country data sets that are completed or scheduled by sites, country networks, or the overall Network is encouraged. Sharing of these results with other Network members and the outside world via the Internet, email, and/or printed materials is also encouraged, but will only be done under the approved mandate of the Network and overseen by the NCT.

Issue One: Intellectual property rights

As a member in the LMMA Network, each participating project team will have already agreed to and signed the current version of the social contract, which includes an Intellectual Property Rights (IPR) Statement. This statement is designed to explicitly protect the intellectual property rights of Network members. In this regard, project teams that have agreed to and signed the social contract have thereby also agreed to share data collected with others in the Network, as per the conditions and protections outlined in the IPR Statement (visit the website www.LMMAnetwork.org to see the IPR Statement).

In addition to the social contract and IPR statement, there are four important points of guidance to the LMMA Network on the issue of intellectual property rights:

1. Copyright in any intellectual property obtained from activities carried out by a particular project will be solely held by that project and the publication of any results from that project by the Network will be arranged by written agreement between the project and the LMMA NCT.

2. Any publication of such results will include on the face of the publication, an acknowledgment of the involvement of both parties.

3. Where third parties (non-LMMA projects) are involved in the production of results and publication of those results, arrangements for copyright and acknowledgments necessary will be made by separate agreement between the LMMA NCT and that third party.

4. Arrangements concerning custodianship and property rights for images (photographs/videos) produced under the Memorandum of Understanding (MOU) are to be mutually agreed upon.

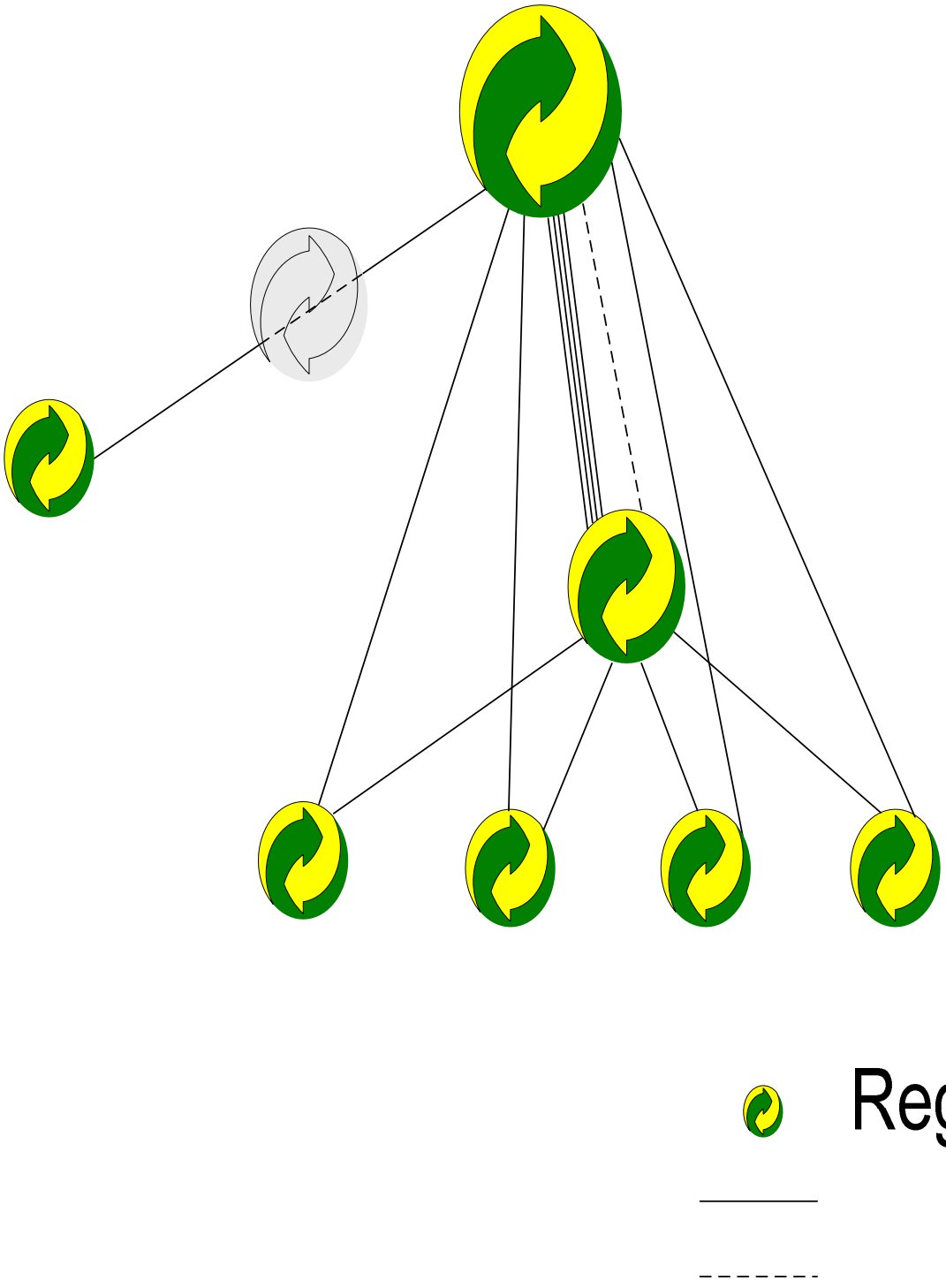
Issue Two: Access and permission process

Ultimately the right to use the data from any given project lies with the data collectors, community leaders and project team. If the aforementioned parties sign a waiver form and IPR statement, then the data is authorized for the collective use of the Network. This data may not be altered in any way except by the primary recipient of the "raw" data, or the site or country level data manager. This authorized data is posted in a secure section of the LMMA website. If this data needs to be updated or changed then the site or country level data manager will have a password to access and manipulate the data from that particular site or country. Provided that a waiver form is signed with an accompanying IPR statement, the data manager can share that data. Any participating project within the Network can have password access to all posted data as "read only" files. The network level data manager is responsible for providing regional and network level analysis to the country level data managers. The country level data managers are responsible for providing site and country level analysis directly to project teams (see Figure 5-1 below). The site and country level data managers may be the same person for countries with only one participating site.

Issue Three: Quality control

Country coordinators and certain NCT members are responsible for briefing/training site and country level data collectors and data managers in standardized protocol for sampling, data collection and data management. Country coordinators will make regular appraisals of site level data collection and management and suggest changes to methodology if necessary. If data coming into the Network database is collected or managed using sub-standard or non-standard methods, it will be flagged so that this data is not used for Network-wide comparison or analysis. Training in standard LMMA protocols will be made available to participating LMMA Network project teams.

***Figure 5-1**. Data analysis and communication paths across the LMMA Network.*



Issue Four: Formatting and data sharing

All data managers for participating sites will be supplied with pre-formatted standardized Word documents and Excel spreadsheets for the entry of LF data. Data managers will be able to adapt these sheets to suit the data that is being collected at any particular site. These pre-formatted sheets will allow all site and country level data managers to easily export data to the Network database.

Issue Five: Code sheet

All LF data will have a corresponding standardized code. All data managers will be supplied with a code sheet showing the standard code for each type of data. See sample potential standardized code sheet for factors L1 'Economic Status' and L2 'Dependence on Marine Resources' below.

Table 5-1*. Sample code sheet.*

Factor	*Code*	*Meaning*	*Notes*
L1	avhhes	Average household economic status	(field header)
L1	vhhes	Variance in household economic status	(field header)
L2	tcih	Total cash income of household	(field header)
L2	%cimr	Percentage of total cash income derived from marine resources	(field header)
L2	plmr	Proportion of livelihood from marine resources	(field header)
L2	1	Almost no livelihood from marine resources	
L2	2	Little of their livelihood from marine resources	
L2	3	About half their livelihood from marine resources	
L2	4	Most of their livelihood from marine resources	
L2	5	Almost all of their livelihood from marine resources	

5. 3 Data Set Referencing

All data or databases shared by a participating LMMA member are the explicit property of this project. The Network itself, nor any one organization or person participating therein other than the contributing project, has ownership over these data. An IPR statement has been prepared jointly by the participating members to clearly and explicitly convey the ownership and rights of participating sites' data.

Any use of shared data sets by other member sites, country networks, the overall Network, or outside parties must be granted permission in writing from the source site and appropriately referenced using standard, accepted scientific citation guidelines. Reference of shared data and data sets will be used in all relevant situations, including the following:

- Reference to any original raw data set or datum point therein.
- Reference to any coded and entered data set (electronic file) or datum point therein.

