Measuring Conservation Impact

An Interdisciplinary Approach to Project Monitoring and Evaluation

Proceedings from a BSP
symposium held at the joint annual meetings
of the Ecological Society of America and the
Society for Conservation Biology in
Providence, Rhode Island, August 1996

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About BSP

The Biodiversity Support Program is a consortium of World Wildlife Fund, The Nature Conservancy, and World Resources Institute, funded by the United States Agency for International Development (USAID). BSP's mission is to promote conservation of the world's biological diversity and to maximize the impact of U.S. government resources directed toward international biodiversity conservation. This publication was made possible through support provided by the Global Bureau of USAID, under the terms of Cooperative Agreement Number DHR-5554-A-00-8044-00. The opinions expressed herein are those of the authors and editors and do not necessarily reflect the views of USAID.

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Editors' Preface

Conservation project managers need to measure project success for two reasons. They need to understand the impacts of the activities they are carrying out in the field. They also need to obtain reliable and timely information in order to make informed decisions. Reliable data help conservation practitioners determine the effects of their projects and why interventions succeed or fail. Perhaps most importantly, monitoring and evaluation (M&E) provides the raw material to form a sound foundation of knowledge about a given project. Based on this knowledge, project managers can carry out *adaptive management*—the integration of program design, management, and monitoring to provide a framework for testing assumptions, adapting, and learning.

While the benefits of a functional M&E system are clear, it is surprising how few conservation projects have one in place. Some of the barriers to doing M&E at the project level include insufficient capital and human resources, lack of experience and expertise, and previous negative experiences with data collection. These obstacles, however, are not insurmountable.

In our work at the Biodiversity Support Program (BSP) and in collaboration with our conservation partners, we have found that there are critical points in the M&E process at which project managers may need a little extra help in maintaining their momentum. These critical points include the following:

1) Conceptualization of the project and the context in which it will be carried out;
2) Selection and use of appropriate methods for data collection and analysis; and
3) Use and application of the results of M&E to adapt and learn.

To this end, we organized the symposium Measuring Conservation Impact: An Interdisciplinary Approach to Project Monitoring and Evaluation at the 1996 joint annual meetings of the Ecological Society of America and the Society for Conservation Biology. This publication contains a complete set of papers that were presented at the symposium.

We organized the symposium so that two invited speakers would address each of the three critical points listed above. Our team of six presenters was truly interdisciplinary and international. It included economists, ecologists, biologists, and anthropologists representing Africa and Madagascar, Asia and the Pacific, and Latin America and the Caribbean. All of the invited speakers came from current or former BSP partner organizations that have demonstrated a strong commitment to improving their M&E efforts.

We trust that you will agree that the papers presented in this proceedings contribute significantly to advancing our field's understanding of how to make effective M&E happen in the field. All of the authors stress the need to take an interdisciplinary and highly participatory approach to conservation project design, implementation, and monitoring. All of the papers provide excellent examples of putting the theory of adaptive management into action, whereby project managers identify, collect, analyze, and use relevant data to test assumptions, adapt, and learn. We hope you will find these papers as useful and relevant to your work as we have to ours.

—Kathy Saterson, Richard Margoluis, and Nick Salafsky

Acknowledgments

Many people contributed their knowledge and skills to produce this book. Our special thanks goes to Ilana Locker, who played an indispensable role in coordinating the symposium, including the travel and lodging arrangements for the participants. We would also like to recognize Jonathan Adams, who wrote initial drafts of introductory sections, as well as the editorial support services provided by Grammarians, Inc. Finally, we would like to thank Norma Adams for serving as managing editor of this publication.

Acronyms

AMP	Activity Management Profile
BCN	Biodiversity Conservation Network
BKA	Beekeeping Activities
BR	Biligiri Rangan
BRT	Biligiri Ranganswamy Temple
BSP	Biodiversity Support Program
CBNRM	Community-based Natural Resource Management
CBO	Community-based Organization
CMBRS	Crater Mountain Biological Research Staff
CMCS	Community Management Calculation Sheet
CMP	Community Management Profile
CMT	Community Management Toolkit
CMWMA	Crater Mountain Wildlife Management Area
FLACSO	Spanish acronym for Latin American Social Sciences Faculty
FRLHT	Foundation for the Revitalization of Local Health Traditions
FPU	Food Processing Unit
GPS	Global Positioning System
HEP	Human Ecological Profile
HMPU	Herbal Medicinal Plant Unit
HPU	Honey Processing Unit
ICAD	Integrated Conservation and Development
ICDP	Integrated Conservation and Development Project
IDCS	Institutional Development Calculation Sheet
IDF	Institutional Development Framework
IDP	Institutional Development Profile
IDT	Institutional Development Toolkit
IRDNC	Integrated Rural Development and Nature Conservation
LACD	Latin and Caribbean Division
LAMPS	Large-scale Adivasi (tribal) Multipurpose Societies
LIFE	Living in a Finite Environment
LLNP	Lore Lindu National Park
M&E	Monitoring and Evaluation
MB	Management Body
MC	Management Committee
MET	Ministry of Environment and Tourism
NGO	Nongovernmental Organization
NNF	Namibian Nature Foundation
NNFC	Nyae Nyae Farmers Cooperative
NTFP	Non-timber Forest Product
PALOMAP	Local Participation in Protected Areas Management (Spanish acronym)
PCI	Participatory Conservation Initiatives
PHF	Pacific Heritage Foundation
PMV	Program Monitoring Visit
PNG	Papua New Guinea
RCF	Research and Conservation Foundation
SPOT	Earth Observation Satellite System (French acronym)

SWOT	Strengths, Weaknesses, Opportunities, Threats
TIAT	Training Impact Assessment Tool
TLO	Trained Local Observer
TNC	The Nature Conservancy
USAID	United States Agency for International Development
VGKK	Vivekananda Girijana Kalyana Kendra (Hindi)
WCS	Wildlife Conservation Society
WMA	Wildlife Management Area
WWF	World Wildlife Fund

Part I

Introduction

R. Margolis

1

Why Is Monitoring of Conservation Projects Both Necessary and Challenging?

KATHRYN A. SATERSON
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Why Is Monitoring Necessary?

Conservation projects worldwide have three major needs that make monitoring necessary:

- Determining whether the project is meeting its conservation goals and whether it is achieving a positive conservation impact.
- Deciding how project staff should adapt and modify their efforts through time to ensure that the project continues to achieve positive impacts.
- Ensuring that all participants in the project, from international nongovernmental organizations (NGOs) to local communities, learn from the experience and can improve their implementation of future conservation interventions.

Continuous monitoring and assessment of project progress can ensure that all three of these needs are met. In recent years, there has been a growing call to improve the monitoring of conservation projects. This call has come from donors who seek to understand the impacts of their funds, from members of the international conservation and development community who seek to understand which approaches to conservation have worked and which have not, and most important, from local stakeholders who seek to understand the best ways to manage the biological resources they control.

Monitoring is necessary in order to determine what conditions lead to the success or failure of a specific conservation approach or strategy. Most conservation projects involve a range of social, economic, or political interventions that are expected (hypothesized) to improve conservation by achieving specific biological results or outcomes. Monitoring enables projects to demonstrate a clear linkage between the interventions and the impacts.

Why Is Monitoring of Conservation Projects So Challenging?

Assessing impact, managing adaptively, and learning from experience are critically important to the sustainability of biodiversity conservation. Nevertheless, project designers rarely pay appropriate attention to monitoring and seldom include adequate funds for monitoring in program budgets. This is due, in part, to a lack of awareness about the importance of monitoring and, in part, to the challenges of monitoring. These challenges make monitoring relatively costly, in both time and money, and therefore often easy to overlook in the short term.

Five factors make monitoring of projects that seek to integrate conservation and development so challenging:

1. Conservation is a multidisciplinary and interdisciplinary endeavor.
2. The natural world, from the species to the ecosystem level, is dynamic, not static.
3. Social, economic, and political worlds are also dynamic.

4. Most impacts of human activities on biological diversity are unpredictable.

5. Identifying simple indicators of status and change for biological resources is difficult.

The relationships between factors 1 through 4 depend on the specific temporal and spatial scale measured, further complicating the difficulty of developing indicators.

1. Conservation is a multidisciplinary and interdisciplinary endeavor.

Conservation is as much a social, political, and economic problem as it is a biological one. Successful conservation programs must be interdisciplinary and multidisciplinary, so monitoring and assessment must address conditions that are biological, social, economic, and political.

The factors to be monitored, techniques used, and criteria for determining impact will vary depending on the specific type of project. Projects that seek to integrate biodiversity conservation with development often need to monitor and assess a variety of baseline conditions and changes. These may be biological (e.g., are they animal and plant species or communities being conserved?), ecological (e.g., is the project affecting ecosystem integrity?), social (e.g., are the resource users changing their management of the biological resources?), and economic (e.g., is the project improving the livelihoods of the local community?).

2. The natural world, from the species to the ecosystem level, is dynamic, not static.

Ecologists describe all ecosystems according to three characteristics: composition (such as the diversity of plants and animals the system contains), structure (arrangement of natural elements), and function (natural processes, such as water and nutrient cycling). Although a great deal is still unknown, research over the past 30 years has demonstrated that ecosystem attributes are not static, and do not change gradually and continuously through time and space. Ecosystems change abruptly. The fact that ecosystems are dynamic and stochastic leads to great difficulty in determining a single equilibrium point for many ecosystem characteristics.

Ecosystems also demonstrate spatial heterogeneity and discontinuity. The processes that influence ecosystem structure do so at different scales. In an analysis of cross-scale dynamics of ecosystems in space and time, C.S. Holling (1992) noted that three broad types of processes determine ecosystem structure, and that those processes act at different scales. Vegetative processes that determine plant structure and productivity create discontinuous textures at micro-scales that range from centimeters to tens of meters in space and days to decades in time. Geomorphological and evolutionary processes are the primary determinants of topographic and edaphic structure at the macro-scale extreme, which ranges from hundreds to thousands of kilometers in space and from centuries to millennia in time. In between are meso-scales, where disturbance processes, such as plant disease, fires, insects, water, and human activities determine vegetation types at spatial scales ranging from tens of meters to hundreds of kilometers, on time scales from years to decades (Holling 1992).

Ecosystem structure and function reflect a number of interactive and cumulative effects that are often products of feedback cycles. For example, coral reefs depend on cycling of nutrients within the reefs, unlike other marine systems. The high number of symbiotic relationships between plants and animals on coral reefs is thought to reflect the advantage obtained from efficient nutrient transfer. While traditional subsistence fishing on reefs is usually sustainable (particularly when fish scraps are returned to the reef and release nutrients), the large-scale, commercial export of fish is often not sustainable. The removal of many more fish and their transport completely out of the system can quickly impoverish a reef (Vitousek and Lubchenco 1995).

The unpredictable nature of the environment means that project teams must continually monitor the situation to document the results of their interventions and adjust accordingly if a change in action is needed to reach project goals.

3. Social, economic, and political realms are also dynamic.

The variability of social, economic, and political conditions compounds the challenge of monitoring programs that aim to integrate conservation of protected areas with increased social and economic development for adjacent communities. For example, the relationship between poverty and environmental degradation is not a simple one of cause and effect. Knowledge of local social, economic, cultural, biological, and institutional issues is needed to determine the role of economic and social development in changing community behaviors to be more supportive of sustainable conservation or to reinforce current sustainable practices.

4. Most impacts of human activities on biological diversity are unpredictable.

The patchy and discontinuous nature of ecosystems and landscapes makes it difficult to predict responses to human interventions. For example, grazing at a density of one cow per hectare might have little impact in one system but might alter the composition of grasses in another system.

Most ecosystems are nonlinear; that is, they are stable or resist disturbance up to some threshold point, after which there is sudden change. Some studies suggest that the capacity of ecosystems to resist disturbance associated with changing environmental conditions is higher in ecosystems with higher species diversity (Mooney et al. 1995). This diversity/stability hypothesis suggests that both human-induced or natural disturbance might cause a larger change in ecosystem function in simple systems than in diverse systems.

There are many examples of human activity causing a reduction in natural variability and a decrease in functional diversity of an ecosystem, resulting in greater sensitivity and decreased resilience. Such changes as species loss, desertification, loss of groundwater, and large-scale habitat alteration are often irreversible because of changes in soils, hydrology, and so on. Whether an irreversible change, such as the loss of a species, causes irreversible changes in ecosystem function depends on the scale of the loss and the amount of "redundancy" in terms of other species that have the same functional role (Norton and Toman 1994).

The principles governing ecosystem dynamics outlined above indicate why it is so difficult to predict the impacts of human activities on the natural world. Because ecosystems are dynamic, it is a challenge to determine whether human activity is causing impacts that are greater than would have occurred naturally. Ecologists are struggling to find ways to deal with such questions as: How much land cover change can a given ecosystem tolerate before biodiversity is lost and before the function of that system is altered? How many exotic species introductions can a system tolerate before diversity is lost?

5. Identifying simple indicators of status and change for biological resources is difficult.

Monitoring efforts must be able to determine whether projects are actually contributing to better conservation. The factors to be monitored are not exact, and all suggested monitoring criteria are open to criticism. Yet, project managers need relatively quick and cost-effective methods of monitoring the status of biological diversity in order to determine project impacts. It is relatively easier to monitor the social, economic, and institutional conditions that influence conservation.

Biological indicators must reflect consideration of change at the appropriate scale for the project. Indicators should not just measure causes of change but should also measure consequences of change. The linkages and interactions between indicators are crucial, for a favorable change in one indicator could be countered by an unfavorable change in another.

The challenge of developing monitoring indicators is determining what to measure in order to learn whether human activity has created an unsustainable change in some aspect of biodiversity. The nonlinearities and thresholds mentioned above make monitoring all the more important.

The type, composition, and distribution of communities, habitats, and ecosystems are important indicators of biodiversity status. Periodic sampling of transects and permanent plots are often used to monitor such changes as population status of utilized species or changes in the number of exotic species that can threaten community composition. While scientists do not yet fully understand the role of biodiversity in maintaining ecosystem structure and function, it is important to monitor changes in community productivity and, if possible, nutrient and water cycling in order to assess the ecological services that biodiversity may provide at the local level. Remote sensing techniques and ground surveys can provide methods to monitor and assess changes in communities, habitats, and ecosystems.

Successful monitoring programs must be able to detect changes in the status of and threats to biological diversity, to use tools and techniques that are appropriate for the particular conservation problem, and assess the results so as to determine whether the conservation hypotheses and objectives are being addressed, and what types of changes in the project activities are necessary.

Objectives of this Book

Despite increasing national and international attention to the need for improved monitoring of conservation projects, there is often a great deal of confusion about how to do effective monitoring or even what monitoring actually is. The Biodiversity Support Program (BSP) has increasingly focused on helping project partners develop and implement effective approaches to monitoring the conservation impacts of the projects we

support. We have begun to accumulate some important lessons about effective approaches to working with partner organizations to monitor conservation projects.

In 1996, BSP organized a symposium in order to share some of the lessons that we and our partners in the field were learning about project monitoring. This book contains the proceedings from that symposium. The following paper presents an overview of the approach that the staff of BSP have developed over the last three years to project monitoring within the context of the project cycle. The papers in Parts II through IV contain project experiences from six countries that illustrate the steps in the process outlined in the overview. The authors are field project managers who are attempting to implement interdisciplinary monitoring as a way to achieve and measure conservation impact.

The questions that all of the papers address to some degree include:

1. How can projects and monitoring plans be conceptualized and designed to achieve conservation impact?

2. What tools and techniques are most effective for interdisciplinary monitoring?

3. How can the information collected from monitoring efforts be used to better manage projects?

The papers in Part II describe the importance of integrating project design with monitoring plans for projects in Papua New Guinea and Indonesia. A discussion of effective techniques and tools for conducting interdisciplinary monitoring in projects in Ecuador and Madagascar follows in Part III. Finally, the papers in Part IV describe how projects in India and Namibia have used the information gained from monitoring to adapt and improve project management.