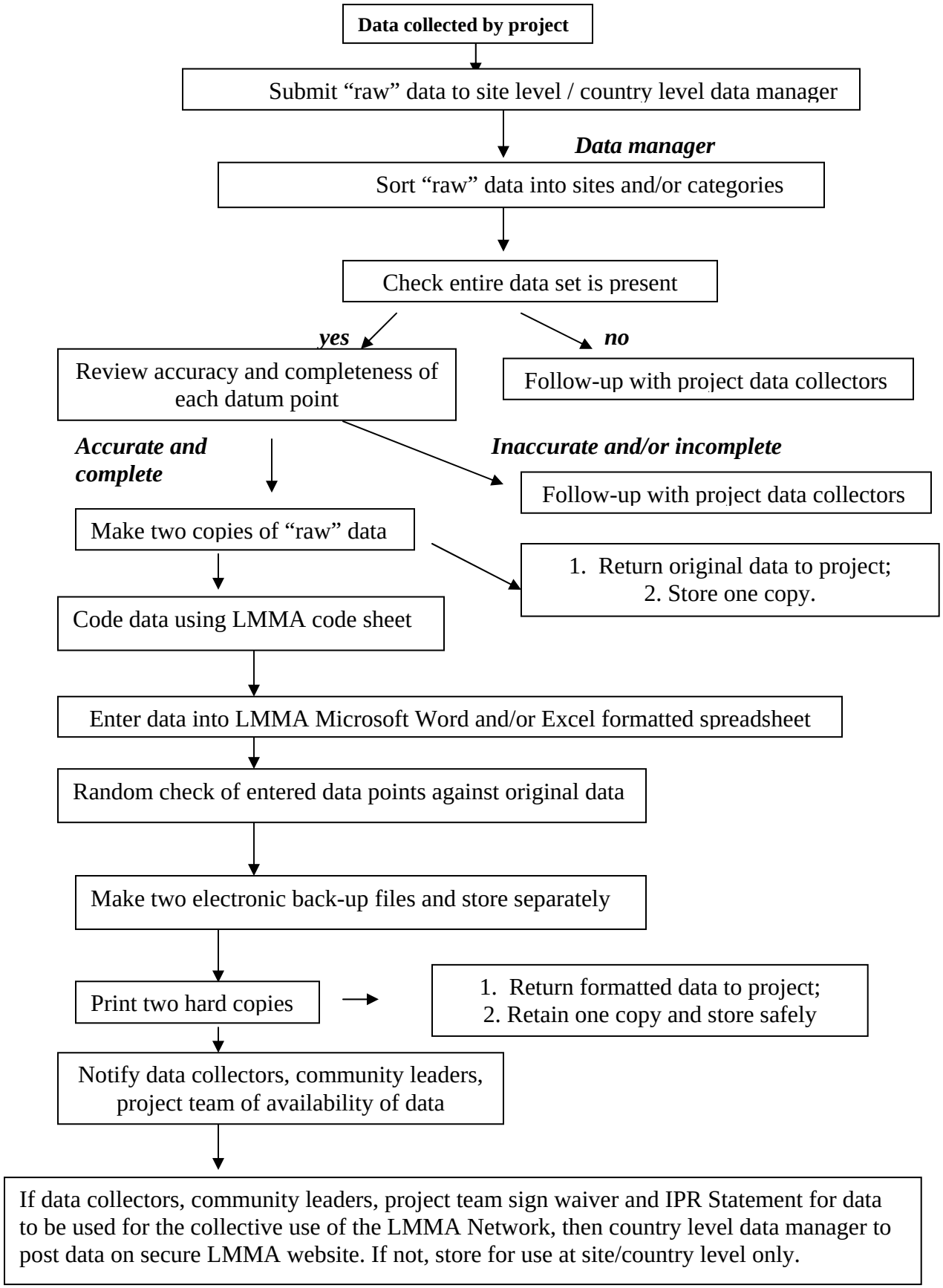
- Reference to any results or analysis that used shared data or data sets.
- Reference to any reports or publications that include the presentation, analysis, results, and/or discussion of submitted data and data sets.

Reference of data submitted by the initiative within both storage systems will include:

- The participating LMMA project (site) name from which the submitted data set is sourced.
- The names of the individuals who collected the original data (monitors), and reviewed, entered, and stored the data (data managers).
- The name(s) of the community(s) from which the data were collected.
- The names of the supporting project partner organizations on the LMMA project.
- Complete reference information must be included with all communications outputs and products.

See Figure 5-2 on the next page for a summary of the entire data management process.

Figure 5-2. *Summary flowchart of data management process.*



5.4 Data Analysis

As of the production of this LF version 2.1 (May 2004), the NCT Data Management Committee is developing a system of data analysis that will be disseminated to project teams for their use and feedback. These will be made available on the LMMA website at a later date. General information will also be made available in the forthcoming LMMA Network publication, *the LMMA Guidebook*.

Chapter 6 - COMMUNICATING RESULTS

For many marine conservation practitioners, communications and reporting of results is not something that is given a high level of consideration or thought. Practitioners are often so busy implementing, maintaining and monitoring LMMAs that communication of what is learned may not go far beyond a report to a donor or the government and perhaps a contributed paper given at a conference or published as a journal article. At the same time, it is likely that if any LMMA project team with a few years experience is asked how important clear and consistent communications with stakeholder groups, peers, decision-makers, and the public is to the success of management efforts, they are likely to respond "very important." This is because people make decisions on how to act and what to do based on information. Whether it be a traditional leader, a national policy-maker, a business leader, a donor, or a citizen, it is information that allows these people to decide how to go about their lives. Therefore, it is an absolutely critical job for conservation practitioners to make sure that the decisions people make related to the coastal environment and marine protection are based on the best available information available – in this case, information related to LMMA use. Many important conservation projects do not achieve their full potential impact because the results of the project are not available or understood by the intended audiences they are or should be shared with.

The purpose of this chapter is to inform Network members on: (1) thinking strategically about communications in general, (2) how to develop a plan to effectively communicate project results to target audiences, and (b) how members can assist and be involved with different communications activities (both internal and external) that the Network is undertaking.

After reading this chapter, you will have the basic knowledge with which you can think about and identify the following:

1. What is your overall communications goal?
2. Who is your target audience?
3. What do you want them to do or think?
4. Develop your message.
5. Choose the appropriate messenger.
6. Choose the appropriate vehicle.
7. Provide a means for gathering feedback.
8. Continually follow up, review, and revise your communications plan.

If members have feedback, questions, or concerns regarding what is outlined in this chapter, please feel free to contact the appropriate country coordinator or email the NCT at: info@LMMAnetwork.org. As the aim of this chapter is to outline a simple process through which effective communications can be possible, the country and Network coordinators are seeking input on how to improve the process.

6.1 Communication Basics

Communication is a means to an end. Its purpose is to bring about a change in understanding, attitude and/or behavior. It involves the transfer of information and feelings, and utilizes a combination of personal and technical skills. Learning how to effectively communicate and employing the appropriate technologies are the keys to successfully achieving communication – as well as wider organizational – goals.

What is Communication?

- "The exchange of thoughts, messages or information by speech, signals, writing or behavior."
- "Interpersonal rapport (a relationship based on mutual understanding and trust)."
- "The art and technique of expressing ideas effectively."
- "The transmission of information through various means, such as advertising, broadcasting, or journalism."

These are some of the various definitions found in dictionaries to define the term "communication." Since the overall goal of communication is to create awareness and adjust behavior, each one of the concepts above will play an important part in how members communicate within and outside the organization.

Communication Musts

Simply because an organization is engaged in communication does not mean it is communicating well. Bad communication can be just as damaging – or more so – than no communication at all. The following principles of effective communication are essential to keep in mind while carrying out communication activities.

- You must have a **clear mission** before embarking on a communication strategy. How do you know what to say if you don't know what you're doing?
- Communication goals must be **measurable** and **obtainable**; they cannot be too broad. How do you know if you've succeeded in reaching your goal if you can't measure it?
- Messages must be **clear**. If people don't understand what you're trying to say, they will likely dismiss it, or worse, misinterpret it and behave in a way you did not intend.
- Communication must be **compelling.** Nowadays people are subject to information overload; they have little time to filter through the mass of messages being bombarded at them daily. In order to capture people's attention, communication must be rousing in both content and delivery.

- Communication must be **consistent**. Much of what people hear tends to go in one ear and out the other. Communication must be reliable and occur regularly for messages to take hold.

- Communication must be **credible.** Information must be accurate to be influential. If not, messages won't be taken seriously, and your integrity will suffer.

- Communication must be **aimed at a specific audience.** Different audiences will require different messages as well as messengers and vehicles.

- Communication must **resonate with the audience's values**. For a message to be internalized, it must strike a cord with a person's belief system.

- Communication must utilize the correct **vehicle.** Messages must be tailored to and delivered via the appropriate medium (print, Internet, radio, television, etc.) to reach the target audience.

- Communication must consist of **ongoing review and modification.** Communication is a two-way process. It requires constant evaluation, feedback and adjustments to be effective. If there is no feedback, it isn't communication.

- Communication must be **well-integrated into an organization's operations.** Open communication amongst an organization's members helps everyone do their job more effectively and better play their roles in achieving the organization's goals. It also creates a positive culture of mutual trust and respect.

- Communication and **conduct must match.** Every member of an organization is an ambassador of its cause; personal behavior is a direct reflection of the organization itself. To uphold the organization's integrity, each individual's actions must reflect the organization's messages and values.

6.2 Communications Planning

This section describes how participating LMMA project teams can begin to think about improving communication with internal and external audiences on project progress and results.[14] Please note that there may be important opportunities for project teams to be able to pool and share human and financial resources in their preparation of project communications using the support of other members within the project's in-country network and within the overall LMMA Network.