We hope that the experiences and approaches contained in this proceedings will contribute to and help catalyze improved monitoring and learning from conservation projects. This book does not specifically address the importance of monitoring outside the context of a specific project, such as national level biodiversity monitoring to assess threats and progress, but many of the same challenges apply at national and international scales. We welcome and encourage your feedback on the approaches presented here, as well as information on your own experience with monitoring.

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2

Overview of a Systematic Approach To Designing, Managing, and Monitoring Conservation and Development Projects

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INTRODUCTION

What Is Monitoring and Why Is It Important?

There is a growing movement to improve monitoring of conservation and development projects. Monitoring can be defined as "the periodic collection and evaluation of data relative to stated project goals, objectives, and activities" (Margoluis and Salafsky 1998). Many people often refer to this process as monitoring and evaluation (M&E).

Monitoring can potentially serve two important functions within a project:

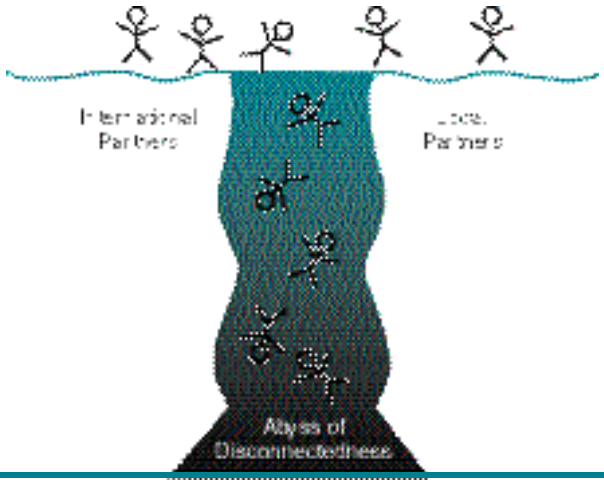
- *Adaptive Management*—Helping communities and project implementers obtain the information they need to manage their local resources more effectively, and act on that information to improve resource management.

- *Impact Assessment*—Enabling project teams and donors to learn from projects and to draw more generalized lessons regarding effective conservation strategies.

Constraints to Doing Monitoring

Despite the near universal agreement on the importance of monitoring, few community-based conservation and development projects have had much success in developing and implementing monitoring systems. In many cases, as outlined in Figure 1, the question of monitoring causes a major "disconnect" between donors and groups implementing projects. Donors demand that project teams design and implement monitoring systems. The teams typically agree in principle, but in practice either do not implement monitoring systems or implement systems that collect but do not use data.

Figure 1
The "Disconnect" beween International and Local Partners over Project Monitoring



At least five main constraints keep project teams from developing and implementing monitoring systems and using the data from them:

1. Lack of Time and Money

Most field-based project teams face enormous time and financial pressures. On any given day, the team members must juggle a host of tasks, such as developing and implementing complex program activities, maintaining working relationships with and among factions of local

community stakeholders (who often have been feuding for generations), managing difficult logistical problems in communicating and getting supplies, dealing with complex staffing problems, and complying with requests from donors. Even if the team wants to do monitoring, it often ends up as a marginal activity that becomes a lower priority as more immediate crises demand action.

2. Perceived Lack of Qualified Staff

Project staff traditionally view monitoring as the domain of scientists. Many practitioners believe that rigorous monitoring work requires a team of Ph.D. scientists with white laboratory coats and elaborate equipment.

3. Little or No Connection between Project Interventions and Monitoring

Senior members of the implementing group who live in the country's capital city, or in places like Washington, D.C., in many cases are responsible for designing projects. The project team in the field thus often has little or no idea about the project's conceptual design—what the goals and objectives of the project are and how the interventions are designed to achieve them. As a result, it is often difficult for the project staff to determine what they need to monitor in order to assess project success. Furthermore, project staff often treat monitoring as a separate set of activities instead of integrating it into the overall project plan.

4. Difficulty in Determining What Specific Data Need To Be Collected

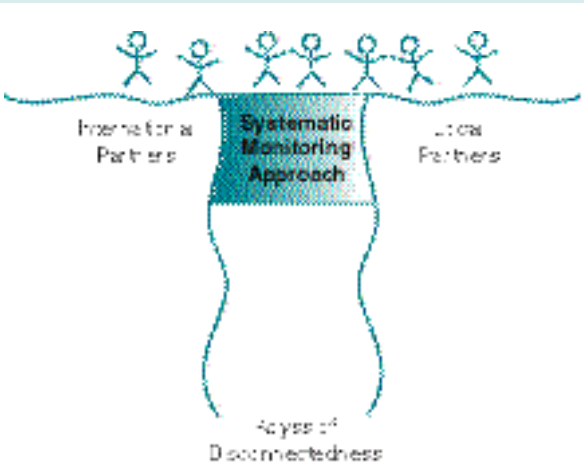
Even if project teams can decide what information they need, they often have difficulty selecting the appropriate methods to use. In particular, since most "monitoring" staff come from specific disciplinary backgrounds, they tend to apply the methods particular to their discipline with little or no regard for necessity or appropriateness.

5. Difficulty in Analyzing and Using Data

Despite these constraints, many projects succeed in collecting data. Most of the time, however, the project never analyzes or uses the data. This problem occurs because either the project collected the wrong data or because teams lack the experience and expertise to do the analyses.

These constraints are real, but project teams must try to overcome them. Over the past few years working for the Biodiversity Support Program (BSP), we have developed a systematic approach to designing, managing, and monitoring conservation and development projects (Margoluis and Salafsky 1998). We hope that, as shown in Figure 2, this approach can help bridge the "disconnect" and lead to more successful projects.

Figure 2
Bridging the Gap with a Systematic Approach to Monitoring Projects



Objectives for this Paper

Our objectives in this paper are to:

1. Describe the evolution of the BSP approach to monitoring in the context of the project cycle and

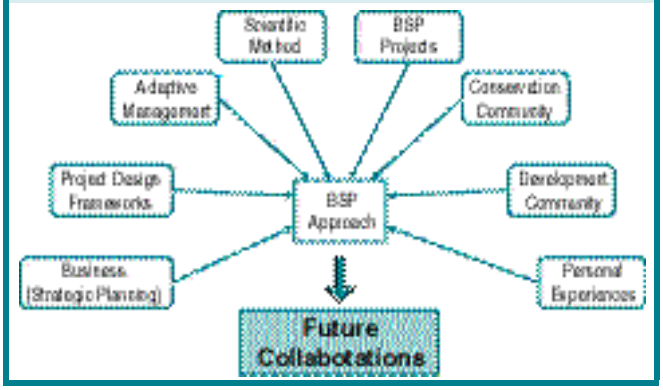
2. Provide an overview of the steps in the BSP approach to monitoring.

Margoluis and Salafsky (1998) describe the approach itself in greater detail. For reasons that will become apparent below, although the intent behind BSP's approach was to focus on monitoring, the approach necessarily involves integrating monitoring with project design and management activities.

Evolution of the BSP Approach to Monitoring

As illustrated in Figure 3, there are a number of sources for our approach. From a theoretical perspective, the approach draws on techniques developed by business, development, and scientific research. From a practical

Figure 3
Sources behind the BSP Systematic Approach



perspective, this approach draws on our field experience working with conservation and development projects. We have developed and field-tested our approach in conjunction with our colleagues from many BSP-supported projects in Latin America, Africa, and Asia.

One of the most important of these sources was the efforts of BSP's Biodiversity Conservation Network (BCN). In order to illustrate our approach, we will briefly discuss how it evolved in the context of the BCN program. First, however, we provide a brief overview of BCN.

The BCN Example

BCN seeks to fulfill the following goals (BCN 1996):

- Support enterprise-oriented approaches to biodiversity conservation at a number of sites across the Asia/Pacific region; and

- Evaluate the effectiveness of these enterprise-oriented approaches to community-based conservation of biodiversity and provide lessons and results to BCN's clients.

To achieve these goals, BCN brings together organizations in Asia, the Pacific, and the United States in active partnerships with local and indigenous communities. The Network provides grants for projects that encourage the development of enterprises that depend on sustained conservation of local biodiversity.

BCN's core hypothesis is that, if enterprise-oriented approaches to community-based conservation are going to be effective, they must: (1) have a direct link to biodiversity, (2) generate benefits, and (3) involve a community of stakeholders. In effect, the hypothesis is that if local communities receive sufficient benefits from an enterprise that depends on biodiversity, then they will act to counter internal and external threats to that biodiversity.

History of BCN's Efforts To Assist Its Partners with Monitoring

BCN went through a number of phases in crafting ways to help its partner organizations develop and implement monitoring plans.

Monitoring in the Initial Project Design

From its first development in the early 1990s, BCN understood the important role monitoring would play in fulfilling both of its goals—documenting project success and testing its core hypothesis. Initially, however, BCN thought that good-quality monitoring would result if project partners developed detailed biological, social, and enterprise monitoring plans in their project proposals.

The project teams did indeed develop lengthy plans on paper. Ultimately, on average, BCN projects allocated over 30% of their budgets to monitoring activities, a percentage far in excess of most conservation and development projects (BCN 1995a). Over the first two years of the program, however, it became clear that many of the projects were running into the constraints outlined in the first section of this paper and thus having difficulties implementing their monitoring plans.

Matrixes of Different Methods

To solve these problems, BCN began in late 1993 to work more proactively with project teams on their monitoring efforts. This work was initially aimed at helping project teams determine which methods they could use to collect relevant monitoring information in a cost-effective fashion. This focus on methods was roughly organized according to academic disciplines and involved preparing "matrixes" of biological, social, and enterprise methods that project staff could potentially use to collect data about the BCN-funded projects.

Within each set of methods, BCN attempted to rank comparable techniques in terms of the trade-off between cost and accuracy of results, trying to find the methods that would be most suitable for community-based monitoring efforts. In addition, BCN also assembled panels of distinguished scientists to obtain their input on how best to select techniques that communities and local project teams could implement. Interestingly, however, although the scientists knew many techniques for collecting data,

for the most part they were at a loss to explain how to do low-cost, community-based monitoring.

After distributing the matrixes of different methods to the project teams, it soon became apparent that these were not sufficient to solve the problems the teams were having with monitoring. Instead, BCN began to realize that the project teams were having difficulty determining what information the project needed—the step that comes before selecting methods.

Comprehensive Guidelines for Monitoring Questions

To help its partners determine what information to collect, BCN began in 1994 to develop lists of potential monitoring questions the projects could ask about the biological, social, and enterprise components of their efforts. These lists of questions initially focused on the monitoring methods matrixes, but soon expanded into a comprehensive listing of almost every conceivable question relevant to a BCN-type project (BCN 1995b).

The idea behind these comprehensive guidelines was not to suggest that each project try to answer all of the questions, but rather to provide a resource guide that the group could use to determine what specific questions it needed to ask. When BCN sent this massive list of questions to project teams, however, it generally overwhelmed them, leaving them more confused than ever about the questions they needed to address in their specific projects.

Common Sets of Questions

In an attempt to give partners more guidance in selecting specific questions, BCN next drew on experiences of all its partners to select the most pertinent questions in each of the three disciplinary areas. To this end, BCN convened a workshop in May 1995 among its south Asian grantees in order to review the comprehensive list of questions in each discipline and boil it down to a "common" or "minimum" set of critical information needs that all the projects could address (BCN 1995c).

BCN made some progress toward this goal at the workshop, but most groups still were having difficulty in coming up with specific questions that they needed to address at their sites. There was a growing realization that ultimately, conservation needs to be site specific and that project teams need to design monitoring not as a supplemental package organized by various academic disciplines, but instead as an integral part of the project design.

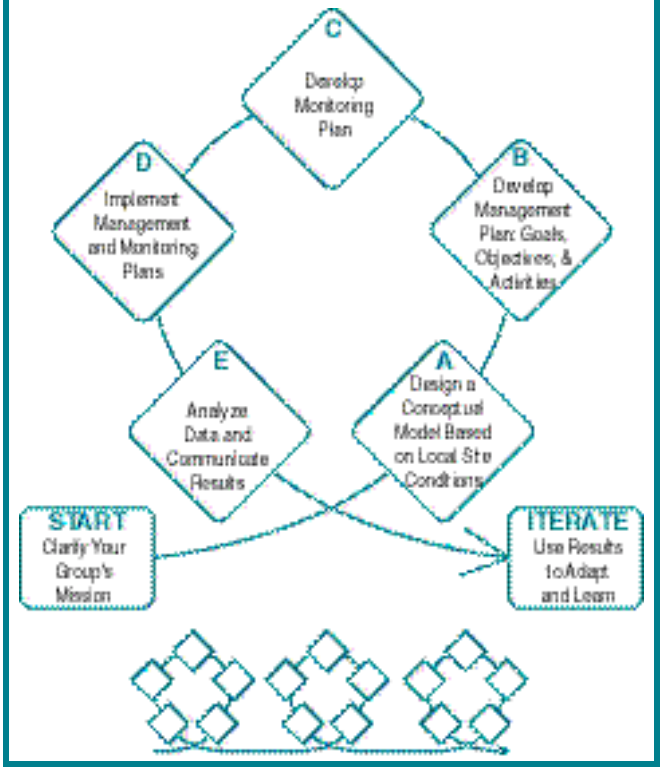
Site-specific Monitoring Plans in the Context of the Project Cycle

One useful technique is to view a project as going through a series of steps in a cycle, as outlined in Figure 4. Up until this point, BCN basically had been starting the process of helping groups develop their monitoring efforts with Diamond C, assuming that the projects had already progressed through the previous diamonds. BCN soon realized, however, that it needed to help project teams complete the earlier steps before planning monitoring efforts. Furthermore, project teams needed to design monitoring to meet the specific needs of each project site.

BCN convened two more workshops in September 1995 for its southeast Asian and Pacific grantees in which the Network presented to grantees a new approach to doing monitoring in the context of the project cycle (BCN 1995d). Participants quickly recognized that this approach had the potential to solve many of the earlier problems. BSP's work with partners in other parts of the world confirmed these findings. BCN has refined and adapted the approach since 1995, and it continues to evolve even today.

Figure 4

Monitoring in the Context of the Project Cycle



Steps in the BSP/BCN Approach to Monitoring

Having gone through some of the history of the BSP approach to monitoring, we now would like to present it in some detail using the BCN-funded project in East New Britain, Papua New Guinea, as an example.

The overall approach is based on the project cycle shown in Figure 4. In addition to the starting and ending boxes, the diagram contains five diamonds, each of which represents a different stage in the overall cycle. These diamonds generally need to occur in order as represented by the letters A–E. The diamonds themselves, however, are part of an iterative process that involves going through the cycle numerous times, as outlined in the sketch at the bottom of Figure 4.

The process is presented from the perspective of the group implementing the project. We define *project*, however, as any set of actions undertaken by any group of managers, researchers, or local stakeholders interested in achieving certain defined goals and objectives. For example, a project could be steps that community members take to revive traditional resource harvesting customs. Furthermore, whether the implementing group is composed of outsiders or members of the community, an important part of the process involves consulting with the local stakeholders at the project site in all stages of the project cycle.

Start: Clarify Your Group's Mission

Before setting out to design a new project, you must have a clear understanding of your group's *mission*. A mission statement provides a vision for the future of your group—your long-term desired purpose, your strategies for achieving it, and the values that will guide your work. Groups generally develop their mission statements through a strategic planning process.

If you plan to work with other groups on the new project, it is also important to understand their missions and how your mission relates to theirs. As outlined in Figure 5, it is unlikely that any two groups participating in a project will have exactly the same set of purposes, strategies, or values in their mission. These differences makes it all the more important that each group explicitly spell-out its mission so that it is possible to see where overlap exists (the shaded areas) and where the differences are (the unshaded areas). Without a clear sense of what you want to accomplish and an understanding of what your partners are trying to do, you will find it difficult to design, manage, and monitor effective projects.

Specific steps in this part of the process include:

1. Define your group's mission.

2. Find common ground with your project partners.

Diamond A: Design a Conceptual Model Based on Local Site Conditions

A *conceptual model* is the foundation of all project design, management, and monitoring activities. As illustrated in Figure 6, a conceptual model is basically a diagram of a set of relationships between certain factors that are believed to impact or lead to a *target condition*. In conservation and development projects, the target condition is generally related to biodiversity. As illustrated in Figure 7 from the Pacific Heritage Foundation (PHF) project, the model is first built using existing information to present a picture of the project area prior to the start of the project.

In particular, your model should illustrate the key *direct* and *indirect threats* to the target condition. In the PHF project, for example, major direct threats include logging and mining operations conducted by large corporations, expansion of subsistence agriculture gardens, and hunting. Project staff next present the model to local communities, revise it according to their input, and then use the model to identify and rank the key threats to biodiversity that the project will address.

Figure 5
Overlapping Missions of Project Groups

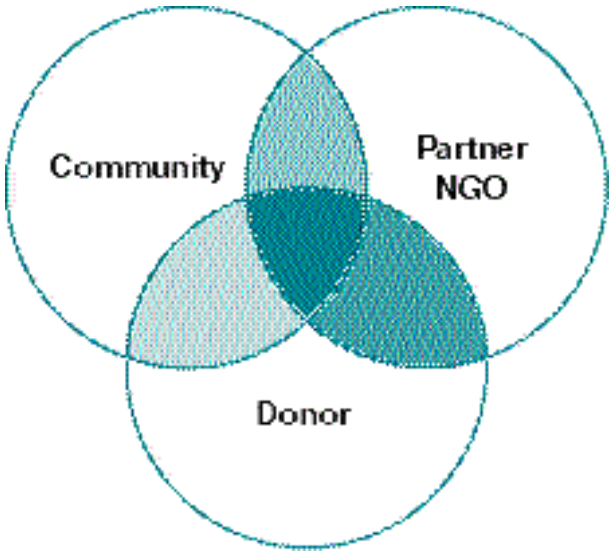
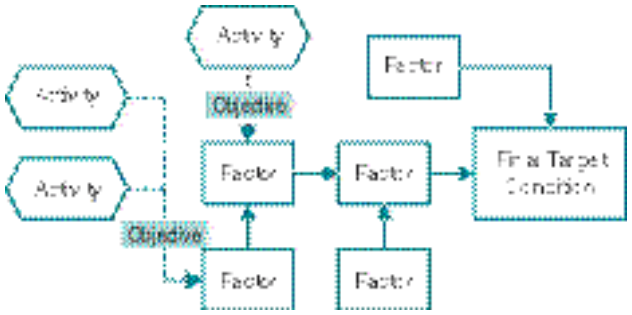


Figure 6

Diagram of a "Generic" Conceptual Model



Specific steps in this part of the process include:

1. Review and compile existing information about your project site.

2. Develop an initial conceptual model of your project site.

3. Assess local site conditions to refine and improve your model.

4. Identify and rank threats at your project site.

Diamond B: Develop a Management Plan

A *management plan* describes the explicit *goals, objectives*, and *activities* designed to address the threats you identified in the conceptual model. Goals, which are derived from the project's target condition, are broad statements of the desired state toward which the project is directed. Objectives are more specific statements of the desired outcomes or accomplishments of the project. Activities are specific actions undertaken by project participants designed to reach each of the project's objectives, which, in turn, should lead to realization of the project's goal. All activities need to be linked to specific objectives that target critical threat factors identified in the conceptual model. These linked chains of activities and factors are the project's assumptions. Once the management plan has been completed, the activities and objectives can be added to the project conceptual model.

Figure 8 illustrates part of a management plan for the PHF project. Figure 9 shows the PHF Project conceptual model and depicts the expected impact of the management plan.

Specific steps in this part of the process include:

1. Develop a goal for your project.

Figure 7

Initial Conceptual Model for the Pacific Heritage Foundation (PHF) Project

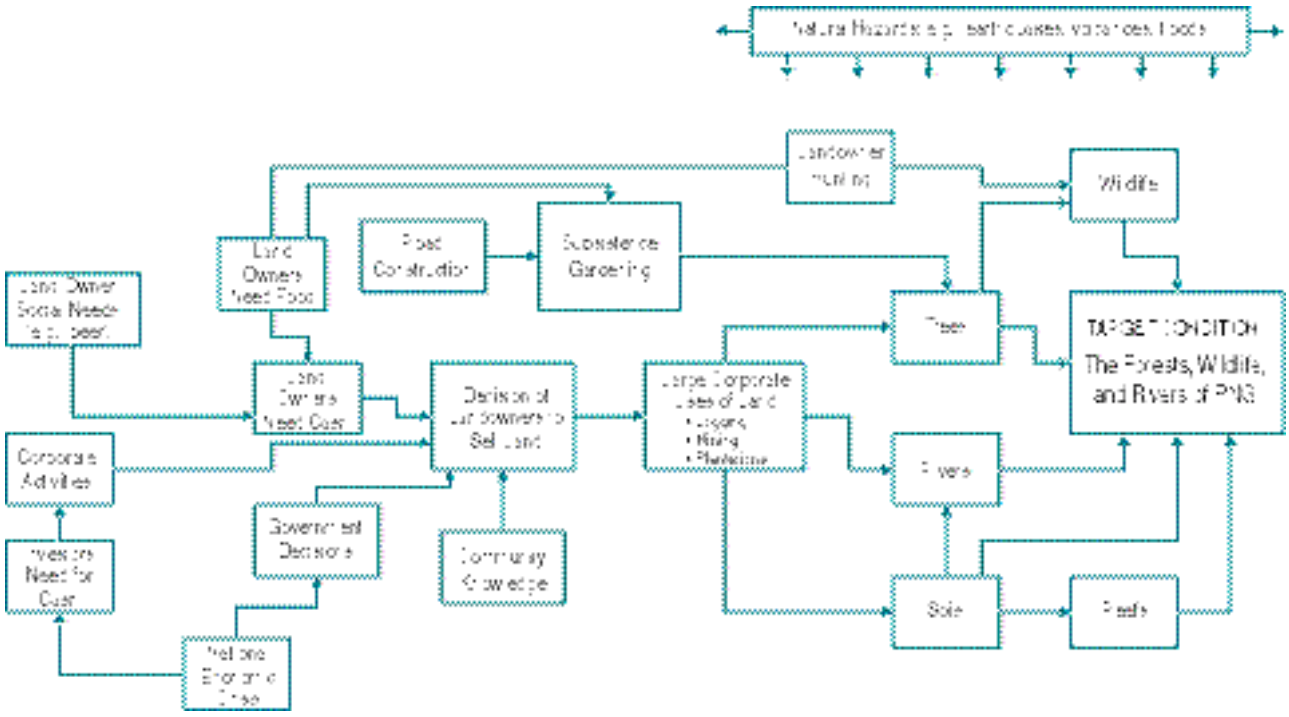


Figure 8

Excerpt from the Management Plan for the PHF Project

GOAL: Conserve the forests, wildlife, and rivers of PNG

OBJECTIVE 1: Within 6 months from the start of each of 5 small-scale logging projects in the Bainings area, income increases by 200 Kina per week

ACTIVITIES FOR OBJECTIVE 1:

1) Enterprise loans
2) Enterprise training
3) Marketing assistance

OBJECTIVE 2: 80% of clan chiefs in the project site know about the importance of biodiversity after 1 year

ACTIVITIES FOR OBJECTIVE 2:

1) Hold awareness workshops
2) Take chiefs to logging sites

2. Develop objectives for your project.

3. Develop activities for your project.

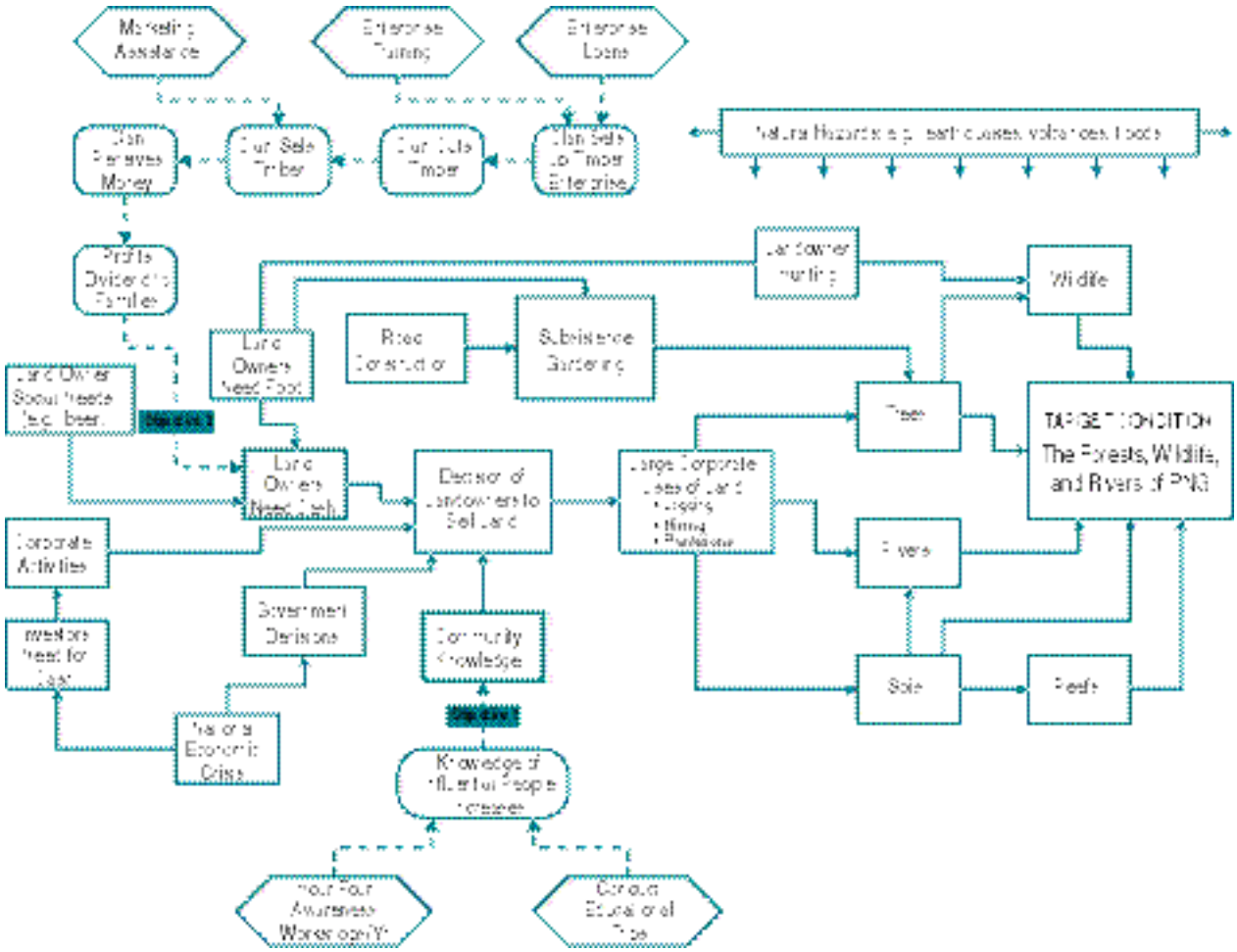
Diamond C: Develop a Monitoring Plan

A *monitoring plan* describes how you will assess the success of your project interventions. If you do not monitor your project's interventions, then you will have no way of knowing whether you have achieved your goal and objectives or what you will need to do to improve the project. The plan starts by identifying your internal and external audiences, what information they need, what monitoring strategies you will use to get the data to meet each of these needs, and the specific indicators you will measure. The remainder of the plan lists how, when, by whom, and where data for these indicators will be collected.

The key here is to be as specific as possible in writing down what data you will collect and how you will col-

Figure 9

Project Conceptual Model for the PHF Project



lect them. An excerpt from the PHF Monitoring Plan is shown in Figure 10.

Specific steps in this part of the process include:

1. Determine audiences, information needs, monitoring strategies, and indicators (WHY and WHAT).

2. Select methods and determine tasks necessary to collect data (HOW).

3. Determine when, by whom, and where data will be collected (WHEN, WHO, and WHERE).

4. Develop a monitoring plan for project activities.

Diamond D: Implement Management and Monitoring Plan

The project conceptual model, management plan, and monitoring plan taken together comprise a complete *project plan*. This diamond involves implementing this project plan.

There is little we can say about this step in a general context—it basically involves putting into action the work you have done in the previous steps. Unless you implement your plan, you will have no hope of achieving your project's goals and objectives.

Specific steps in this part of the process include:

1. Implement your management plan.

2. Implement your monitoring plan.

Diamond E: Analyze Data and Communicate Results

Once you have data, you need to analyze them and communicate the results to your internal and external audiences. Your challenge here is to take the data that you have collected and turn them into useful *information* that you can make available to your project partners, other stakeholders in and around the project site, and outside audiences.

Specific steps in this part of the process include:

1. Analyze data.

2. Communicate results to your internal and external audiences.

Iteration: Use Results To Adapt and Learn

Iteration means to repeat a process or sequence of steps that brings you successively closer to a desired result. It is the key step in *adaptive management*, where the work invested in monitoring can pay off by helping you incorporate the information that you have obtained to improve your project and move forward. In this step, you first complete the process of testing assumptions and adapt your project plan based on your monitoring results. You then should also document and share the knowledge you have gained with others, so that they can improve their conservation efforts.

Specific steps in this part of the process include:

1. Put your assumptions to the test.

2. Use monitoring results to adapt your project and refine knowledge of conservation techniques.

Figure 10

Excerpt from Monitoring Plan for the PHF Project

Goal, Objective, or Additional Information:

OBJECTIVE 1: Within 6 months from the start of each of 5 small-scale logging projects in the Bainings area, income increases by 200 Kina per week

WHAT	HOW	WHEN	WHO	WHERE	COMMENT
Household income	Inspect project records	Every 6 months	Enterprise managers	Enterprise offices	Looks at income from sawmills
Kg rice consumed per month	Household survey	Every 6 months	Project social scientist	6 Project villages	Proxy indicator for wealth

Conclusions

At the start of this paper, we stated that monitoring has two primary functions:

- ***Adaptive Management***—Helping communities and project implementers to obtain the information that they need to mange their local resources more effectively and act on that information to manage better.

- ***Impact Assessment***—Enabling project teams and donors to learn from projects and to draw more generalized lessons regarding effective conservation strategies.

BSP's systematic approach to designing, managing, and monitoring conservation and development projects provides a useful framework for this complex and important process. We hope that this overview of BSP's approach demonstrates not only that monitoring is essential to project success, but that all conservation and development projects have the capacity to design and conduct effective monitoring efforts.

Acknowledgments

We wish to thank the many people who have contributed to the development of the BSP approach to designing, managing, and monitoring conservation and development projects including, in particular, the project partners who worked with us to develop and refine these ideas. This work was supported through the Global Bureau of the United States Agency for International Development (USAID) under the terms of grant number DHR-5554-A-00-8044-00.