[14] Most of the content in section 6.2 has been adapted from "So You Want to Tell Your Conservation Story?" (McCann and Parks 2003).

Audience

An audience is the target person, people, or group that you are trying to communicate to/with. Potential audiences can vary widely by LMMA site and host country. Commonly identified audiences (these can be either internal or external audiences, depending on the site) of marine conservation efforts include the following:

- Academic researchers and administrators
- Activists
- Advocacy groups
- Businesses and businesspeople (including business leaders)
- Coastal communities and residents
- Civic groups
- Decision-makers (policy) and elected officials
- Donors
- Educators (primary and secondary levels; university level)
- General public
- Government agencies and bodies
- Indigenous peoples
- International non-government conservation or resource management organizations
- Journalists (newspaper, television, radio)
- National non-government conservation or resource management organizations
- Other Marine Protected Area (MPA) managers and practitioners
- Project managers and staff associated with the MPA
- Researchers and conservation scientists
- Resource managers
- Protected area staff
- Students
- Tourists
- Traditional leaders
- User groups, including fishers and recreational users

In thinking through the aspects of site, country and Network level communications, the reader may find that there are a number of important target audiences beyond those that were originally considered or identified, and/or that planning for important communications opportunities may be beyond the current capacity of their project team … don't get worried. Others in the LMMA Network with communications experience and expertise are available to help participating projects address these needs, and will do so upon request of any participating project in the Network.

Getting Started on Communications at the Start

The right time to begin thinking about and planning for communications is at the outset of an LMMA project, not the end of it. The reason for this is twofold. First, as the purpose of using an LMMA is to improve conservation and learn how useful it is in the local marine management context, this will inevitably require communicating the results

of evaluating the conservation impact of the LMMA (via the dependent variables/target factors within the learning framework) with others who will influence this use or maintenance of LMMAs. In other words, it is important for practitioners to know at the outset of using LMMAs who they will be sharing results with, and why.

Secondly, if LMMA project teams understand which target audiences they will de directing LMMA results to and why, then the LMMA adaptive management process itself and the results that arise from it can be oriented in such a way as to inherently and efficiently generate the relevant stories and findings for the previously-identified target audiences. This orientation will thereby allow project teams to focus their sharing and application of results toward the most relevant avenues of LMMA replication, adaptation, and support. In other words, developing a communications plan at the outset of project participation in the Network (specifically, at the outset of implementation of the LF) will make applying results easier and more strategic once analysis is complete.

In understanding one's communication needs and directions at the outset of LMMA use, the necessary activities, time, and human and financial resources to meet these needs can be planned for and budgeted into the overall project workplan and timeline. These needs should be clearly outlined within a communications plan to accompany and be implemented with the overall workplan of LMMA activities. The questions necessary to be answered in a useful communications plan are presented below. When the project team finishes addressing these questions, the answers can be used to develop the LMMA project level communications plan.

Who Are the Results for?

A common contributor to ineffective communication is insufficient thought about who the results should be directed to, for what reasons, and how. A simple and useful tool to guide participating LMMA project sites through their consideration of these questions is an audience analysis matrix (see McCann and Parks 2003). An audience analysis matrix is a planning tool that logically structures a conservation practitioner's responses to a set of questions in a way that can then assist in creating a communications plan.

The steps that the participating LMMA project team should undertake in completing an audience analysis matrix are as follows:

(1) First, have the participating project team members list on a sheet of paper the names of all of the potential audiences, or interested groups or people that may benefit from or be interested in the project's communication of LMMA results and learning. For example, which communities and local leaders should results of monitoring and analysis be shared with? What organizations or groups are interested in marine conservation and protection issues at the LMMA project site or in-country? Are any government agencies or policy makers involved in LMMA use or decision-making? What sectors of the public have interests in LMMA use? Who within the project would want to learn about the results of the LMMA and any learning that comes from LMMA use within the Network?

(2) Second, from the top to the bottom of a large sheet of paper, divide the page horizontally (up and down) into five columns using a pen and a ruler. The first two columns (left-hand side of the page) should be less wide than the last three (middle to right-hand side of the page). Label the top of each of these five columns with the following five headers (left to right): (a) Audience Name; (b) Internal/External; (c) Degree of Influence/Interest; (d) Preferred Mode of Communication; and (e) Expected Action.

(3) Next, under the first column (titled "Audience Name") list all the potential audiences that may benefit from or be interested in your communication of LMMA results. A good starting point for this is your project's stakeholder analysis. List each audience name separately, and be sure to leave ample space between each. Divide each of the audiences listed from one another using a pen by drawing vertical lines between each listed across the page. The page should now be divided into five columns and as many rows as there are listed audiences (plus the top row of titles). If a second or third sheet of paper is needed to accommodate all the potential audiences identified, continue the list and the five columns.

(4) For each audience identified down the far left column, within the second column (titled "Internal/External") identify and list whether or not the audience is an "internal" or "external" one. For example, which of these audiences are internal stakeholders and participants in the LMMA project and the LMMA site management? Which of these audiences are external to the LMMA site and project management? Which audiences are other participating members in the LMMA Network?

(5) For each audience, within the middle column (titled "Degree of Influence/Interest") briefly characterize both: (a) the degree of influence, and (b) the level of interest that the audience has over the project's LMMA use and performance. It may be helpful to rank this in terms of "low", "medium", or "high" interest and influence, followed by a brief explanation of the nature and type of interest and influence relevant. In addition, list how important it is for the project to stay in communications with the audience, and how high the need is for the project to keep them informed of the results and conservation impact of the LMMA.

(6) For each audience, in the fourth column (titled "Preferred Mode of Communication") record what is known about the audience's preferred method of receiving information and communicating. In some cases, this may be closely related to the audience's cultural norms or their educational or technological capacity. For example, does the audience prefer to communicate person-to-person or as a group versus receiving and reading printed information on their own? Do they regularly read a newspaper, listen to the radio, or watch television as a primary means of receiving communication? Are they computer literate and use the internet or email regularly? Does the audience gather periodically with others at meetings or conferences? If so, when are these forthcoming?

In addition, it is important to understand what language the audience primarily uses to communicate (speaking, writing). Is the native tongue of the country or province the

primary language used? If so, does the audience also read and write in this language? Does the audience use English as a secondary language? If so, what level (basic, intermediate, fluent) of conversational English is understood? What level of reading and writing in English does the audience possess? When are the primary versus secondary languages used by the audience, if applicable? Does the audience prefer to receive information in technical or academic prose to that of an informal, conversational style? Where, how (protocol), and when are spoken or written communications with the audience typically done?

(7) Finally, in the last (far right-hand side) column, briefly describe what it is that the project team hopes or specifically expects each audience to do with the results and learning that will be presented to them? What actions does the project team want each audience to take following their receipt of results? How are these expectations linked to the goals and objectives of the LMMA project and participating communities?

Assuming that the project has completed each of the steps stated above, the team should now have a completed audience analysis matrix (see Table 6-2 and Table 6-4 later in this chapter for modified samples). It is recommended that the completed matrix be transcribed into print using a computer (word processing program) or typewriter. Copies of a printed version of the matrix will allow for the clear (legible and organized) and easy reference of the content by project and community members.

In some cases, the project team will only have a limited number of audiences to communicate with. In such cases all audiences will be important to reach. But if at this point the project team feels it has identified more audiences than it can effectively target (given available time and human and financial resources), a careful review by the project team of the relative 'importance' (e.g., high, medium, low) of reaching each audience listed in the matrix compared to each of the others will allow for the prioritizing of a discrete set of target, or primary, audiences. In this case, determining the 'priority' audiences should be based in part on understanding: (a) the overall level of perceived need for the project to reach one audience over that of another (assuming that a choice between the two had to be made), and (b) the extent of action and degree of influence that each audience can potentially have on the project's future and overall marine conservation efforts. Particularly at the outset of planning for project communications, choosing a smaller, selected group of target audiences rather than long list of audiences may help project teams focus on communications priority setting and message development.

From this point the project team should be able to use the completed matrix to: (a) easily recall communications priorities (target audiences), (b) identify commonalities and differences between target audiences (e.g., their preferred method of receiving information, the actions that can be taken by them), (c) group certain audiences together or separate them from one another, and (d) predict the level of action and degree of influence that should result from effective communication of project findings and outputs with target audiences.

If needed, review of the matrix can also be used to easily generate (for project and donor reporting purposes) a brief but comprehensive summary description of each target audience (or a group of audiences) and their specific characteristics.

How Can Results Be Most Effectively Shared?

Once a set of prioritized target audiences and their characteristics have been identified through the audience analysis, the next thing for the project team to do is determine exactly what *format* will most effectively reach these audiences.

There are several ways to transmit information to people. These include both **one-way** and **two-way** communication formats. Examples of each form of communications are presented in the Table below.[15]

Table 6-1. *A list of some of the one- and two-way communication formats that LMMA project teams can use to share their project results with target audiences.*

One-way communications	*Two-way communications*
▪ Written materials, such as reports or journal articles	▪ Group discussion (done in-person)
▪ Visual materials, such as posters, flyers, or photos	▪ One-on-one discussion (done in-person)
▪ Oral presentations (done in-person with no discussion or questions and answers)	▪ Physical and electronic bulletin boards
▪ Mass media, such as newspapers, radio or television programs, popular magazines, or film or video	▪ Remote discussion, such as use of telephones, video phones, or web cameras
▪ Internet: viewing content on the world wide web	▪ Internet: using email and participating in internet chat rooms or instant messages

(adapted from Margoluis and Salafsky 1998).

Note that in some cases, the ideal format to reach a target audience may require additional finances or the outside assistance of communication specialists such as editors, graphic artists, publication designers, journalists and news agencies, community leaders, professional facilitators, lobbyists, statisticians, and internet designers and digital solution providers.

Using your completed audience analysis matrix, the project team should identify how each target audience prefers to receive information. From this, the team should now be able to develop a logical approach of how to most appropriately prepare project results for each target audience using the most relevant one-way and/or two-way formats. This approach should be captured on paper. To do this, the project team should begin by

[15] A useful discussion of presentation formats commonly used by conservation practitioners to communicate project results can be found in Margoluis and Salafsky 1998.

listing the name of each of the identified target audiences on a piece of paper. Next, beside each audience name, list the most relevant form(s) of one- and two-way communications identified (and brief description, if necessary) for each audience. It is important to ensure that the chosen format(s) will provide for meaningful communications with the target audience receiving them.

From here the project team should now think about and decide on a delivery strategy for the chosen formats. The first step in this process involves outlining (through group discussion and writing results on paper) exactly how the relevant one- and two-way presentation formats identified and assigned to target audiences will be most strategically and logically undertaken and provided. For example, is there a particular communications format that can be used to share results with multiple target audiences? Beyond simply the format in which results are to be given, what language and style (e.g., tone, level of prose, passive or active voice) will convey the information to the target audience in a meaningful and thought-provoking manner? Which communications formats should come before others in terms of the timing of sharing results? How do these considerations differ between those target audiences that are internal and those that are included as the outside world? Are there certain communication formats and products that should be presented to target audiences together at the same time or within a restricted timeframe? Such strategic considerations regarding the delivery of results for each audience and format should first be discussed and agreed upon by the project team and then documented on paper.

Once: (1) the most appropriate one- or two-way communication format(s) to transmit results to each target audience has been identified and assigned, and (2) a delivery strategy to share results with each target audience using these formats is determined, this new information should be transcribed from writing into print using a computer or typewriter, and then copied and distributed to project and community members. It may be useful to include this new information within an additional (sixth) column titled "Communications Formats and Delivery Strategy" within the completed audience analysis matrix, or kept as a separate document that should be used in conjunction and referenced with the matrix.

What Is the Story to Be Told?

Assuming that an audience analysis matrix, appropriate communications formats, and results delivery strategy have all been prepared, next the project team should focus on what *key messages* the project team hopes to communicate through sharing their results with each target audience. The process for doing this is referred to as messaging.

Because the specific content of these messages will likely not be known until after results are generated, messaging actually requires two distinct activities and timeframes:

(1) The first activity is identifying the important themes and concepts regarding the state of the local marine environment and its management and protection status that target audiences are known to listen to and will want to hear about once results become available. From this, the most important (i.e., top three) message

themes that target audiences will likely be most interested in listening to can be identified. This part of messaging should be done at the outset of the project, before results have been generated.

(2) The second activity is identifying the specific content relating to the most important messages identified, based on the actual results and what they mean or say about the themes and concepts with which target audiences are known to be concerned.

Undertaking these two activities through the messaging process allows the project team to identify and keep in mind the most relevant and critical pieces of information that their target audiences will be looking for during the project lifetime and as results are generated.

An important part of this process is keeping an eye out for interesting and illustrative stories that can be used later on (after a round of monitoring and analysis is completed) to support or contradict the project's findings arising out of the indicators. Communication experts say that in general, most people will remember and be more interested in hearing about a compelling story than being given a list of numbers or percentages. For example, a story about how an increase in fish yields resulting from LMMA use is beneficially impacting a coastal community will be of more interest to most people than simply providing them with a list of percentage increases in several populations of marine organisms alone. However, sharing numbers can be important for a team's effective communication, particularly if they know that the target audience they are trying to reach (e.g., conservation scientists, researchers, academics, etc.) is interested in seeing quantitative evidence.

If telling a particular story is found to be useful in getting the attention of an audience, then it can be remembered and used again in the future when sharing results with other audiences. This approach of identifying and using effective examples is referred to as *story banking*. The term "banking" here is used to refer to how certain stories that are found to be useful in communicating results with others can be "saved" and remembered by the project team for future communications use. In some cases, it may be useful to even write down stories that have proven to be effective in getting audiences to listen, in order to share such stories with other members of the project so that they too may use them when sharing results.

By identifying and banking useful stories throughout the project lifetime, LMMA participants will be able to build up their ability to influence multiple target audiences with compelling, impact-oriented stories to go along with and illustrate their scientific (monitoring) results. Highlighting and illustrating project results with real-world examples, stories, and anecdotes can be powerful tools with many audiences to both build human interest in results and enhance the communicator's (i.e., project's) ability to share important messages. For instance, if an important message identified to share with local fishers (as a target audience) is that the LMMA is replenishing fish stocks, having a story about how one resident fisherman says he has been catching many more fish shortly after

the designation of the LMMA may support and strengthen the audience's understanding and interest in the project's quantitative evidence. Such a story would illustrate how there has been a three-fold increase in fish populations inside and immediately outside the LMMA compared to little or no increase in other comparable harvest areas within the project area. It may be that with certain audiences, storytelling in this manner may be the only way the audience will pay close attention to project results or numerical findings. This is particularly important when working with reporters from the media (e.g., television, radio, and newspaper), because journalists typically write for diverse audiences.

Successful messaging requires that the most important, not all, messages be prioritized and then effectively relayed to target audiences using the appropriate format(s) and delivery strategy. Moreover, different target audiences will need to be reached with different sets of key messages. Assuming that the appropriate format(s) and delivery strategy have already been documented, such considerations will already be fully understood by the project team so that they can be reviewed and taken into account each time a communications product is going to be shared with a target audience. Effectively relating messages with target audiences is not always easy, and may require a mix of communicator skill, practice, and intuition. For this reason, having a designated "communications expert" or "officer" on the project team may be useful.

A successful approach to messaging will increase the likelihood that the key pieces of information needing to be delivered are communicated in such a way (format) that it will result in the target audience undertaking the desired form of action, behavior, or influence being sought by the project team. The proof of effectively bridging important messages with identified target audiences is in how the target audience subsequently takes action once the message has been delivered. The extent in attaining the desired changes in the audience's behavior and/or improving influence over effective LMMA use depends on the target audience being communicated with, and should be easily identified through the audience analysis.

At What Point Should Results Be Shared?

Once a discrete set of the most important messages have been formulated for target audiences based on results generated, a specific and logical timeline of when to release (deliver) these messages using the various presentation formats identified and delivery strategy should be developed. It is likely that the timeline will be largely determined through: (a) the type of formats used, (b) the approach and style in which results will be strategically delivered, and (c) the nature of the messages to be delivered and desired actions to be taken by audiences.

While such planning is important and will be found to be useful, it is also important to remember that when unplanned or unanticipated communication opportunities arise, being opportunistic with communications can help a project team get their message out and may lead to greater impacts. Not all outreach opportunities with target audiences can be planned, so the project team must be ready to spot and take advantage of such opportunities if and when they arise.

The timeline should logically identify when specific formats and messages will be used to communicate with each target audience. Identification of forthcoming opportunities for outreach can come from reviewing the audience analysis matrix and in considering the logic in which results and messages should be given to target audiences.

As the project team begins to identify a logical timeline, this should also be documented on paper.

Pulling All of the Answers Together into a Plan

Assuming that the LMMA project team has come this far, the outputs of the previous steps can now be combined in a single document to create a project site's *communications plan* through which results will be strategically and logically shared. This communications plan will contain:

- An audience analysis identifying the range of possible internal and external audiences, their characteristics, and a set of priority target audiences.

- A strategy for how and where delivery of results will occur using appropriate one-way and two-way presentation formats with each target audience, including the approach and style of delivery to be taken with each communication format.

- A set of specific, key messages (with illustrative examples and stories) that effectively communicates what project results indicate and helps to focus the attention of particular target audiences.

- A timeline of when messages and presentation formats are to be released and delivered to target audiences.

Once these pieces of the plan are pulled together, an estimate of the necessary time and human and financial resources required to complete the plan can be made. Based on this estimate, the allocation of sufficient time and budgeted resources can be appropriately made at the outset of the LMMA project or within the next funding cycle. Assistance on the human capacity needed to implement this communications plan can be requested from within the country network and/or from members and coordinators within the overall LMMA Network.

The following tables are sample outputs of the processes described above, with slight modifications as follows:
- The internal/external audiences column is not specifically stated (but assumed).
- The degree of influence has not been included (this is an important omission as it helps to set priorities).
- Preferred method of communication is called "How do we reach them."
- Preferred mode of communication is called "Outreach Opportunities."
- The "Message" column included in the matrix below is described above as to be done in a separate matrix.