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Introduction

One of the first and most fundamental activities a project team must undertake to measure conservation impact is to gain a clear conceptual understanding of the site conditions in which the team is working and the situation it is trying to address. Clear project conceptualization is also key to effective *adaptive management*. BSP and its partners have found that one of the most effective ways to conceptualize a project is by using a *conceptual model*. Without a good conceptual model, BSP's experience shows that project teams run a high risk of not being able to communicate achievable goals and objectives, design effective and efficient interventions, or determine specific information they need to monitor in order to make sound management decisions and measure project impact. The cause of a fundamental flaw in a project can usually be traced back to an inadequately conceived or designed plan.

A conceptual model forms the foundation of project design, management, and monitoring activities. A project team uses the conceptual model to clarify its goals; define, in clear operational terms, how it intends to achieve them; and determine what information is required to monitor and evaluate progress toward these goals. As Salafsky and Margoluis state in Part I (Chapter 2), a conceptual model is a diagram of a set of relationships between certain factors that are believed to impact or lead to a *target condition*, which, in conservation and development projects, is usually the status or health of some biodiversity-related condition or site. A good conceptual model:

- Presents a picture of the situation at the project site.
- Shows assumed linkages between factors affecting the target condition.
- Shows major direct and indirect threats affecting the target condition.
- Presents only relevant factors.
- Is based on sound information.
- Results from a team effort.

Design of a conceptual model is not an abstract exercise. In fact, its success—and thus the ultimate success of the conservation project it is intended to benefit—depends on involving appropriate stakeholders, using the best available information, and revising the structure of the model as many times as needed. Developing a final conceptual model occurs in two phases. The first phase involves creating an *initial conceptual model* that describes the situation at the project site before the project begins. In essence, it is a diagrammatic "snapshot" of the project site as it exists independent of the project. The second phase involves showing how project activities, identified by developing goals and objectives based on the initial conceptual model, enter into and influence the initial model. This second phase results in the final *project conceptual model*.

Both papers in this section illustrate how the process of designing a conceptual model can enhance communication between stakeholders, clarify what a project is intended to accomplish, and help map out how a project's goals will be achieved. In addition to describing the particular conceptual model used for each project, the authors show how the model-building process came about through the use of reliable information and the promotion of solid teamwork.

In Chapter 3, Ericho, Bino, and Johnson describe their use of conceptual models in the Crater Mountain Wildlife Management Area (CMWMA) of PNG. The CMWMA, an area of spectacular biodiversity, is home

to some 220 species of birds and 84 species of mammals. It is also home to two groups of people: the highland Gimi, who live in relatively well-established stationary communities, and the lowland Pawaian, who maintain a semi-nomadic existence. Because of legislation passed by PNG's parliament in 1994, Gimi and Pawaian landowner groups, in cooperation with the CMWMA project team, have jurisdiction over decisions affecting all aspects of land use in the area.

Ericho and his colleagues describe the establishment—with all of its potentials and challenges—of the CMWMA Integrated Conservation and Development Project (ICDP), which straddles three peripheral regions of three provinces. The project seeks to help landowners develop eco-enterprise activities that link income-earning opportunities with conserving biodiversity. The authors stress the particular relevance of using conceptual models to developing ICDPs, which are inherently complex. For this project team, the conceptual model is an indispensable tool that helps to accomplish the following:

- Identify and achieve project objectives.
- Set project activity priorities and thus aid in personnel selection and budgeting.
- Spend limited conservation financial resources more efficiently.
- Determine why certain interventions work and others fail and discover alternative solutions.
- Provide a useful tool for communicating about the project with community and project team members.
- Determine what the project team needs to monitor and how information will be collected and used.

Ericho and his colleagues close by providing some excellent recommendations for developing and using conceptual models.

In Chapter 4, Wirawan, Neville, and Crocker apply the conceptual model approach in Lore Lindu National Park, located in Central Sulawesi, Indonesia. Wirawan and his colleagues are part of a team working to find sustainable alternatives to overuse of natural resources through the promotion of nature-based tourism and small-scale, wildlife-based economic enterprises that link economic well-being to sustainable use of park resources. Like the Crater Mountain example, Lore Lindu is home to an amazing array of endemic biodiversity, including 88 bird species and 79 mammal species. According to the authors, the greatest threats to Lore Lindu are road construction, migration, agricultural encroachment, and overharvesting of plant and animal species.

Wirawan and his team describe how they worked through various stages of developing the project conceptual model. It had to be revised to reflect changing perceptions about the project site and the efficacy of different interventions. Construction of the model forced the team to address key assumptions they held about the root causes of biodiversity loss and those interventions that were identified to offset this loss.

The experiences at Crater Mountain and Lore Lindu demonstrate that conceptual modeling is most useful when it:

- Incorporates community participation into the process from the outset.
- Provides a starting point that can be continuously revised and improved, based on feedback from monitoring activities.
- Focuses on key threats and their sources.
- Is used as a management tool to inform key project decisions.
- Leads to integrated monitoring that provides the feedback needed to carry out the project effectively.

The two papers presented in this section provide a wealth of information on the importance of project conceptual models and how to develop them. They show how conceptual models form the foundation of solid project design, management, and monitoring. They also explain how the use of conceptual models can lead to a more systematic and objective measurement of conservation impact.

3

Testing the Effectiveness of Using a Conceptual Model To Design Projects and Monitoring Plans for the Crater Mountain Wildlife Management Area, Papua New Guinea

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Introduction

Crater Mountain Wildlife Management Area (CMWMA) is an integrated conservation and development project that straddles three provinces of Papua New Guinea (PNG): Simbu, Gulf, and Eastern Highlands. The project is a collaborative effort of the Research and Conservation Foundation (RCF) of PNG, Wildlife Conservation Society (WCS), and the peoples of Crater Mountain. Field project staff maintain a continuous presence in the villages of Haia, Herowana, and Maimafu (Figure 1).

The Crater Mountain Project began in 1984, under the guidance of Karol Kisokau, Navu Kwapena, and David Gillison, along with local, national, and international partners (Pearl 1994). In October 1994, PNG's parliament passed legislation gazetting CMWMA. Under this legislation, landowner committees composed of representatives from landowning groups within the wildlife management area, in cooperation with the CMWMA project team, have jurisdiction over decisions affecting land use, subsistence hunting, agricultural practices, natural resource extraction practices, cash crop plantations, and other human activities.

The people of the CMWMA belong to two distinct language groups: Gimi and Pawaian. The Gimi speakers are highland people who dwell in static communities; their activities center on food cultivation (Pearl 1994) and occasional hunting on traditional grounds. In contrast, the Pawaian speakers are lowland people who maintain a semi-nomadic existence—a lifestyle that may have given them nearly 70% tenure of southern CMWMA holdings. Unconfirmed census reports estimate the Gimi population at approximately 2,000 and the Pawaians at below 1,000.

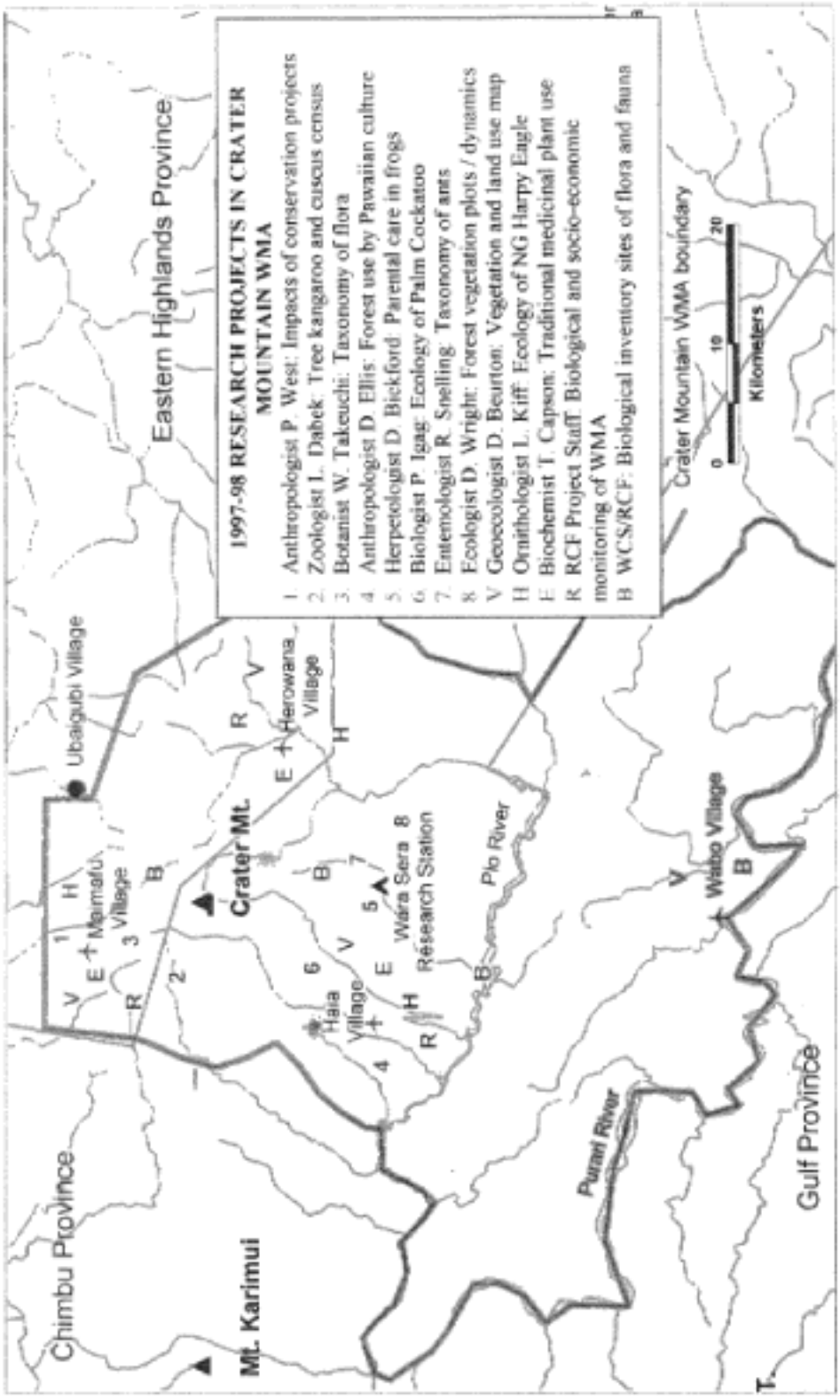
The remote lands of the CMWMA (nearly 2,700 sq. km) range from rich lowland alluvial rain forests along the Purari River (150 m elevation) to the stunted subalpine forests and grasslands of Crater Mountain's summit (over 3,000 m). The area has been identified as a priority for conservation because of its diverse collection of flora and fauna and healthy wildlife populations (Beehler 1993). The site is home to 220 bird species, 49 of which are endemic, and 84 mammal species, 15 of which are endemic. Included are several species of bird of paradise and two species of tree kangaroo.

The CMWMA project seeks to help landowners develop eco-enterprise activities that link income-earning opportunities with biodiversity conservation. Current activities include ecotourism, research as an industry, and the making and selling of artifacts. Future enterprises could include raising poultry, butterfly farming, and organic coffee export. Once the current external collaboration ends, local partners are expected to continue managing the wildlife management area sustainably.

What Is an ICAD?

The term Integrated Conservation and Development (ICAD) has a common usage in the Asia and Pacific

Figure 1
Crater Mountain Wildlife Management Area



region (Brown and Wyckoff-Baird 1994); in other areas of the world, ICADs are referred to as Integrated Conservation and Development Projects (ICDPs). Such projects merge the conservation agenda with development in relation to cultural and economic aspirations of the local population. The success of conservation projects may stem from adequately meeting the socioeconomic interests and needs of local people (Brown and Wyckoff-Baird 1994).

The ICAD concept is rapidly gaining momentum due to its credibility with financial institutions and donor agencies (Wells and Brandon 1993). Although conservation organizations still lack hard data validating the success of ICADs, these efforts can, if executed well, lead to prosperity. Monitoring, an essential part of ICAD projects, gauges and documents their varying degrees of success.

Governments and conservationists increasingly recognize that they cannot simply create protected areas and ignore the livelihoods of indigenous peoples or local landowners (Brown and Wyckoff-Baird 1994). In PNG, local people own the land and rely heavily on using their natural and biological resources for their survival. To displace or exclude people from the use of natural resources because their land or forest is of biological importance may be unethical.

PNG rural communities, such as those in the Crater Mountain area, view themselves as living in poverty or are envious of the more developed areas of their provinces or more affluent areas of the country. Acquisition of products and money is an important measure of wealth and status in Highland Bigman societies; therefore, the drive to make a "quick buck" can become an imperative for individuals seeking status or power. Hence, the ICAD approach is geared toward achieving conservation and, at the same time, providing economic and social returns to local people.

Designing the ICAD

Designing an ICAD project in PNG, where landownership is vested in local people, can be a complicated process. The pressure from landowners, who, in most cases, have misconceptions about the project, bombard its proponents from all angles with demands for consumer goods, cash, and infrastructure development.

Landowners may have a hidden agenda motivating them to participate in conservation, depending on how they perceive and interpret the actions and initiatives of the external collaborators, particularly during the project's formative stages. In the village of Maimafu, for example, prior to establishing the Wildlife Management Area (WMA), conservationists paid a certain landowner 100 Kina (K) annually to refrain from hunting birds of paradise on his land. The landowners who signed onto the WMA project thought they too would receive K100 annually for taking care of the wildlife on their land. The project now faces a series of chronic impediments because of dissatisfied landowners.

Managers of an ICAD project must not capitalize on landowner expectations for an easy achievement of conservation. Conservation for the PNG situation inevitably involves people and their emotions, desires, and changing attitudes. Therefore, evolution of the ideals of conservation should be synchronized with peoples' changing perceptions, especially with regard to how they view modernization and development.

Project Challenges

The list of CMWMA project challenges is long. First, the key to the project's success is a loyal and supportive office staff, since field personnel are often handicapped by isolation.

Second, project managers need to assess the potential effect of unprecedented actions, such as making monetary payments and providing materials for infrastructure construction. Present actions will result in lasting legacies that may impede a harmonious flow in the future. Communities welcome handouts, which may give rise to endless cases of landowner insurgencies that might be impossible to contain.

Third, the CMWMA project is a partnership of landowners and external project proponents that is still in the primary stages of getting people motivated. In PNG, there is no filtering process by which to select landowner groups that sincerely desire to conserve their natural heritage (Orsak 1996). Like their counterparts elsewhere in the developing world, most PNG landowners have not yet come to terms with the massive environmental destruction that development and natural resource extraction schemes can cause. Presently, landowners are more focused on money, products, and infrastructure development, believing they can easily achieve these objectives by selling their forests.

Fourth, the CMWMA project is sensitive to progressing in tune with local peoples' understanding and technical capabilities. Funding agencies set limits to the life span of projects, yet the task of educating an almost illiterate society about the concepts pivotal to environmental stewardship, such as eco-enterprise management

and community-based WMA law enforcement, is terribly difficult. Prime activities of the CMWMA project include training workshops and adult literacy classes.

Fifth, landowners must be active participants in all aspects of the project. Effective local participation extends beyond merely sharing the project's social and economic benefits. The project must also mobilize landowners to manage their resources, make decisions, and control activities that affect their lives (Cernea 1985). External project collaborators must continue to be sensitive to the capacity of landowners during the project's start-up. For example, an eco-enterprise venture in the CMWMA that centered on the Ubaigubi lodge failed, in part, because the local community was not adequately prepared to understand or to run it (Pearl 1994).

Finally, PNG's local people own 95% of the land in a corporate fashion by virtue of the clans. For the ICAD concept to be workable in Crater Mountain, it must be participatory. A broader distribution of money-earning and related opportunities for the community is a principal challenge of the CMWMA project. Unless benefits generated by the eco-enterprises reach the various levels of the community, dissatisfied members will continue to be antagonistic to the project.