Table 6-2. *External Audience Analysis Matrix of the LMMA Network (version August 2003).*

Audiences	*What do we know about this audience*	*What we want them to think/do*	*How do we reach them*	*Message(s)*	*Outreach Opportunities*
Network participants	• Conferences • Workshops • Web • Email • Journals • Organizational channels • Newsletters • Cross site communication Some barriers: different languages; slow/no internet, busy people, * add contact information to dossiers… updatable project info data on web	• Remain engaged • Be committee • Learn through participatory adaptive management • Increase their own capacity • Increase project success To promote LMMA work. Influence communities Influence projects outside the network Influence their own ngo's	• what works?... of PCT, and projects.	• We're here for you. • How else can we help you • Participation is valued and key to the overall success.	• Electronic • Conferences • Outreach trips • Conference/phone calls • Site visits
Other NGOs	• Conferences • Workshops • Web • Email • Journals • Organizational channels • Newsletters • Publications • Network participants • Donors Barriers • Institutional boundaries • Arrogance, rigidity, my way is best • Distance	• Join the LMMA • Include AM • This is great! • It would be beneficial to them in joining the network • That their voices would be heard	• Network participants • Conferences • Workshops • Publications • Media • Sci journals	• This improve your practice and some of likely objectives of programs and organizations • This is a proven method (successful examples) • Follow some of the success and leadership demonstrated by our projects in Fiji.	• Site visits • Conferences • Workshops • Key persons within the organizations • All products, web, reports, brochures etc.
Government agencies	• Conferences • Workshops • Web	• Join and support the LMMA • Include AM	• Meetings. • Network participants	• This is a proven method (successful	• Site visits • Conferences • Workshops

	• Organizational channels • Publications • Network participants • Donors • Government/Institutional boundaries • Arrogance, rigidity, my way is best • Distance	• This is great, frees up government resources to focus on other issues. • Community/local management is more effective than government enforcement.	• Conferences • Workshops • Publications • Media • Sci journals	examples) • Follow some of the success and leadership demonstrated by our projects in Fiji.	• Meetings with key government officials • Publications
Donors	• Busy but interested in results • Looking to link themselves to successful projects • Will have certain reporting guidelines • Conference attendance • Site visits • Web • Other products, brochures, information kits • Media	• Continue to stay engaged with the project • Continue to fund current activities and future initiatives involved with the LMMA • Invest in similar projects • Help us spread the word on the benefits of the LMMA	• Donor reports • Media • All products (web, brochures) • Meetings • Site visits • Targeted media (Journal of Philanthropy etc.)	• LMMA activities are creating a major impact and with your continued support we can do much more. • The LMMA is improving the practice of conservation.	• Donor reports • Media • All products (web, brochures) • Meetings • Site visits • Targeted media (Journal of Philanthropy etc.)
Media	• Tough audience, very busy, not necessarily interested in your project • Only interested in newsworthy results • Press releases, fact sheets, kits • Look to develop relationships • Newsroom of your web site • Regional interest only	• Write about our results • Publicize the LMMA network and its partners • Add third party credibility • Impact government officials, NGOs and funders	• Traditional press kit materials • Personal contacts • Conferences • Other NGO networks	• Depends on the news that we are reporting.	• Traditional press kits • Personal contacts phone, email • Web • Conferences • Other NGO networks

(source McCann and Parks)

Table 6-3. Tactics Ranking Grid

Taking what we know about our audience and knowing what we want to say to them, we must find the right medium for communicating to them (e.g., glossy report, CD-ROM, web-based publication, listserves, white papers, PSAs, earned media, or some type of local event). Timetables, budgets, cost/benefits, and usability expectations also need to be developed.

Audiences	Communication Tactics						
	Web	***Conferences***	***Site Visits***	***Media***	***Publications***	***Newsletters***	***Donor Reports***
Network Participants	High	High	High	High	High	High	Medium/Low
Other NGOs	High	High	High	High	High	Low	No
Government Agencies	High?	High	High	High	High	Low	No
Donors	High	Medium	High	High	High	Medium	High
Media	Medium	High/med/low	High	High	Medium	No	No

(source McCann and Parks)

6.3 Country-level Communications Plan

As of the production of this LF version 2.1 (May 2004), the Network is undergoing a plan to address site, county and Network-level communications. As this is an ongoing activity, updates and practical "how to" information will be made available on the LMMA website. In the meantime, following is an existing example of a national-level Communications Plan for FLMMA.

Example of a National-Level Network Communications Plan: Fiji Islands

The Fiji Locally-Managed Marine Area Network (FLMMA) comprises non-government organizations (NGO's), government agencies and statutory bodies whose main aims are: (1) to conserve and sustain marine resources and ecosystems for communities throughout the Fiji Islands who seek their help; and (2) to improve the quality of life of the people in these communities. FLMMA, after successfully establishing project sites in Verata and Votua, wanted to promote establishment of LMMA sites in other parts of Fiji. The successful results of the conservation projects in both these sites created great interest among other communities/villages from all over the Fiji Islands.

Audiences

Internal Audiences

Identified FLMMA audiences are coastal communities/villages of Fiji and government and non-government agencies that make up the FLMMA Network**.** Of great interest here is the Fiji government's active involvement with FLMMA meetings and activities as it planned to revert rights and ownership of fishing grounds to their traditional native owners beginning in 2003. Communication between FLMMA and our target audience at the community level has been and is being carried out through numerous series of meetings between FLMMA staff and community leaders, followed by correspondences, telephone calls, faxes and actual meetings with people in communities themselves. Videotapes screened in villages include marine biodiversity, coral destruction, coral reef life and FLMMA project results. These videos had a tremendous effect in the thinking of village people when they saw how and what caused destruction of reefs, which could happen or was already happening at their site. Against negative scenes, village people also see the FMMA projects' positive results, which depict increases in population of formerly diminishing marine resources through the conservation process of "tabu" or no-take areas. These are most effectively presented by members of the relevant community. Planned project site visits at appropriate intervals by FLMMA staff had been found to be very much appreciated by communities. Villages have weekly meetings and districts meet every three months. Such meetings are used to discuss project results. The district meetings of village representatives are also attended by government representatives who learn about project activities and results. Posters which capture activities of a FLMMA project is a great learning and promotional tool for students and community people alike.

FLMMA reaches out to government and non-government agencies involved with the Network through its monthly planning meetings where LMMA projects' activities are discussed and future plans are designed. Collaboration work at this level through email,

telephone, and meetings is indeed very important, as our ultimate goal is government ultimately taking over management of FLMMA. Continuing collaboration through consultations and meetings is an ongoing process between government agencies and the FLMMA Network in Fiji.

Reaching out to Internal Audiences

- FLMMA plans to provide monitoring results to communities, which will be part of a project site report for all Fiji projects. It is envisaged that communities will maintain interest in their marine resources when they see the results of conservation work. Additionally, the FLMMA Network will be able to determine whether or not FLMMA goals and objectives are being met.

- The University of South Pacific Institute of Applied Science (USP-IAS) decided on a plan for 2003 in which a staff member is responsible for a FLMMA project site and is expected to act as a liaison between the site and the Network. This is a move toward having a systematic approach to bringing FLMMA projects to the same level or stage of development. This approach is envisioned to bring efficiency to FLMMA community projects in meeting their desired objectives as spelled out in their respective management plans, hence maintaining their interest. The FLMMA Network is expected to replicate this process.

External Audiences

External audiences have been identified as relevant government and non-government agencies, communities not involved with FLMMA, donors, and the media. FLMMA acknowledges the existence of other external audiences but would like to keep its audiences to the five categories stated above.

Reaching out to External Audiences

- A FLMMA project video has been televised on Fiji TV and has reached a wide cross-section of Fiji's community. Because of this outreach strategy, inquiries have been received and some villages have even gone ahead with setting aside "tabu" or no-take zones within their fishing grounds.

- FLMMA has also provided LMMA Network goals and information via radio interviews and local newspapers in the local language. Radio is an effective medium of reaching communities, as almost all Fiji communities have access to radios but may not have TV or receive newspapers.

- LMMA presentation at conferences and seminars including Global Biodiversity Facility (GBF) and South Pacific Regional Environment Program (SPREP) in the Cook Islands, where donors were present.

- Papers and talks provided by FLMMA members such as Professor Bill Aalbersberg and Alifereti Tawake to government high officials on LMMA work in Fiji; Dr. Joeli Veitayaki and Alifereti Tawake gave talks on FLMMA work to an University of Rhode Island audience.

- Journals and Publications. Some examples of published information from FLMMA sites include:
  a) Alifereti Tawake, John Parks, Pio Radikedike, Bill Aalbersberg, Veikila Vuki and Nick Salafsky. 2001. "Harvesting Clams and Data." *Conservation in Practice* 2:4.
  b) "Community-Based Refugia Management in Fiji" by Alifereti Tawake and Bill Aalbersberg. Available from LMMA Network or the authors.
  c) "Empowering Local Communities: A Case Study of Votua, Fiji" by Joeli Veitayaki, Bill Aalbersberg and Alifereti Tawake Available from LMMA Network or the authors.
  d) "Combining Traditional Values and Science for Effective Marine Resources Management in Fiji" by Joeli Veitayaki, Alifereti Tawake and Bill Aalbersberg. Available from LMMA Network or the authors.

- Parkinson Lectures at USP on environmental conservation included a presentation of FLMMA projects in Fiji.

- Press releases is another form that FLMMA has used to expand awareness.

- FLMMA won the 2002 Equator Initiative Award, which received wide coverage both nationally and internationally.

- FLMMA is in the process of developing its website.

- Annual Reports is another medium of promoting LMMA activities to donors.

Table 6-4 below shows the FLMMA Audience Analysis Matrix. Please note that the table was prepared using a slightly different format than the one described in the section 6.2, as follows:

- The internal/external audiences column is not specifically stated (but assumed).
- The degree of influence has not been included (this is an important omission as it helps to set priorities).
- Preferred method of communication is called "How do we reach them."
- Preferred mode of communication is called "Outreach Opportunities."
- The "Message" column included in the matrix below is described in section 6.2 as to be done in a separate matrix.

Table 6-4. *FLMMA Audience Analysis Matrix.*

Audience	*What do we know about this audience How does this group get their info*	*What we do we want the audience to do with this info*	*How do we reach them*	*Messages*	*Outreach Opportunities*
FLMMA Network	Members of the Network Email, letters, telephones, faxes, meetings, journals, conferences, radio, workshops, media	Remain committed Share information Improve efforts Increase success	Email, faxes phone, meetings, workshops	FLMMA committed to providing assistance, support, and training We are here for you. How else can we provide support Their participation is valued.	Site visits Workshops Cross site visits Phone, letter
Other NGO's FSPI Women in Fisheries SPACHEE TNC WRI	Existing national and international NGOs and conservation practitioners that are not part of the Network Conferences Workshops Media Publications Network agencies	To start thinking about joining the FLMMA Network FLMMA project is great! They can contribute to our cause	Publications Media Press releases FLMMA presentations	FLMMA methods have a proven record - Verata and Votua project sites are examples. There are now 22 project sites in Fiji. Still more and more communities are requesting establishment of LMMA projects at their sites	Conferences Workshops Site visits FLMMA info kit and brochure
Other government agencies	Government departments not part of the Network Conferences Workshops Media Publications Network agencies	To start thinking about joining the FLMMA Network FLMMA project is great! That they can contribute with our cause	Publications Media Press releases FLMMA presentations	FLMMA methods have a proven record - Verata and Votua project sites are examples. There are now 22 project sites in Fiji. Still more and more communities are requesting establishment of LMMA projects at their sites	Conferences Workshops Site visits Meetings with key government officials Brochures
Donors	Busy but interested in results Donors want to be associated with successful projects Regional conferences attendance Site visit Web Annual Reports	Stay engaged with the Network Continue to fund current and future LMMA activities. Invest in similar projects. Help us news about the benefits of LMMA	Donor reports Publications Media Web Publications Journals	Equator Initiative Award won by FLMMA created a major impact both locally and worldwide. LMMA activities and documentation of results are improving.	Conferences Newsletters Publications Information Kit and brochures
Media	Very busy and not necessarily interested in our project Only interested in newsworthy results Press release, fact sheets, brochures	Spread successful results of FLMMA. Impact communities and other agencies about FLMMA.	Personal contact Conferences Other NGO networks	Reported successful results of the Verata and Votua projects	Personal contact Phone, email conferences

6.4 Network-wide Communications Plan

During 2001 and 2002, the Network Coordination Team (NCT) of the LMMA Network sought the expertise and participation of communications specialists to help develop an external communications strategy for the overall LMMA Network. In order to begin the development of an appropriate communications strategy, the NCT engaged in a strategic communications planning process, the outputs of which were outlined and discussed within the LMMA's Learning Framework (LF) version 2.0, and served as the initial foundation of the Network's external communications strategy.

In February 2004, the NCT worked with another team of communication specialists to re-address the communication needs of the overall Network as well as project-based needs. The team worked with the NCT to review the existing plan, elicit feedback and suggestions, bring to light pressing communication weaknesses and needs, and prioritize communication products and activities for 2004. The results from this work, together with the previous findings, are the basis for the LMMA Network Communications Plan for 2004.

Throughout the remainder of this chapter, wherever a goal or need is identified, it is followed by "**Actions needed**." These actions, many of which overlap between the different sections, are refined and compiled in a workplan that details the people involved, their roles and responsibilities, timeframe and estimated costs. Staying true to the adaptive management approach, this plan will adapt and change as the Network moves through the activities listed herein, monitors and analyzes results, and learns how they may be improved.

Goals and Objectives

The communications goal of the LMMA Network is:

> To inform conservation practitioners on how they can improve the practice of marine conservation and link their site-based LMMA actions into a broader, more powerful international voice.

The Network hopes to do this by strategically sharing and clearly demonstrating with defined target audiences under what conditions community- and collaboratively-based marine management and protection can both be of important conservation value and serve as a complementary approach to government-led marine protection efforts. This requires the focused, effective and timely communication of key messages with target audiences.

In keeping with the principle that "communication goals must be measurable and obtainable," we need to refine this goal so that it is as specific as possible. What is the behavior we are trying to change? What would be the measurements that we have succeeded?

For the first half of our goal, the behavioral outcome would be that practitioners are doing better conservation after learning about (via the LMMA website, videos, radio, written materials, workshops, etc.) and implementing the LMMA approach. The tangible measurement would be more project sites and more/bigger fish/clams/xx resources at those sites (these resource data are being collected using the LF, and a means for compiling and analyzing data from different sites and sharing results in a coordinated effort is currently being developed by the NCT Data Management Team.)

For the second part of our goal, the measurement of success would be more stories and lessons learned being shared among communities, practitioners and broader audiences worldwide.

With the Network's communication goal in mind, the following are specific communication objectives for the Network:

1. **To engage members in communication efforts -** To ensure the full participation of LMMA members within external communications and delivering key messages to target audiences.

   Actions needed:
   - Provide training to participating members in communications planning and implementation, identifying audiences, and targeting and delivering messages.
   - Include all members in requests for submitting materials to include in communication products, such as the LMMA website, brochure, books, training manuals, videos, etc.
   - Include all members in notifications of new communication products available and surveys/requests for feedback.

2. **To orient communications products so that they:**
   (a) **show proof -** clearly evidence the biodiversity conservation impacts, fisheries management utility, and social value being measured at participating projects sites;
   (b) **are useful to communities and practitioners** – transfer knowledge and skills to participating community groups and organizations; and
   (c) **promote the LMMA Network and its work -** build awareness among other conservation practitioners, organizations, agencies and the general public of the Network and its learning progress.

   Actions needed:
   - Participating projects provide relevant data, results, photos, stories, charts, etc. demonstrating such evidence to the Communications Team (via the NCT representative) for inclusion in communication products.
   - Development of training materials, such as an LF training video, as well as making available (either on website or as hardcopy) sample socio-economic surveys, biological monitoring procedures and templates, etc. Also include a section on the LMMA website for "Training Tips" that will showcase how-to

articles and/or samples and templates on various training topics. Can update every month and keep the others archived for easy retrieval.
- Collect mailing lists from all NCT members and designate a centralized home for these and person(s) responsible for keeping updated. Send out regular correspondences to these recipients on recent LMMA news, events, accomplishments, etc.
- Synthesize data from individual project sites into a Network-wide database to be analyzed in order to actually determine the LMMA's learning progress.

3. **To identify appropriate messages and vehicles for target audiences -** To understand the information target audiences need and in what format they prefer to receive messages.

   Actions needed:
   - Conduct a survey of target audiences to find out how they use information and what vehicles are best to deliver them (LMMA website, publications, mass media, video, in-person meetings, etc.). Incorporate responses into the mailing list to ensure appropriate method of communicating with each recipient.

4. **To improve internal and external communication -** To continually learn how to provide for efficient and effective internal and external communications within the Network.

   Actions needed:
   - Constant review, feedback, and modification of process.

5. **To ensure customer satisfaction -** To learn how satisfied our clients are in our communications with them by following up and surveying them after communications have been completed. Clients include both internal (member projects, partner organizations, government, donors) and external (outside practitioners, international conservation community, decision-makers, the general public) target audiences.

   Actions needed:
   - Create a standard yet modifiable survey to use for this and circulate results to gain feedback on how the LMMA can improve communications.

6. **To create a trusting, enjoyable, and powerful communications environment -** To ensure that Network communication respects intellectual property rights, provides for results sharing and equitable acknowledgement, increases morale, inspires confidence and encourages participation.

   Actions needed:

- Create a protocol for approving and using data, results, name mentions, quotes, photographs, video and sensitive information from project sites, and for citing sources, acknowledgments, copyright and contact information.
- Include all members in requests for submitting materials to include in communication products, notifications of new communication products available, and surveys/requests for feedback.