The Conceptual Model

Given the challenges discussed above, careful planning is required. The conceptual model becomes an indispensable tool for project planning.

What Is a Conceptual Model?

An effective way to devise monitoring protocols and establish institutional structures and administrative systems to consolidate an ICAD project is to conceptualize it (BCN 1995). This process involves constructing modules of the various project factors in sequence, with arrows indicating the flow and nature of these relationships. The result is a conceptual model—a diagrammatic representation of the overall plan of action, integrating all these linkages into a holistic picture that helps clarify the goals and objectives of the project.

Usefulness of a Conceptual Model

In the CMWMA project, field personnel are most susceptible to committing impulsive errors when they are continuously pushed by the demands of landowners. In such circumstances, the conceptual model has proven useful in providing guidance, such that each action contributes to the ultimate goal of biodiversity conservation. The CMWMA project uses the conceptual model to set priorities for resource personnel selection and budgeting. Project administrators use the conceptual model to spend limited conservation dollars on specified targets. Where a planned project activity hits a dead end, the model provides a means for identifying alternatives. At a field personnel level, staff can arrive at 8:00 a.m. on Monday mornings knowing specifically what to do.

It is argued that the proponents of any project formulate a conceptual model in their minds before it is constructed on paper. The physical formulation of a conceptual model, however, is a revelation of those ideas that allows the effective dissemination and implementation of the model.

The conceptual model delineates potential areas for monitoring, a crucial aspect of the CMWMA project. The impact of the project can be a chain reaction, and the conceptual model helps reveal the links in the chain. Project successes and failures can be monitored at these points. With the application of the conceptual model, this multidisciplinary approach can engage appropriate expertise in the respective target areas of monitoring.

Methods

Model Design

The construction of the conceptual model for the CMWMA project followed instructions given during a Biodiversity Conservation Network (BCN) workshop in the Philippines. The first step was to state the ultimate goal of the project, biodiversity conservation. The second step was to list the major factors, variables, and threats that affect the target condition. These were enclosed in boxes, which were then linked by arrows to indicate their respective causal relationships. For convenience, the factors and the final target condition were written on small paper boxes, which were then freely moved, deleted, combined, or modified during the process of model construction. Then the workshop participants identified the factors and threats that can be influenced by some project activity or intervention associated with specific target points on the model.

The activity or intervention was encircled and superimposed on the factors, variables, and threats on the model. This presentation worked well using two sheets of transparencies, the first containing the conceptual model and the second containing the interventions. By superimposing the second transparency over the first,

plans to influence trends toward the target condition can be clearly expressed.

Functions
The CMWMA conceptual model identifies project objectives and highlights opportunities for monitoring. Formulating a conceptual model is an evolutionary process, however, and the current list will likely expand when new perspectives of the model are considered.

Events and Activities
Events and activities bring the conceptual model to life. Events refer to the project planning phases, where project staff and consultants put the "nuts and bolts" of the machinery together, in a way that most closely represents the site conditions. Activities refer to on-site actions and involve both project staff and community members working in partnership in response to community needs. The project staff oversee the overall plan, but the community dictates the activities. The project anticipates that, by being active participants, local people will appreciate the ownership issue and approach it confidently.

Assessing the Model's Effectiveness
The identified functions of the model were compared to their respective utilities by listing a function and then attaching a sample event or activity to it derived from real-life site experiences from the CMWMA project. The process was intended to address the usefulness and effectiveness of the conceptual model.

Results and Discussion

The results and discussion are combined, since the results are ongoing and will be observed incrementally throughout the project's life. The results are only anecdotal. The functions of the conceptual model are listed and compared with the events and activities.

Development of the Conceptual Model
The conceptual model has evolved and may continue to do so. The initial model built in September 1995 (Figure 2) was modified in May 1996 (Figure 3). These models are indicative of the changes a model can undergo. The model basically depicts the site situations as accurately as possible. However, as the whole machinery is put into operation, the weakness of the model will become apparent, and then the reiteration process will come into play.

Project designers identified the interventions after reviewing the initial site report and constructing the conceptual model. The objectives were then derived from the interventions to meet the needs of the landowners who will respond by managing their resources in a sustainable manner. The interventions are shown in the four oval shapes on the conceptual model (model 1, Figure 2). The objectives listed below underwent rigorous scrutiny; thus, from the initial five objectives the final four listed below were identified. So the conceptual model not only changed itself but also identified and changed the objectives.

- ***Objective 1.*** Increase the average annual per capita income of clans (landowning groups) over the next three years by establishing locally owned research and ecotourism enterprises in the WMA.

- ***Objective 2.*** Over the next three years, increase the level and range of understanding and skills of community residents who work in the research and ecotourism enterprises in the WMA.

- ***Objective 3.*** Over the next three years, increase the number of decisions and actions that integrate the results of enterprise, biological, and socioeconomic monitoring programs into the working management plan.

- ***Objective 4.*** Over the next three years, increase national involvement and human resource exchange within the WMA as teachers, trainers, and consultants working towards conserving natural resources in the WMA.

Functions of the Conceptual Model
The functions identified below have been divided into two categories. The first nine functions refer to the identification of the objectives and their utility, while the tenth deals with monitoring.

1. Identify project interventions and objectives.

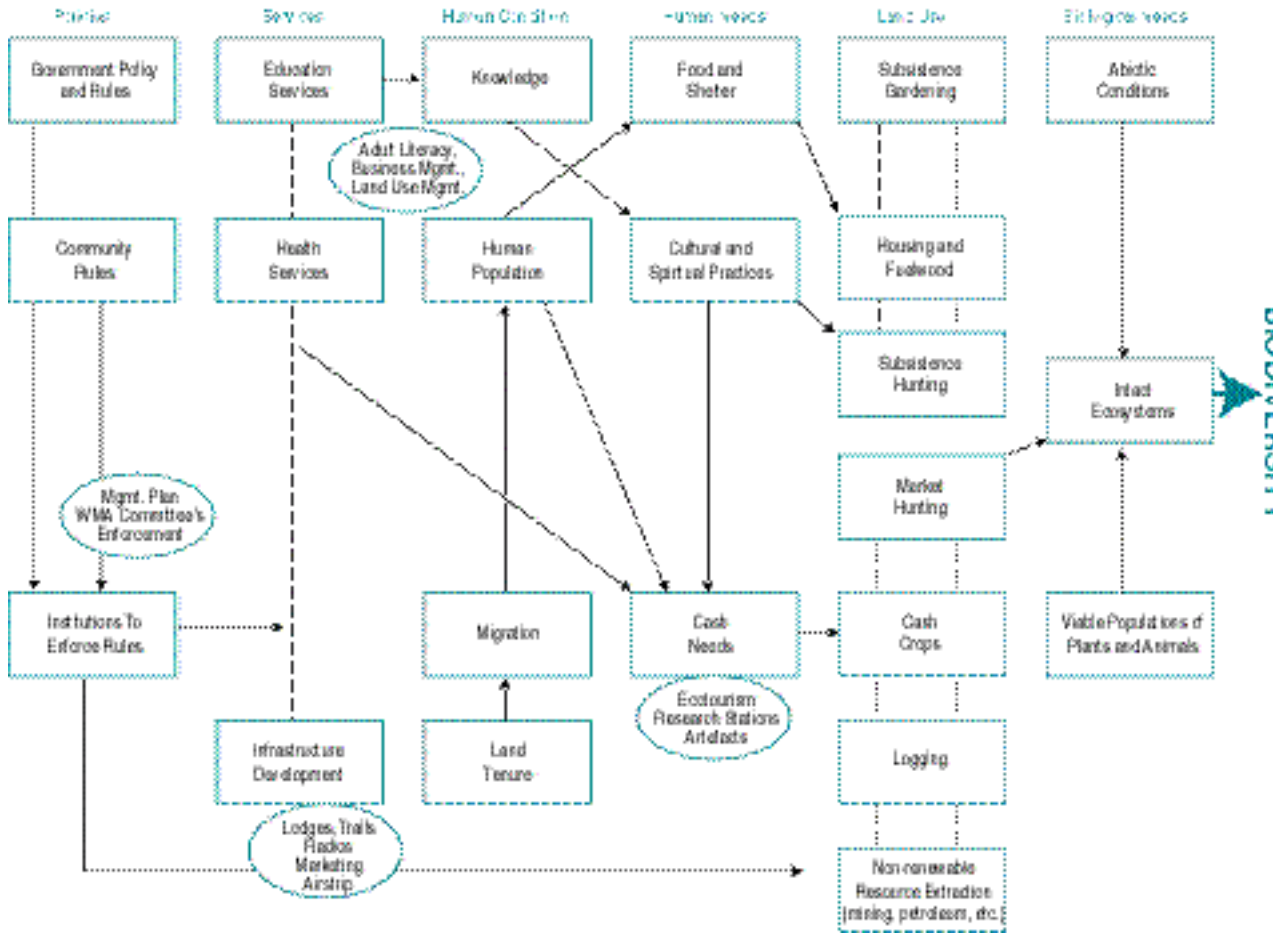
2. Catalyze project pieces to form cohesive picture.

3. Identify resource people and what they can contribute.

4. Identify overlaps with non-CMWMA-affiliated interests.

Figure 2

Initial Conceptual Model of the Crater Mountain Project—September 1995



5. Assist project staff to prioritize actions.

6. Assist project staff to respond to landowners.

7. Serve as a communication tool between project planners and implementers.

8. Guide community and local participation.

9. Identify financial needs for project implementation.

10. Pinpoint targeted areas for monitoring.

Events and Activities

The events and activities identified during the model construction process are listed below. By comparing them to the functions, a holistic picture of the project's evolution emerges, showing how the conceptual model guided that evolution.

Events

- Formulation of project proposal
- Manila monitoring and evaluation workshop
- Wara Sera monitoring and evaluation workshop
- BCN meeting at Herowana
- Quarterly project staff meetings in Port Moresby
- Monthly field staff meetings in the WMA
- Monthly and semi-annual reports by field staff

Activities

- Nahinamo meeting
- WMA annual meetings
- Monthly management committee meetings
- Site visit to impact areas
- Artifact business committee meetings
- Trained local observer (TLO) workshops
- Research assistant training course
- Guest house and research station management training

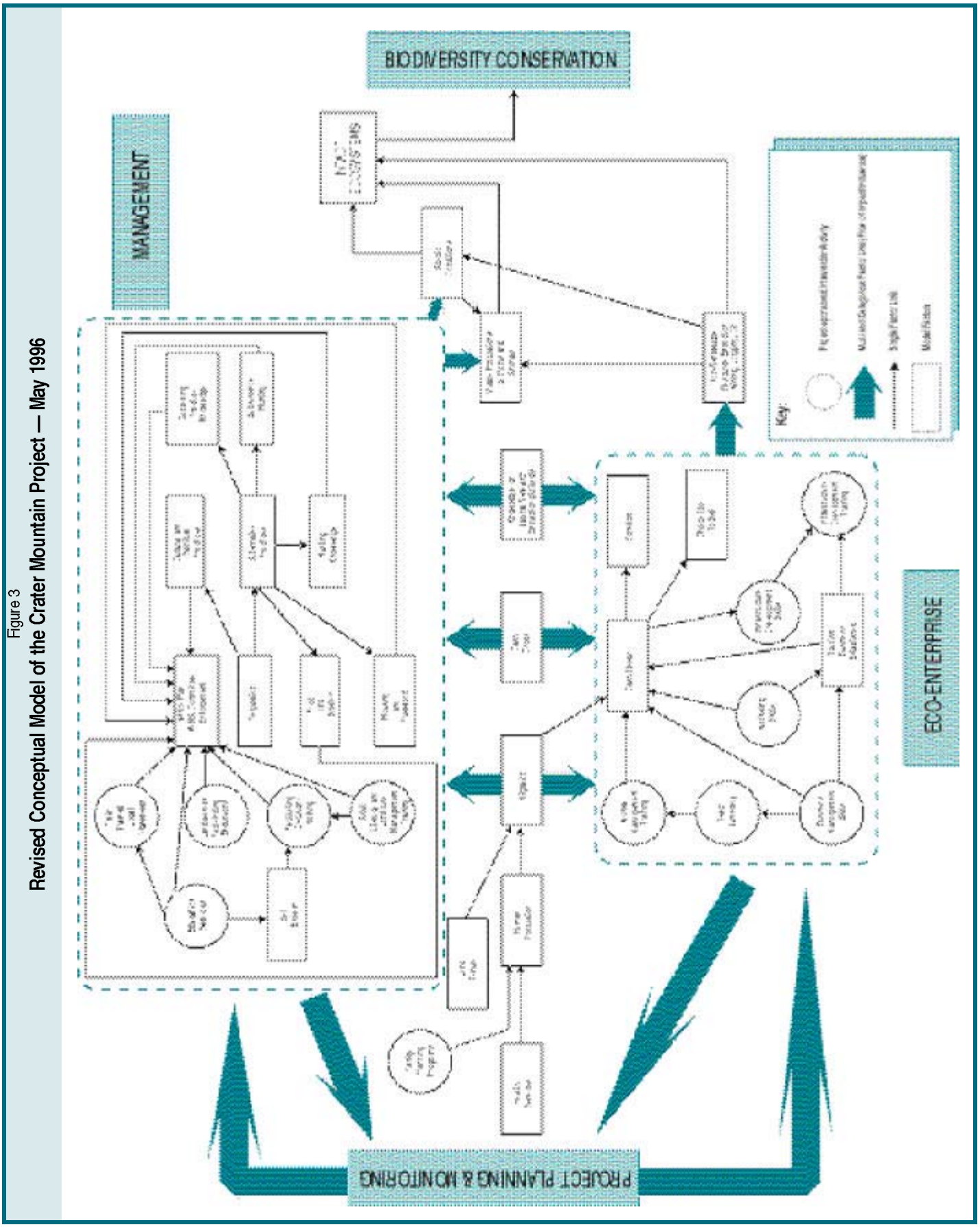


Figure 3
Revised Conceptual Model of the Crater Mountain Project — May 1996

- Biological surveys
- Setting aside land for conservation
- Tourism guide training course
- Adult literacy course
- Population intervention
- Community school instruction
- Socioeconomic surveys
- Land use surveys
- Artifact buyers workshop
- Money management course
- Promoting the education of landowners
- Using village agents to monitor the wildlife export
- Establishing a new business structure development to effect maximum cash needs
- Interest by corporate bodies for resource extraction

Comparisons

Below, the functions are compared with the events and activities in order to highlight the usefulness of the conceptual model.

Function 1: The Conceptual Model Identifies Project Interventions and Objectives.

The objectives of the project can almost be gauged from the conceptual model. The oval shapes in the conceptual model (model 1, Figure 2) represent interventions, and the objectives are derived from them. The interventions that are listed inside the oval shapes will be executed in the field for the achievement of the objectives that they spell out. The following subfunctions list events and activities that elaborate the process of project objective identification.

Function 2: The Model Catalyzes Project Pieces To Form a Cohesive Picture.

The conceptual model must illustrate the overall picture of what the project is doing and intends to achieve. The objectives must be built into the model framework so that the actions leading to that objective are self evident. The pieces, at first glance, might be jumbled, but the arrows link the pieces to form a cohesive whole. Some arrows might confound the uninitiated, but careful observation complemented with the text will soon bring enlightenment. This should allow one to combine all of the pieces into a whole that is both meaningful and reachable. We will pursue the models development in the rest of this section to bring this aspect into focus.

Activity 1: Nahinamo meeting

In early 1993, WCS engaged a lone and roving field coordinator named Seldon James to conduct a massive educational awareness campaign concerning environmental issues and biodiversity conservation. He communicated to Crater Mountain communities many of the ideals and concepts of linking biodiversity conservation to eco-enterprise prosperity, and created a following mainly because of his approach in dealing with the local people. Although he was alienated from the locals by his skin color and culture, he was able to merge well with the people by eating their food and sleeping in their houses. Because of his success in getting them to regard him as one of their own and yet being different, people would listen attentively to his revelations. Crater Mountain communities had sufficient time to properly assimilate these new ideologies. Whether they fully understood the content was a different matter.

A combined forum was organized in October 1993 to involve Crater Mountain communities at a place called Nahinamo. The ICAD concept appeared to have gained popularity because of the products and money associated with development. People complained of the lack of vital government services and economic opportunities. Therefore, their involvement and participation was mainly for the material benefits they could reap from such a venture. They didn't fully understand what they were bargaining for in regard to the conservation agenda because they were so focused on the tangible benefits from the project.

During the Nahinamo meeting, all the external collaborating parties in the CMWMA project had some clear indications of what their plans would be and a general sense of direction toward establishing a viable project. The partners reached the following resolutions:

- Resolution 1. The project endorses the idea of research as a development activity that can provide an alternative form of income and, at the same time, help local communities look after their forest.

- Resolution 2. The Crater Mountain Village wildlife committees would function as leaders should the area receive support for an ICAD project. Potential revenue earning would be distributed by rotating individuals in each clan.

- Resolution 3. The participating clans would set aside land for total protection and any violators would be fined (James 1993).

Event 1: Formulation of the project proposal

Following that meeting, in 1994 the project proponents received a planning grant that enabled them to pool all

their nebulous ideas into a document with coherence and substance. The proposal enlarged the three resolutions above to include the whole repertoire of activities, monitoring protocols, workshops, meetings, infrastructure establishment, equipment, expertise, and the finances needed to implement the whole package in three years. Although hidden, the goal and the objectives were present. A conceptual model was especially needed to bring forth the related and interrelatedness of the whole document, particularly the interventions and objectives.

Event 2: Manila monitoring and evaluation workshop
The physical formulation of a conceptual model did not occur until after a BCN-sponsored meeting in Manila, Philippines, in September 1995. During this workshop, the usefulness of designing and utilizing a conceptual model became clear. The formation of a conceptual model for the CMWMA ICAD project crystallized these rather elusive structural and conceptual components of the project. The skeletal ideas in the resolutions listed above were discussed and enhanced.

Event 3: Wara Sera monitoring plan workshop (Revisitation of the objectives)
After the Manila workshop, the Crater Mountain project staff met at the Crater Mountain Biological Research Station (CMBRS) in the heart of the WMA at Wara Sera in November 1995. The objectives of the model were revisited at the Wara Sera workshop, in order to make them more holistic and cohesive. At the Manila workshop, the organizers emphasized that "reiteration" is the key to success. The finished product in Manila was never a "finished" product as it is as variable as the landscape, the people, and the natural systems that operate at these sites. The second model might have to be revisited depending on the progressive circumstances and situations. Workshop participants scrutinized the model, revisited the objectives, weighed each word against the evidence, deleted whole sentences, and added new words and sentences. The original five objectives underwent such rigorous dissection that one was found to be wanting and was incorporated into another to form four final objectives. The outcome was a concise, measurable, time-bound, achievable set of objectives.

Event 4: BCN meeting at Herowana (Conceptual model revisitation)
During this January 1996 meeting at Herowana, the conceptual model assembled in Manila came under intense scrutiny. BCN's critical analysis reassessed the pathways inherent in the conceptual model. This resulted in the derivation of the existing model, which proposed to accommodate every objective of the project by realigning activities to be more realistic and reachable.

BCN thought the reiteration process was so important that it sent some of its officers to visit the CMWMA project team. It became evident that we were limiting ourselves in our first model by affixing topical headings (e.g., policies, services, human conditions) to the respective factors in model 1. BCN became our "extra pairs of eyes" to make constructive criticisms. One can be so engrossed in what one thinks is the correct model indicative of the real site conditions that the obvious is not always clear. After the BCN visit, the project staff met again to derive the second model (Figure 3).

Function 3: The Conceptual Model Identifies Resource People and What They Can Contribute.
It appears that the success of the CMWMA project depends on a multidisciplinary approach. The immediate project staff cannot accomplish a project of the size and nature of the CMWMA. Resource people with a variety of training and backgrounds are needed. Although the proposals would enlist the required personnel, the conceptual model is a better and faster tool for identifying needed expertise. The staff can interpret the pathways and relationships of the conceptual model to find the respective resource personnel to employ at specific target intervention and action points.

Planning involves both field and office personnel. At quarterly meetings for the scientific program staff in Port Moresby, for instance, the field staff report on field situations and expertise requirements, and appropriate actions are taken or expertise is solicited from various professionals and technical experts. In this section, events and activities that depict this function are highlighted.

Activity 1: WMA annual meetings
The conceptual model assists in identifying resource personnel from the provincial and national governments, corporate bodies, private sector, and other nongovernmental organization (NGO) groups that can help distinguish land and management issues for project staff to incorporate into alternative plans. The purpose of the annual management committee meeting is for all players concerned with the project to identify problems

and successes and develop alternative plans for the next year. In the 1995 annual meeting, for example, resource personnel who were requested to participate included: (1) a representative from the Tourism Promotion Authority, the national government statutory body responsible for developing tourism; (2) the chairman of the RCF board, and; (3) a representative from the Department of Environment and Conservation arm of the national government.

Community representatives got together to formulate the WMA laws and policies that will be recognized by the government. They also deliberated on the service charges in various categories and agreed to charge a uniform rate for all services provided to visitors to the WMA. They took a bold stand by disallowing resource extractors to enter the WMA. This is bold in the sense that the community does not like the legislation that proclaims government ownership of everything two meters below the surface soil. It was a rewarding and enlightening exercise for all who participated. This has happened at each of the annual meetings so far, and we plan to continue this rewarding practice.

Activity 2: Education and training

Objective 2 of the conceptual model is to increase the knowledge and skill level of selected landowners. We will solicit outside personnel to accomplish this in the areas of business and financial management, hospitality, tour guiding, community-based WMA law enforcement, research assistantship, para-biological monitoring, and literacy and basic arithmetic courses. Field staff comprised of volunteers who are usually highly trained professionals will conduct some of the training, but they cannot hope to accomplish everything. We must solicit the balance of the expertise from the outside to bring about the desired change in the landowners.

Activity 3: Trained Local Observer (TLO) workshop

The conceptual model shows that training is required but does not state the specific nature of the training. Monitoring is paramount and is one of the most significant areas. Trained local observers are people elected and trained from the community who show promise and who also have some rudimentary formal education. The project organized a TLO workshop to train local participants in biological monitoring using such basic tools as a ruler, tape measure, and watch to assist the researcher. Local participants were brought to a site, and resource people were shuttled in to do the training. All the research fellows, a scientist from CRC and CMWMA's scientific project staff assisted with the training. Now the project boasts of at least 12 such trained local people.

Activity 4: Research assistant training course

This was the first training course implemented in the WMA. Some of the trainers were brought in from the outside. One was a research fellow studying megapodes, and two of them were WCS field coordinators. This course and the TLO workshop revealed many inadequacies in the content and methods. It reflected on the methods used by the instructors, which are not consistent with the learning experiences of the trainees.

Activity 5: Artifact buyers workshop

The conceptual model emphasizes that all CMWMA sites should develop the tourism industry. This includes infrastructure, services, and artifacts. Artifact business has become popular and is flourishing. Because the business is new and some of the artisans are inexperienced, the quality is sometimes low and the pricing is exorbitant. In order to prevent the business from failing, in September 1994, the project organized a buyers workshop. Three buyers from artifact-buying firms came to the workshop and discussed how quality influences the buying power and the pricing of items. They had examples and pointed out the difference between poorly crafted and well-crafted artifacts. Participants also discussed overseas buyers and their preferences and freighting plus other associated costs.

Activity 6: Market and socioeconomic surveys

A multidisciplinary approach to accomplish what the conceptual model requires is a must. In February 1996, a British volunteer expert seconded by the British High Commission conducted a market survey of Crater Mountain products in terms of potential domestic and international markets. The investigation focused on the potential of tapping into the existing mainstream adventure tourist packages in operation in PNG. The survey also assessed the potential for selling Crater Mountain products under a patented trademark.

In early 1996, a University of PNG social anthropology honors student conducted the first socioeconomic survey for the CMWMA. As part of his thesis, the student visited and surveyed the villages of Haia, Herowana, and Maimafu. The project's field staff will continue socioeconomic surveys with occasional outside expertise. As expressed in the conceptual model, the

interventions are designed to offset pressures on the environment caused by the socioeconomic needs of the local population. These surveys are to measure whether the interventions achieve this goal.

Activity 7: Land use surveys
Population growth leads to destructive forestry practices. The project must intervene in order to foster more "closed" forests or conservation areas. The project requires a land use survey to gauge the extent of forest clearing for crop cultivation, cash crop plantations, and new settlements. Project staff will use the information thus garnered for the realization of Objective 3, where it will aid in the development of a working management plan.

Foreign expertise in the form of doctoral candidates in both anthropology and human geo-ecology would assist in this area in some parts of the CMWMA. Two students have expressed interest in doing their dissertation research in the Crater Mountains, working with the local people on land use practices.

Activity 8: Empowering the landowners to enforce laws made by themselves
The conceptual model envisions that local commuities will in the future enforce the laws and manage the WMA. This relates to another prime focus of the conceptual model, which is to empower the local law enforcement agency at the village level. A community-based institution will enforce the WMA rules and laws set by the Crater Mountain management committees, but that institution must overcome the hurdles of the "Wantok System" (nepotism). The collective community management structure has always been a loose one, and it did not anticipate the intricacies and the complexities of the Western economic management structure. Illiteracy compounds the problem. How do we engineer a management body that has the capacity and the modern economic sense to manage? At various venues we bring in resource people from the government departments to empower the communities to enforce laws and build the capacity of our field staff to manage. We must provide this support for some time before the people can function independently. It is a long, hard process.

Function 4: The Conceptual Model Identifies Overlaps with Non-CMWMA Project-Affiliated Interests.
There are agencies within the WMA with their own interests and purposes. The conceptual model has sufficiently accounted for these interests. It is important to note whether there are areas of overlap and convergence of these interests with those of the project. Once these are recognized, care should be taken in soliciting the cooperation, loyalty, and support of these interests. In addition, the activities and plans of the project should also be sensitive to the well-being and prosperity of these institutions. By doing so, the project courts the community at large to support the conservation effort. This is vital for Crater Mountain since a trace of disharmony or lack of consensus might result in unwarranted impediments. The competing agency may sabotage the efforts and potential achievements of the CMWMA project. Some form of dialogue and understanding should persist between these village-based agencies and the CMWMA project. Some of these interests will be listed and discussed below.

Activity 1: Government services
Schools. The conceptual model recognizes instruction, related to conservation, to enhance learning as an integral part of the project's objectives. Therefore, some of our field staff intervene when requested or required. At the Maimafu community school, for instance, the headmaster allocated one hour each week to the resident field coordinator for specific instruction to his class on the ideals of conservation. During these sessions, the field coordinator gave short presentations and designed "fun" activities with a conservation theme for the students. The headmaster reserved a small section on the bulletin board dubbed the "environment corner" for the field coordinator to display articles and pictures on environmental and wildlife issues. When U.S. Peace Corps volunteers come to Maimafu, it is believed that they will effectively assume this responsibility.

At one community school, the teachers are at odds with the project personnel, and thus this important avenue for community outreach may be blocked. A varying degree of style and taste in approaches will have to be used in effectively disseminating the conservation message to different members of the community. Some of the approaches have been World Environment Day (June 6) celebrations at the schools with posters, video shows, slides, and speeches. Others have been through monthly meetings, annual meetings, and other meetings and workshops organized by the project.

Local and provincial government. The conceptual model recognizes the importance of government policies and also highly regards community-level government par-

ticipation. The village councilor and politicians have their political ambitions and prestige to maintain. These interests may differ from the goals and objectives of the CMWMA project. In the village of Maimafu, project staff have made tireless efforts to consolidate the interests and fidelity of these influential figures. Both political figures have been involved in programs and activities outlined by the conceptual model, and it is hoped that this will nurture their interest and support in the CMWMA project. These two politicians have thus far pledged financial support for WMA activities, i.e., money to pay labor for the construction of a "Tumbuna House" and the Peace Corps volunteers' house at Maimafu. The Tumbuna House will serve as a storage and display area for artifacts, as well as office space for the project.

Community health (Aid Post). The project can use the village Aid Post Orderly to maximize the campaign against population expansion by implementing family planning workshops and programs. In villages where rural agricultural officers are based, the assistance of these resource personnel can be used in educating the community in new agricultural practices conducive to the WMA goals and objectives. The project must be sensitive toward creating an atmosphere that fosters the interest and involvement of these officers for the benefit of the project.

Churches and missions. The church is another important village-based institution. The CMWMA communities have had missionary contacts for several decades. In many cases, the missionaries were responsible for breaking the frontiers of cannibalism and witchcraft and for establishing order and peace. These missions have replaced the government in providing essential services such as health, education, adult literacy, trade, and transport. Therefore, apart from spreading the Christian gospel, these missions have been the "government" to the people. These missions have formed an intricate part of people's lives and, in turn, cast a net of ownership over their converts. In order for the CMWMA project to prosper, there is need for a high degree of cooperation and partnership with these institutions.

Activity 2: Interest by corporate bodies for resource extraction

The conceptual model, by implication, excludes all large-scale resource extraction, though the resource owners can do so by choice. The boundaries of the CMWMA project area encompass resource-rich regions with high potential for logging and mining. Generally, the cash needs of Crater Mountain communities appear to transcend all categories of rational decision-making concerning environmental stewardship. This fact continues to threaten the integrity of the CMWMA project. In addition, the absence of a central planning agency in the PNG bureaucracy (*Post-Courier* 1995) further complicates the situation. Ideal examples of this situation are reflected in (1) the issuing of an exploration license to MacMin NL to do mineral prospecting within the CMWMA and (2) the inclusion of parts of the CMWMA near the Purari River to the Turama Forest Products Timber Rights Permit. In both circumstances, there was no central bureaucratic agency to orchestrate the interests of the CMWMA as a recognized wildlife management area. Political interference and bribery at the local level by resource developers are additional concerns. The project staff must serve as informants and negotiators in the absence of an organized and recognized legal body in the WMA.

Function 5: The Conceptual Model Assists Project Staff To Prioritize Actions To Fulfill Project Objectives.

An ICAD project implemented without a sound conceptual model can be synonymous with navigating without a map or a compass. The conceptual model maps the array of mechanics of the project. This map enables project managers to plan detours and alternative routes apart from the terminal points for intervention and project activities. Each set of players at every phase in the project must understand what it has to accomplish. We at the Crater Mountain project are using the model at every phase to plan and to prioritize our actions. Some of the activities that depict this are elaborated below.

Event 1: Monthly field staff meetings in the WMA

Field staff use the conceptual model to assess whether their individual and combined efforts are moving not only in the right direction but also at the right pace and in concert with the fulfillment of the objectives. If all the field staff working at a particular site focus on their respective "little worlds" without interfacing, they are likely to fly off at various tangents. To avoid such circumstances, the CMWMA field staff meet at regular intervals to refresh and reorient themselves. The various field personnel have their respective duties and interest areas. However, these should overlap for the smooth running of the project. They also set their priorities for the month and scrutinize previous efforts.