7. **To empower site partners/members to tell their own stories, key messages and lessons learned -** To provide the skills to communities and individuals to tell their story in their own words describing how using an LMMA approach affected their lives/resources/communities.

Actions needed:

- Provide training to project partners and members at the site level in communications planning and implementation, identifying audiences, and targeting and delivering messages to them.

Advantages in the Network's Ability to Deliver Results

1. **Credibility.** There is growing body of documented and peer-reviewed evidence that LMMAs are being successfully used for marine conservation. Most of this evidence has been generated on a case-by-case basis, but there exists some comparative documentation of the experiences and challenges that multiple LMMAs share together. Because of mounting conservation needs and increasing evidence of the utility of LMMA use, LMMAs are increasingly being cited as necessary conservation tools. There is growing demand on how to most effectively use these tools.

2. **Real world examples.** There already exists a substantial number of marine conservation projects, coastal communities, NGOs, and government agencies throughout the world actively using LMMAs. This means that there exists a base of potential Network members who could participate in, contribute to, and benefit from the LMMA Network. Such existing activity allows the LMMA Network to build a learning foundation based off the existing knowledge and experiences already available from both single and multiple LMMA sites.

3. **Existing opportunities for sharing information.** The international conservation community comes together on a regular basis at meetings and conferences, providing the Network with the opportunity to share its results and learning with conservation practitioners and organizations, decision-makers, donors and other target audiences through existing dissemination channels.

Obstacles to the Network's Ability to Deliver Results

1. **Lack of capacity.** The members of the LMMA NCT have full-time commitments at their primary jobs in addition to trying to provide coordination services to the

increasingly large and complex Network membership. The capacity of this team is no longer sufficient to meet all of the growing needs of the Network and its members.

Actions needed:

- Hire additional staff/consultants to assist with the Network's communication work.

2. **Lack of participation.** Many projects associated with the Network are not receiving the services needed to fully participate (particularly capacity-building in their ability to use the LF), thereby leading to reduced buy-in and participation.

Actions needed:

- Increase members' capacity through training (especially in LF proficiency) and member participation through inclusion in communication activities/products/surveys.

3. **Lack of consensus.** Political interference from and among government agencies, NGOs, and community leaders within some of the member projects and country-level networks lead to competing principles, aims and/or reduced efficiency in conservation efforts.

Actions needed:

- While there will never be full consensus among all sectors on particular approaches and issues, training in governance, mediation and conflict resolution may help to alleviate some of these barriers.

4. **Hindered opportunities for in-person sharing.** The international travel required to share skills and results is being increasingly challenged and restricted by instable global security, including both political stability internally within Pacific Island nations and between nations as a result of the United States' efforts to avert terrorism.

Actions needed:

- While nothing can be done directly about the political climate and its affects on travel, the Network can adapt by making the necessary adjustments to compensate for this by staying attuned to recent political affairs and planning for site visits and in-person meetings accordingly, such as allocating extra time for making visa arrangements and actual travel, special consideration when selecting venues and being flexible to last minute venue changes, etc.

The Role of the NCT Communications Committee

While the Network's Internal Communications are handled by the NCT Coordination Committee, External Communication is entrusted to the NCT Communication Committee. Specifically, the function of the NCT Communication Committee is to:

1. Help projects get their stories told.
2. Produce overall Network communication materials.
3. Assist country Networks with their communication needs.

A long-term goal of the Communication Committee is to "take it to scale." Rather than having a centralized body covering select stories from the field and trying to produce communication materials to satisfy all needs, the hope is to enable project-level partners to do it themselves. As mentioned several times throughout this section, this would require training in basic communication planning and implementation, in addition to providing ideas on how to find the local resources to help in areas where local member capacity is lacking (e.g. identifying and utilizing Peace Corps volunteers, journalists, students, etc. where possible).

Actions needed:

- Develop a project-level communication planning training module and/or basic information sheet that country coordinators can deliver/transfer to project members at the site level.
- Develop a simple template for storytelling that can be used by members at the site level.
- Provide assistance and training as needed to site-level members and country Networks.

Communication Needs

The following communication needs have been identified for the Network:

1. **Clarifying what the Network is/does**
   - differentiating between LMMAs in general as one management tool from the LMMA Network as a whole (many think these are one and the same).
   - differentiating between the NCT and the LMMA Network (some think the NCT ***is*** the LMMA).
   - requirements and objectives of the Network.
   - clearly explaining the process to determine whether an LMMA is the right tool to use at a particular site (both to practitioners and donors).
   - differentiating between which models work at particular sites and which won't.

   Actions needed:

   - Clearly and simply state the "who/what/how" about the Network on all communication materials. Have a standard declaration similar to a tagline, as well as more detailed information that is easy to find, access and understand. This will ideally include a graphic representation of the Network as well as a full listing of NCT members, their affiliations and their roles within the LMMA.

- Develop a short, simple yet clear information fact sheet on the LMMA (a shorter version of the Frequently Asked Questions) that can be viewed "at a glance."

2. **Promoting the Network and its work**
   Actions needed:
   - Collect mailing lists from all NCT members, designate a centralized home for these and person(s) responsible for keeping updated. Send out regular correspondences to these recipients on recent LMMA news, events, accomplishments, etc.

3. **Sharing experiences and lessons learned from the field**
   Actions needed:
   - Create a forum for sharing data collected and analyzed at individual project sites, and create a means for integrating site-based data into a Network-wide database where results can be compiled, analyzed and shared.
   - Include all members in requests for submitting materials to include in communication products and notifications of new communication products available.
   - Provide basic training in communication and storytelling to site-based partners.

4. **Training manual/guidebook, videos, and other materials on LMMAs and Adaptive Management**
   Actions needed:
   - Locate and compile all existing resources on LMMAs and Adaptive Management in a centralized storehouse that is easily accessible by practitioners.
   - Identify gaps in existing resource base and develop plan to acquire and/or create them.

5. **Skills in writing reports and stories; communications training**
   Actions needed:
   - Provide basic training in communication and storytelling to site-based partners.

6. **Person to do the work**
   Actions needed:
   - Hire staff/consultant to carry out the necessary work.

Audience, Message and Messenger

So far, many actions have been identified throughout this section, which have been refined and compiled into a separate workplan. As the Network addresses each action

and creates/modifies its communication products, it is important to keep in mind the audience, message and messenger.

Audience

The Network must always keep in mind the ultimate goals and objectives of its communication with each audience. What behavior are we trying to change? What do we want them to do/think/feel? What is important to them and how can we use that to get across our message? What is the outcome we want from our communication with them? Identifying the appropriate approach for each audience is crucial for communication success.

The LMMA Network has four primary target audiences:
1. Conservation professionals (CPs), including scientific community and academics
2. Communities
3. Government
4. Donors

Message

The Network's core message is the same for all audiences, yet with slight modifications dependent on the specific recipient targeted, as follows:

- to CPs - "Teach this approach, which has proven to be useful"
  - "How this approach is different from other approaches"
- to Communities - "Use this approach"
- to Government - "Support this approach and others using it"
  - "Use the approach"
- to Donors - "Fund us/our projects"

Messenger

We have identified our target audiences and what we want to say to them. The next question is - who will the target audience listen to? A fisher from a small coastal village will likely respond better to another fisher in the same situation rather than a foreign aid worker or businessman. You would not want, for example, to have an executive of a big international corporation tell fishers in a small community why they should stop blast fishing. The message is much more convincing when it comes from someone with whom the audience can identify ("If it worked for us, it can work for you."). This "testimonial" type of approach can be very compelling. As one NCT member said, "having communities tell their own stories can be a very powerful tool." This applies to both the receiver (it provides evidence or proof that this approach works), as well as the messenger (it fosters a sense of pride and accomplishment).

The messenger could be the same for some target audiences, while very specific for others. What would a community member say in their own words about using an LMMA approach? What would a donor say about the Network and its work? The following are potential messages from various messengers directed at different audiences:

Messenger: Fisher/Community (to all target audiences)

Messages:

"The big fishes have come back."
"We now have lots of clams."
"We're now catching fish in areas where we never caught fish before."
"We've seen xx [marine resource] where we haven't seen them for years."
"We're getting help from outside the community."
"We did it ourselves."
"We're losing our fish/reef/etc. [resources]."
"This approach was helpful."
"This is good for our biology, socio-economy, and governance."
"We became tighter as a community."
"It's easy to use. It gives us more power over our area."
"We're learning new skills."
"There's more poaching because we're doing so well."

…and what the Network would answer for fisher/community:

"How can we stop dynamite [destructive] fishing? How can we get the government to help us? How can we affect policy?"
"What is this all about? Just another foreign package?"

Messenger: Donors (to other donors)

Messages:

"Supporting the LMMA Network is a way to help projects we're already supporting improve their conservation activities/impact."
"Supporting the LMMA Network a way for us to get an indication of how effective LMMAs are, which will help with our grantmaking strategy."
"Supporting the LMMA Network is a way to bring our site-based grantmaking to scale."

Messenger: LMMA (to donors)

Message:

"The money you have given us has multiplied in many ways: fish, livelihood, coral reef conservation."