Event 2: Quarterly staff meetings in Port Moresby
The field staff conduct their work at various locations to fulfill the requirements of the project objectives as specified by the conceptual model, while the office staff are based at the headquarters in Port Moresby. The different sites present varying scenarios, hence each staff experiences varying degrees of successes, accomplishments, and failures. Thus, it is imperative that staff get together at a central location on a regular basis to exchange ideas and information. By doing this, the larger picture will remove any sense of gloom at respective sites, provide hope, and invigorate staff to pursue purposeful activities in the future. Field staff gather every three months in the headquarters in Port Moresby. In these meetings, accomplishments of the past three months are reviewed, and plans for the next quarter are made accordingly. Some actions might become redundant, while others are included in the coming quarter. Staff write and compile reports for the benefit of donor organizations, make appointments with resource people, and set dates for field meetings or workshops.

Event 3: Monthly and semi-annual reports by field staff
The project will obviously face difficulties if the field staff are working together while the office staff are kept in suspense, and the latter has nothing to do with the former. The two groups must be kept informed for the project to have any sense of continuity, harmony, and accomplishments. The Port Moresby headquarters sends bulletins of upcoming events, workshops, staff movement itineraries, and a listing of visitors to the WMA so that the field staff are kept informed. The field staff submit monthly and semi-annual reports for the benefit of the office staff and the board of directors. Donor agencies also require these reports so they know how the project is spending their funds. The project uses these field reports to prioritize its actions. Without this flow of information in both directions, the conceptual model will have no strength, for information is the mainstay of any venture.

Function 6: The Conceptual Model Helps Project Staff Respond to Landowners
The conceptual model was structured by looking at the various needs of and areas impacted by the landholders and how project proponents can intervene to minimize destructive use of delicate natural systems. Consider for a moment a situation in which two disparate groups of people with distinct educational backgrounds, accompanied by a varying array of cultural consciences, expectations, hopes, and aspirations, pledge to work together for a common goal. Both groups need to be sensitive to each other's interests and purposes. The objectives of the conceptual model are built into the structure so that project staff can easily point them out to the landholders. The big question in the minds of the landholders in the CMWMA is why are we there. They question whether we have a hidden agenda or will make a quick profit at their expense. Landowners are overly suspicious, with the communities divided in their support of the project. Some are staying in the mainstream to see what will happen, while others look on from the periphery. A number of events that respond to the landowners questions are discussed below.

Activity 1: Artifact business committee meetings
The conceptual model demonstrated to landowners that the artifact business is not the only eco-enterprise activity planned. The artifact business will help satisfy the growing cash needs of the community. It is already an established entity bringing in much needed cash. The staff are fighting for a managed approach to the extraction of natural resources for use by the artisans; otherwise, these resources will be depleted and the project will have negated its original goal and objectives.

While the locals are already receiving money from these ventures, the taste of having some money drives the need to get more. As far as they are concerned, the enterprises are not big enough to meet their cash needs. The artifact business has already been successful but exerts pressure on the natural system, which may sabotage other eco-enterprise ventures within the WMA. It is envisioned that the local artisans will recognize that sustainable extraction practices of the natural resources and their associated linkages are indispensable for the sustainability of this enterprise. To maintain that scenario, the business committee meets once a month to stay on track. Here the business and monitoring regimes will complement and make linkages to each other. The business enterprise must make sure, through monitoring, that conservation is achieved.

Activity 2: A new business developmental structure for alternative sources of income
The CMWMA conceptual model identifies opposing agencies and helps navigate potentially deviant business ventures onto a suitable track. The Crater Mountain project's field enterprise development officers have designed and will incorporate landowner companies that will be self-sustained and managed through profits

earned from eco-enterprises. Clans will operate business groups as separate entities at respective Crater Mountain communities, but they will amalgamate into a parent company governed by a board of directors. Members of the board will be selected from core landholding groups in the management committees in the CMWMA communities. The project envisions an umbrella company for the entire WMA. Landowners will become shareholders of these companies, in which all decision-making and purchasing of WMA support services will come directly under their control. Their articles of business will legally delineate environmentally friendly business ventures that these landowner companies can operate.

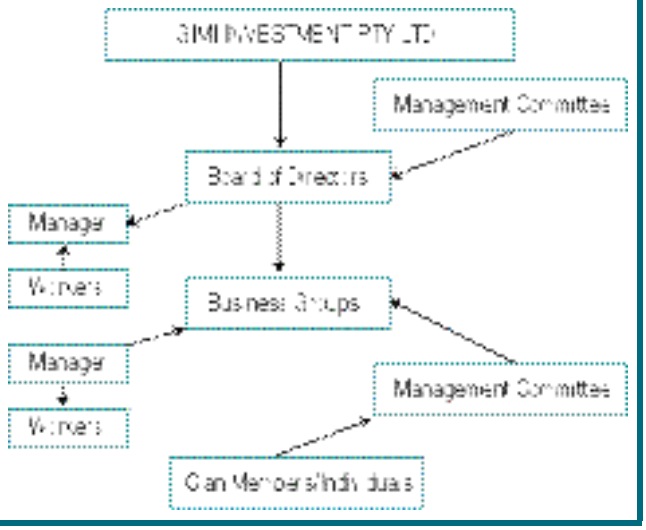
A substitution strategy is necessary to compensate the landowners for their denied access to resources. The CMWMA conceptual model aims to design and to introduce alternative, compatible, and compensatory means. For instance, the new business development program will attempt to establish poultry projects plus others with similar intentions to provide an alternative to the protein that would otherwise be obtained from the forests (Figure 4). Since such projects cannot be directly linked to biodiversity conservation, they are inclined to compete with the goals and objectives of the project. Care and sensitivity must be taken to avoid such conflicts.

Event 1: BCN meeting in Herowana and the communities agenda

The conceptual model was used to assist in bringing insight to the landowners and making them aware that, if they want material things, they will have to earn them. This meeting revisited the conceptual model, but a side issue stemmed from this meeting with the landowners. The project staff were concerned about the model and how all parts fit together, but the landowners were impatient about the expected results taking too long. They wanted to know when the promised hydroelectric scheme was going to be set up, and whether the project would build a green coffee factory for them. The landowners questioned why they were not getting paid for the work they now did for the project as they had been in the earlier stages.

Figure 4

Proposed Company Structure—GIMI Investment Pty Ltd.



Local landowners are people who plan to do things immediately. They easily get impatient when things fail to materialize sooner than expected. Their cultural method of planning does not require money or a hard-and-fast planning method. They plan as they work, with ideas coming from everyone. How are we to tell them that planning and organization take money, time, and energy? We can only be patient, keep working with them, and hope that they will soon see the light at the end of the tunnel.

Function 7: The Conceptual Model Serves As a Communication Tool between Project Planners and Implementers.

The conceptual model is clearly useful as a communication tool. It helped project staff and planners alleviate the cumbersome procedure of moving between the different pieces of project documents. With the conceptual model, all the integral components of the project are presented at a glance. In the Crater Mountain project, the staff at each village site used the conceptual model to plan their monthly activities. All field and office staff use it during their scheduled meetings and at the end of the year when the annual plan is being determined for the new year. It is also used at meetings, workshops, and other training events related to the project so that everyone involved stays tuned to the progress of the project. With the conceptual model, intervention activities can be effected uniformly across all of the Crater Mountain communities.

Activity 1: WMA annual meetings

A pictorial or diagrammatic representation of the conceptual model's individual pathways is presented at these meetings, as the landowners may not be able to digest the whole model at once. During these meetings, the project attempts to convey to the landowners in simplistic terms various aspects of activities and decision-making.

Event 1: Monthly field staff meetings in the WMA
Project staff consult the conceptual model at these meetings to avoid the danger of field staff acting tangentially to the goals and objectives of the project. Therefore, the conceptual model is vital in fostering uniform field personnel duties, actions, and responsibilities.

Function 8: The Conceptual Model Guides Community and Local Participation.
The conceptual model indicates how we are attempting to strengthen local institution managers by community participation without providing money or products. Local participation and ownership are crucial for the maintenance and sustainability of the project. The project's objective is to cultivate and to nurture local ownership. Here we are emphasizing that the management committee must make all decisions as to how things should happen, where things should be, and how money should be spent or divided. Then the local people will appreciate the ownership issue. The CMWMA project plans to achieve this by encouraging the communities to contribute their time, labor, materials, and land to project-related activities free of charge. However, this conflicts with the cash economy ideals of the locals who expect products, cargo, and monetary rewards for their time and efforts in project-related activities. The proponents of the CMWMA avoid this expectation, as it will only continue to alienate the sense of ownership of the WMA by the local population. But it is still a sensitive issue.

So, are we to guide community participation in a cohesive and forced manner? Are we to solicit a participatory approach by gentle persuasion? If we follow the former course of action, will the landowners ever anticipate ownership status of the enterprises or the CMWMA project for that matter? If the latter course of action is pursued, will the landowners ever participate, and if they do, will they willingly contribute their time, effort, and resources free of charge? For instance, if the landowners are paid to build a house, they will do so in two weeks flat. If they are not paid for a job, such as for the construction of the U.S. Peace Corps volunteers' house, it will take forever. In the Crater Mountains, we are maintaining both methods. At times we pay the locals, and at others we do not, depending on how people will respond. We are using the gentle persuasion approach at most sites and hope that this will ultimately succeed. We use persuasion in the following ways:

Activity 1: Monthly management committee meetings
At this venue, landowners may make decisions, rules, and sit as judges through the management committee. Community participation is difficult to attain when each household has its own agenda or schedule. If one were to call a meeting, a few individuals might make an appearance and the most committed persons might. To avoid such problems, in the Crater Mountains we have organized the landowners' management committee, a representative committee that we use as a vehicle for the dispersal of information in both directions and for maintaining a discrete body to train as managers. Every month at a regularly appointed time, a meeting is called for all the members in which all matters relating to the project are discussed or disseminated. This assembly is encouraged to educate their clan members to respond to the project agenda and make appropriate contributions where necessary. They make decisions on the use of land, building houses, and use of their money, produce financial reports, and announce upcoming events. The members are expected to pass along information, but because this does not happen, some meetings are "open" so all can attend.

The field staff must look for avenues to connect with everyone in the community. If the management committee members are only elders, then the younger generation is isolated. If the committee consists of only men, then it isolates the women. A committee that reflects a balance of older and younger members and men and women is a healthy compromise for the maintenance of influence from age discrepancies and gender disparities. In the Crater Mountain project, we are working to achieve this committee composition.

Activity 2: Money management training
The conceptual model indicates that educating the community in money management and budgets may relax the strain on the current trends pertaining to the cash needs of the community. They must be instructed on how to save and to make investments. Perhaps this strategy may aid in soothing the pressing levels of cash needs for landowners simply by changing people's current attitudes toward the use of money.

One of our objectives is to train people to manage their resources, but more so their personal income generated by the project. It appears, in most instances, that there is enough cash in circulation within the local economy which, if managed well, may cover the cash needs of the local population. The bride price custom, particularly in the Gimi-speaking and highland com-

munities of the Crater Mountains, tends to quickly drain hard-earned cash. Bride prices are rising so fast that they may drain all earnings from coffee for a particular family. Even if a family did have money, it would not want to use it on immediate needs. For instance, parents may be reluctant to use the cash they have to send a sick child to a bigger hospital for medical treatment. All cash they earn is usually for cultural obligations and commitments to perpetuate a display of their status in the society.

Activity 3: Education of landowners for employment in research and ecotourism enterprises

Educating and training the local population in the ideals of conservation and the expertise required to successfully manage their business ventures is a principal focus of the CMWMA project. Training landowners as TLOs, research assistants, tour guides, and visitor service workers is an activity that will increase the self-esteem and well-being of landowners. This will be accepted in the absence of literacy conducive for employment in the community. It is apparent also that the employment of indigenous people as trainers and teachers will be more effective, as they will interface well with the locals, especially from the cultural perspective. The transfer of knowledge and expertise can be more effective and hassle-free with this approach. The CMWMA project is also planning to secure funds to offer a high school scholarship for potential students from CMWMA community schools. It is hoped that this scheme will encourage the youths from these communities to pursue a high school education. After completion of their education, these men and women will be instrumental in educating their people, providing sound management of the eco-enterprises in their villages, and making linkages with biodiversity conservation.

Function 9: The Conceptual Model Identifies Financial Needs for Project Implementation.

A project proposal is not written for its aesthetic beauty or psychological soundness, but to perpetuate funding. The proposal looks at the number and types of interventions required and the inherent costs. Because conservation dollars are limited and scarce, justification and cost saving are the rules of the game. Every action listed spells money, and if anything, these actions must be **smart:** ***s***ound, ***m***easurable, ***a***chievable, ***r***eliable, and ***t***ime bound. If they are, then chances are high that a donor organization, such as BCN, will give the proposal favorable consideration. Funding is an integral part of any project activity, so all actions planned must not only be convincing but also clear and concise.

Event 1: Quarterly staff meetings in Port Moresby

The conceptual model becomes an effective planning device in these meetings to hone in on activities that require money. Candid assessments by staff of the ground situation, in addition to guidance from the conceptual model, will help identify which interventions deserve funding priority. Though there is a skeletal financial plan on the general expenditure covering the various intervention activities, the field staff will usually have a good sense of the real situation. These meetings should also produce reports and results on the progressive successes and failures of current intervention activities. Decisions can then be made on whether financial commitment should be reinforced, eliminated, trimmed, or rechanneled into more worthwhile activities.

Activity 1: WMA annual meetings

Landowner suggestions and decisions conducive to the goals and objectives of the project as reflected in the conceptual model are carefully assessed. WMA annual meetings focus on landowner queries and issues affecting the entire WMA. Those suggestions that are compatible with the goals and objectives of the project and require financial assistance are given consideration. The landowners, for example, in one of these meetings suggested a countrywide landowner forum workshop. This is going to be staged in 1998, which certainly requires money and planning.

Function 10: The Conceptual Model Pinpoints Targeted Areas for Monitoring.

One objective in the conceptual model for the CMWMA project hinges on the fact that all actions carried out within the WMA are result oriented, so that all outcomes are recorded for future reference and monitoring purposes. The result is scrutinized to identify the mechanisms that influence the outcome. Project staff then take remedial measures to ensure that the objective is accomplished. In fact, all project activities require an outcome, as they are a sequential series of events with each resultant action being dependent on a preceding one.

The activities that are planned and implemented must have a monitoring process to determine whether the actions have accomplished the objectives and to

measure any form of success or change. Monitoring is a tool to oversee the actions and fulfillment of the objectives. Monitoring presupposes initial surveys so that consequent changes will be recorded and analyzed to determine whether positive or negative change has taken place. In the Crater Mountain project, we heavily emphasize monitoring, hence the placement of science- and business-oriented staff at the sites. This will ensure that business-related actions are monitored while the natural resources are accounted for by field-based biologists. In both areas, trained TLOs from the communities will be used to gather basic data. Outside people, such as researchers and students will also be used to assist in data gathering. The activities listed and discussed below exemplify the process.

Activity 1: Biological surveys

Biological monitoring is consistent, as indicated by Objective 3, with biodiversity conservation. Specific target indicator species of plants and animals can be monitored as impact (direct) or proxy (indirect) indicators. A species inventory of the entire elevation range of the CMWMA is essential during the early stages of the project, since nothing of this sort has ever been conducted for the area. This is important because, at the end, the project will possess the basis of knowing whether biodiversity conservation has really been achieved. Hence, the 1996 CMWMA Flora and Fauna Survey will cover five taxa, including plants, mammals, birds, reptiles and amphibians, and insects. Five sites at different elevations representing major habitat types will be surveyed. An extrapolation of the results will delineate the flora and fauna spanning the entire elevation range in the WMA land mass. The site biologist, supervised by the resident project biologist, will maintain the ongoing monitoring.