Messenger: Practitioner (to practitioner)

Message:

"The LMMA concept is a set of tools available to anyone (it's not a 'gang')."

Communication Products/Activities

The following communication products/activities have been identified for the Network:

- Articles in general
- Branding/Logo usage guidelines
- Training Manual
- Graphic representation of network
- Newsletter
- Presentations at conferences
- Project fact sheets
- Publish LF
- Stories from the field
- Template for press releases
- Test LF and results
- Training video (LF Introduction)
- Translating LF to local languages
- Updating LMMA brochure
- Videos in general (on training, conservation, site stories, etc.)
- Website update

Strategic Selection of Priority Products

In order to know where to begin with these products and activities listed above, the NCT ranked them in order of priority to narrow them down to the top five priority products/activities as follows:

Rank	Product/Activity	Audience	Vehicle
1	Stories from the field	Communities	Video
2	Website update	Conservation Professionals	Web
3	FLMMA Training Manual/"JP's" Guidebook	Conservation Professionals	Print/web
4	Publish LF	Conservation Professionals	Print/web
5	Training video (LF Introduction)	NCT, Conservation Professionals	Video

These products and activities and more are currently being undertaken as part of the Network-wide Communications Plan. Check the LMMA website at www.LMMAnetwork.org regularly for progress updates. For more information, or to provide feedback on anything in this document, please email info@LMMAnetwork.org.

GLOSSARY

Adaptive Management – A process that integrates project design, management, and monitoring to provide a framework for testing assumptions, adaptation, and learning.

Aggregate Score – .

Analysis – The process of comparing the parts to the whole, either in seeking out differences or similarities, or relationships between the two. Studying data to extract information from them.

Artisanal – As related to fishing, small-scale, commonly traditional practices, usually for non-commercial or subsistence purposes.

Assessment – A study to collect data at one time, usually conducted prior to more extensive research, monitoring, or other long-term activities.

Assumption – A statement of causality believed to be true. Symbolized in models as links between factors showing how they affect one another. Represented in conceptual model diagrams by arrows. The direction of the arrow indicates the primary direction of causality. Large arrows represent general links to a suite of factors.

BEANS – Acronym standing for "Brief Easy Attitude and Numbers Survey." A Participatory Resource Assessment (PRA) method used to obtain information from key informants about the number and distribution of a factor within a population.

Causal chain – An explanation of causal relationships between factors, conditions or effects.

Catch-per-unit-effort (CPUE) – Catch or harvest statistics standardized to compensate for variable units of effort, e.g. hours of fishing.

Conceptual model – A representation of general conditions, factors, and assumptions within the context of conservation or resource management at a site. A conceptual model diagram shows the relationships between certain factors that are believed to impact or affect one another.

Conditions – The current state of being or existing circumstances at a project site.

Correlation – A relationship or trend between the values of two variables.

Dependent variable – A variable that is a function of other variables used to describe a given outcome or result. Generally graphed on the y-axis.

Direct threat – Factors that immediately affect the target or physically cause its destruction. Represented in conceptual model diagrams by a rectangle.

External threats – Threats caused by processes, activities, or individuals that originate from outside a site.

Factor – The specific events, situations, conditions, policies, attitudes, beliefs or behaviors that you believe affect the target condition at a site as represented in a conceptual model. Factors correspond roughly to predictors or independent variables in evaluation research.

Governance – The rules, rights and institutions involved in determining the norms of behavior in society.

Hypothesis – A statement of assumption or belief about reality that can be tested.

Income-generating – Refers to activities that as a result produce money or cash, as opposed to subsistence.

Indicator – A unit of information measured over time that documents changes in a specific condition.

Indicator species – A species indicative of the quality, condition or health of some aspect of its environment or specific community. Additionally, indicator species can be species particularly valued by humans for promoting human well-being.

Indirect threat – Factors that underlie or lead to the direct threats. Represented in conceptual model diagrams by a rectangle.

Internal threats – Threats caused by processes, activities or individuals that originate from within a site.

Key informants – People with rank, experience, or knowledge who can provide extensive insight on biological or socio-economic conditions at a site.

Learning Framework (LF) – A basic planning and monitoring tool used as a guide by participating project teams in the Network that describes: (a) the typical conditions and common strategies and/or tools being used at project sites, (b) general assumptions about the use of these conditions and tools or strategies being applied, and (c) the comparable set of information and methodologies that will be used to test these assumptions.

Livelihood – Human activities undertaken to maintain life, standards of living, and lifestyle.

Locally-Managed Marine Area (LMMA) – For the purposes of this Network, a defined or delineated marine area – including coral reefs, seagrass beds, mangroves or other associated area – where special management rules are applied and has significant management input from local stakeholders and interests. An LMMA is the water area (or 'marine' portion) of a site that is being managed with local stakeholder influence and/or input. As the name implies, the locally-managed marina area consists of the entire marine area that stakeholders are managing, not just the protected areas or tools being used within it. There may be several tools being used within an LMMA (e.g., a no-take zone in one portion of the LMMA, and a species specific refugia in another).

Locally-Managed Marine Area (LMMA) Network – The LMMA Network is a formal group of projects that use a common strategy to achieve a common end and agree to work together to systematically collect, test, and communicate information about the conditions under which this strategy works best and why. The Network attempts to improve the capacity of its members through networking, specific training, and skills-building in the practice of Adaptive Management.

Managed Area – The overall marine area being used and actively managed by local stakeholders.

Network Coordination Team (NCT) – Members of the LMMA Network who are responsible for organizing, planning, and coordinating activities of the Network.

Practitioners – Individuals and organizations that have the skills and capacity to implement these strategies. Represented in conceptual model diagrams by a diamond.

Project – An undertaking by a team of people interested in achieving specific goals and objectives and who are working to implement or enhance an LMMA strategy at one or more specific sites.

Proxy indicator – A substitute for an indicator that cannot be directly measured or assessed.

Quadrat – A fixed unit area, usually square, used for sampling.

Qualitative – Descriptive, non-numerical assessment. Qualitative data normally describe people's knowledge, attitudes or beliefs.

Quantitative – Numerical; based on counts, measurement or other values. Quantitative data generally describe formal measurements of variables such as income, crop production, or animal population densities.

Replicate – A repeated sample from the same location and time

Resilient – Marked by the ability for an ecosystem or community to recover readily from damage, disturbance or catastrophe.

Site – A site is the area where an LMMA is physically located and includes the habitats and resources present in the area, as well as any village or community that is adjacent to the LMMA and whose members use its resources. A project may involve just one site or multiple sites. For the purposes of the Network, a site also includes a temporal dimension, which pertains to the timescale of the project or project activities.

Social contract – In the case of the LMMA Network, a mutually-developed agreement that governs how the Network functions. It includes a statement of the Network's vision, outlines ideas of what the Network members will do together, and describes the obligations and benefits of being a Network member. Although useful as a reference for the participating project team and others involved in the Network, the 'social contract' is *not* a legal document.

Socio-economic – Referring to social, cultural, economic, and political aspects or conditions.

Stakeholder – People, groups, communities, and organizations who use and depend on marine resources, whose activities affect marine resources, or have and interest in these resources or activities. Stakeholders can include residents of the project site, local users, government agencies, non-government organizations, private businesses, and others who potentially will be affected by project activities or outcomes.

Strategy – The actions being taken to address the threats and achieve the target. Represented in conceptual model diagrams by a hexagon. All projects in the Network use at least one type of LMMA strategy. They may use other conservation and/or resource management strategies and tools as well.

Subsistence – Describes productive activities which directly contribute to bodily sustenance and basic human needs; no excess production for commercial profit.

Target – The condition that the project is focusing on and is trying to affect through its activities. Represented in conceptual model diagrams by a circle.

Temporal – Referring to time.

Test – A procedure for critical evaluation; a means of determining the presence, quality, or truth of something. Systematically trying different interventions to achieve

desired outcome. In statistics, one of various methods used to validate an assumption or hypothesis.

Threat – A factor that undermines or poses danger to the continued existence of biodiversity, healthy ecosystems, or resources used by humans. See *Direct threats* and *Indirect threats*.

Threat Reduction Assessment (TRA) – A simplified method of assessing threats and measuring overall conservation success.

TRA Index – This index is designed to identify threats, rank them according to their relative importance, assess progress in reducing each of them, and then pool the information to obtain an estimation of actual threat reduction as a percentage of total potential threat reduction so that meaningful comparisons can be made across different projects.

Timeframe – A period or scale of time. In relation to the Network, timeframe is the time period over which project assessments are made.

Tool – A specific strategy or action that a project can use to counter threats to conservation targets.

Transect – A line or narrow belt used to survey the distribution of organisms across a given area.

Triangulate – Using of a variety of sources, methods, and/or field team members to cross-check and validate data and information. See *Validation*.

Unit of Effort – The amount of time spent harvesting resources, as opposed to the actual amount of targeted resources harvested.

Validation – The process of cross-checking to ensure that the data obtained from one survey or monitoring method are confirmed by the data obtained from a different method. See *Triangulate*.

Variable – A particular characteristic of a unit that an observer in interested in measuring. Any measurable aspect of a sample that is not constant.

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