Activity 2: Socioeconomic surveys

The conceptual model clearly expresses potential points, such as land tenure systems, traditional trading systems, and the current monetary system, on the socioeconomic front to embark on as monitoring subjects. The CMWMA project uses factors in the conceptual model that are influenced by the interventions to be monitored. These factors are either impact or proxy indicators. The monitoring systems are also designed to determine whether it is really money generated from the interventions that is mitigating the need for cash. These monitoring devices should also reveal whether money obtained through these interventions is used to purchase goods and services contrary to the goals and objectives of the project, such as the purchase of shotgun bullets or indulgence in gambling activities, because of the specific inflow of cash into the community.

Activity 3: Using village agents to monitor the export of wildlife

The conceptual model has assisted the project team in identifying an effective way to monitor the departure of wildlife articles from the CMWMA. A local resident is trained to keep a record of wildlife articles leaving the village, whether they are sold, offered as gifts, or exchanged as bride price endowments. Their market value is also to be determined.

Such a monitoring system will address three concerns. First, local persons have a better knowledge and sense of the exit points of wildlife from the CMWMA. They also tend to be better informed about the current state of affairs surrounding hunting, and therefore will adapt well in facilitating a legitimate collection of the required data. With the CMWMA laws protecting the wildlife in exclusion zones of the CMWMA, people will tend to be more secretive with activities of this nature. Second, we will be fulfilling one of our fundamental objectives, which is local participation in the drive to impart the sense of local ownership of the CMWMA project by CMWMA residents. Third, it is hoped that this system will ease people's suspicions so that they can be more candid about their activities in this regard. Although this system has its weak points, it is hoped that the community at large will see the importance of cooperation and participation. Then, perhaps, people will begin to appreciate that these data collections are essential to the sustainability of their eco-enterprises.

Event 1: Monitoring and evaluation workshops

Any action must be evaluated and checked against the expected outcomes as perceived by the conceptual model. The Herowana and Wara Sera workshops were important milestones for the project in that they notified the participants to be results conscious. They alerted the CMWMA project team to establish specific monitoring devices. During the construction of the conceptual model, project staff singled out areas to be targeted for monitoring. These included the biological and socioeconomic monitoring systems. These systems must complement each other so that we can see a linkage between them.

Other Activities That Assist in Monitoring

Activity 1: Adult literacy courses

The project will conduct adult literacy classes in all of the communities where field staff maintain residence. The purpose is to increase the knowledge and skill levels and, most importantly, self-esteem. Such classes are being conducted in at least one of these villages. The response is high initially, but the attrition rate increases as time goes on. Remedial restructuring has been suggested, in which students enroll in a six-week course on a certain topic and pay a fine if they miss a day. This may frighten the people and increase the attrition rate, but, if they really want to learn, they must be committed. We have already trained two students as TLOs at one of the sites, an obvious result of that education.

Activity 2: Site visit to impact areas

The project hopes to discover more effective ways of impressing the values of conservation upon CMWMA landowners. Those from outside bring all of our experiences, educational backgrounds, and know-how. But the people who have lived with nature all their lives have a more difficult time understanding what we are talking about. Theoretical instruction on environmental damage, loss of forest habitat and species extinction is difficult enough since we have to understand how these people think and appreciate the worth of new information and knowledge. Monitoring and management concepts will mean nothing to them without the visual, first-hand appreciation of the issue.

The CMWMA landowners' excursion to the heavily logged trans-Gogol area of the Madang Province proved to be a winner. Landowners in the south end of the WMA visited a site where a logging company had been courting them to create a partnership for some time. Upon return from the impact site visit, the landowners turned down the offer. It demonstrated what a site visit and practicality can do in transforming people's attitudes and approaches to new concepts or ideas. What the CMWMA project tried to achieve for some time was accomplished in less than a week. This possibly demonstrates, in a small way, what local management and monitoring can do in the future.

Another trip is in the pipeline, this time to a mining site, since mining companies are already prospecting for gold and, by all counts, seem to have "struck luck" right in the WMA. We hope that this trip will help local people to present their case forcefully before the government in order to disqualify the mining license and avert any further incursions.

Activity 3: Set aside land for conservation

The ultimate goal is to achieve a conservation corridor throughout the elevational range of the WMA to cover all habitat and microhabitat types. The process of zoning the CMWMA into categories of exclusion zones and low-impact zones is slowly making progress. During the first annual meeting at Nahinamo in 1993, the clans pledged to set aside forested areas as conservation zones (Resolution 2). These may initially appear as small pockets scattered throughout the WMA, however, landowners' decisions for further zones to be included will be influenced by appropriate bodies within the CMWMA project. The idea of using these forest reserves as recruitment and nursery sites for the impacted areas appears to be accepted by the landowners. They also appreciate that hunting pressure is increasingly depopulating their game animals. Field staff are awaiting the delivery of a new global positioning system (GPS) to begin a more serious land demarcation exercise to map out those respective impacted and conserved zones. Following this, the challenge of getting a functional community-based agency to enforce WMA rules and policies will be another obstruction to overcome to make this scheme a reality.

Activity 4: Human population intervention

The project hopes to affect the human population by intervening at strategic points, such as the health services and land tenure system. The health personnel are adequately trained and placed. Peace Corps volunteers are components of our interventions placed in these communities to assist the health workers. They are required to educate the community about family planning methods and keep a tally of population migration and emigration and land tenure systems. These activities will assist us in monitoring. If this program becomes successful, it will help ease the human pressure on the natural systems. Ironically, health services aid population increase, a move that the community welcomes. In the highland communities, the number of male children one has is significant on several counts as evident in the following conversation between one of our staff and a man who already had six children, five of them boys:

Staff: Do you think you have enough children now?
Man: Oh, no! That's the last thing on my mind right now.

Staff: Why do you say that?
Man: Because I have to have a few more before I stop, or rather before my wife stops (laughs).
Staff: Why do you really want a few more?
Man: Because, first, our clan has only a few males who will protect our land and properties, you know that number is power here. Second, some of these children will most likely die due to sorcery, so the more I have the greater the number left. So you see I must go on.
Staff: What do you think about the use of family planning methods?
Man: No, those are for others who are mentally retarded.

Although this man's clan already has the largest number of males in the community and the land available for use is getting smaller for each male, this mentality persists. Our field staff are working against such odds, pure stubbornness against change. Our target group will be the next generation, and we continue to hope that they will see the light soon.

Summary

Building a conceptual model is an intensely focused process. It requires the thinking of all involved at every stage of planning and implementation in order to reach the desired goal in the set time frame and beyond. The model will have to be revisited to accommodate the changing landscape. Once completed, the model is not a static, finished product. The production of a model is important on several counts, which are depicted in the functions discussed above. The most inclusive function of the conceptual model is its use as a tool at each planning phase of the project. The events listed and compared are indicative of the model working for the time being.

Recommendations

Below, we offer some hard-earned advice to those who may be in the business of formulating conceptual models.

Formulation of Conceptual Model

A conceptual model gives planners and implementers an indispensable tool. Field personnel must be located on-site for at least one year. They then submit reports on their assessments of site conditions. These reports and all individuals involved in the project and project proposal should be used to formulate the conceptual model.

Lessons for Project Implementers

If possible, the person hired for the field position should be someone from the general area, know the language, and be familiar with the culture. This will make the project implementer's work much easier. Because of the many cultural nuances and norms that this person will understand, his or her ability to transmit project goals and objectives to local people will go smoother.

We recommend that the field person have excellent interpersonal skills, as well as the necessary qualifications in the biological sciences. Even though the work is science oriented, the most important part is being able to relate to people. Staff must deal with people's aspirations, hopes, and desires at a human level.

Local ownership and participation must be encouraged from the beginning, which will encourage the community to make required contributions, such as land, materials, and labor. Without this approach at the outset of the project, the question of ownership will loom large toward the end of the project. Because of the limited time remaining, the project will likely become more uncertain than when it started, and end in failure.

When field staff arrive in their communities, they need at least three months to find their niche. During this time, they can identify key players in the communities and learn about village politics and other factors that will help orient them.

All levels of government must be informed and briefed at all times; otherwise, many unexpected problems may result. Project implementers should interact with the relevant government department, such as the department of environment and conservation. Getting the appropriate department officials involved with any activity and keeping them abreast may mean the difference between success and failure.

Other points might become transparent as time goes on. These recommendations may vary, depending on the current landscape of the site and country. Those we have presented here are based on our situation in the Crater Mountain Wildlife Management Area of Papua New Guinea.

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4

Conceptual Modeling for Nature-based Tourism and Wildlife Microenterprises: Conservation Support for Lore Lindu National Park

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Introduction

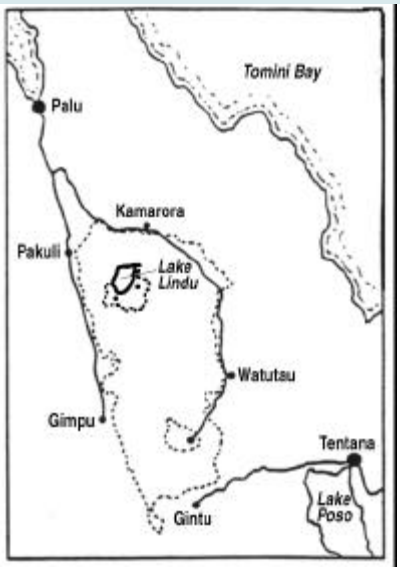
Lore Lindu, located in Central Sulawesi, is one of Indonesia's most pristine national parks. Increasing human pressures around the park's borders, however, are beginning to take their toll. In collaboration with the Indonesian government and such partners as the Cooperative for Assistance and Relief Everywhere (CARE) Indonesia and communities around the park, The Nature Conservancy (TNC) has begun to play an active role in the conservation of Lore Lindu. TNC has introduced a system of bioreserve strategic planning that focuses on threats and their sources. Ensuing strategies emphasize informing policymakers; developing community education projects; fostering compatible economic development; and designing an integrated program of biological, socioeconomic, and enterprise monitoring to guide ongoing management and to measure the impact of the strategies.

The Biodiversity Support Program's (BSP's) Biodiversity Conservation Network (BCN) has introduced a conceptual modeling process that has been useful in redefining strategies and shaping monitoring plans to reduce threats and sources of threats at Lore Lindu, as well as at other sites in the region where TNC works. In this paper, we describe BCN's conceptual modeling process and present the evolution in our use of conceptual modeling as a strategic planning tool aimed at securing Lore Lindu's future.

Context

The Government of Indonesia created Lore Lindu National Park (LLNP) in 1982 in a mountainous forested area south of Palu, the provincial capital of Central Sulawesi (see Figure 1). At approximately 231,000 hectares, the park is almost twice the size of the Hawaiian Island of Oahu. It is bounded on all sides by valleys containing agrarian communities of traditional and migrant people. The park contains no permanent human settlements, aside from two valleys that have been established as enclaves.

Figure 1
Lore Lindu National Park



Sulawesi's biogeographical history has blessed the island with numerous endemic plant and animal species. The island provides important habitats to approximately 79 mammal, 88 bird, 29 amphibian, and 11 swallowtail butterfly species that occur nowhere else in the world. Important endemic species in LLNP include dwarf buffalo, pig-deer, wild boar, macaque, cuscus, tarsier, Sulawesi civet, male bird, and the Sulawesi hornbill (TNC and Indonesian Ministry of Forestry 1992).

LLNP, located in a mountainous, heavily forested province, is sparsely populated and has a poorly developed land transport system. The province is home to approximately 60 indigenous ethnic groups and large numbers of migrants from South Sulawesi and elsewhere in the archipelago. Most of the people living in the region are subsistence farmers who are only weakly integrated into the cash economy. While economic and health indicators are among the worst of Indonesia's provinces, absolute poverty is low because of the general availability of agricultural land.

People living near the park's boundaries, for the most part, still continue traditional lifestyles. They produce handicrafts, including bark cloth and weavings from rattan, pandanus, and grass, and they perform a special type of bamboo music that has attracted the attention of both domestic and international scholars. Researchers from around the world come to investigate the mysterious megalithic remains scattered throughout the Napu, Besoa, and Bada valleys. This cultural heritage, along with the natural beauty of forest, lake, river, wildlife, and park scenery, attracts small numbers of tourists to the area, thus providing environmentally sound alternative sources of income to some of the people living around the park.

Illegal encroachment and collection of park resources, however, yield greater incomes for ever greater numbers of people and are increasingly threatening the integrity of the LLNP. Although park managers are interested in beginning community involvement and education activities, to date, the resources for enforcement and community activities have been limited.

Immediate Threats and Stresses

Until recently, LLNP and its surrounding areas were fairly isolated, despite their proximity to the provincial capital of Palu. Isolation is now rapidly diminishing with new road construction and improvement. To further develop agricultural potential in the province, the Indonesian government is exploiting all fertile land around LLNP boundary areas through resettlement and transmigration programs. The government considers development of road networks an absolute necessity in marketing agricultural products from the communities abutting LLNP. Most existing and future road networks are located along the boundaries of the park. Better access to the valleys, formerly accessible only on foot, has resulted in a great influx of outsiders to the park and its immediate surroundings. Directly or indirectly, the growing population is forcing inhabitants to move into LLNP for farming, hunting, and the gathering of wood and rattan. Thus, the most immediate observable stresses on the park deriving from the communities are rattan collection, timber and fuelwood harvesting, coffee and cocoa cultivation, and hunting.

Links to Microenterprise and Monitoring

The goal of the BSP- and TNC-supported projects in the park is to link economic well-being to sustainable use of park resources by assisting communities in compatible enterprise development. We believe this means that policies governing the park and its management must allow surrounding communities to have a major role in maintaining the diversity and sustainability of park resources. To achieve this goal, our planning process identified four projects. As of this writing, these projects include three focused on establishing self-sustaining enterprises (honey production, butterfly farming, and white-water rafting) and one research project centered on rattan use, ecology, and management in preparation for the establishment of a rattan-based enterprise.

The following three approaches guide the enterprise and research projects:

1. Working with communities to ensure the sustainability of the resources that communities have been collecting from the park, such as butterflies and honey (Intervention 1).

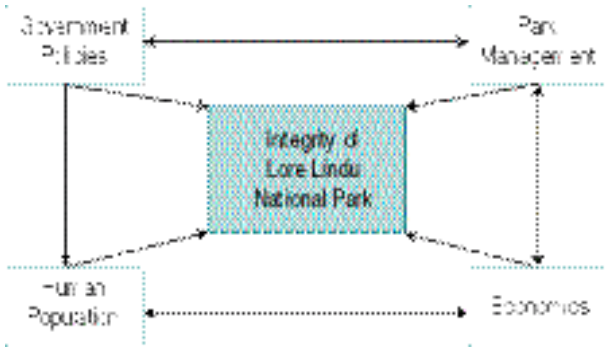
2. Working with the park management to change some of its policies to permit communities to continue harvesting some park resources legally and sustainably. Such policy changes includes the formation of a traditional use zone (Intervention 2).

3. Facilitating development of community-based microenterprises that will provide project participants sustainable incomes from the products they directly or

indirectly harvest from the LLNP. Enterprise projects, in turn, should serve as opportunities for involving community members in monitoring and awareness-building activities (Intervention 3).

The success and sustainability of these efforts, in turn, depend on information generated by the monitoring program, based on the conceptual model presented in this paper. Information must enable continuous adaptive management. Thus, we expect the plan to change as we learn more about the system we are modeling.

Figure 2
Identification of Target Condition and Factors Affecting It



Developing the Conceptual Model

In September 1995, members of the TNC enterprise and monitoring team working in LLNP attended a BCN-sponsored workshop in Manila, Philippines, where participants applied the conceptual modeling process to the wealth of information they had already gathered. Although introduced after enterprise projects had begun, the modeling process was particularly useful in planning monitoring activities for the three enterprise projects and the integrated research project in the LLNP boundary communities. TNC has also adapted the modeling process to other conservation sites in the Asia and Pacific region.

In order to plan monitoring activities for the projects, the team first had to define the overall goal of the activities: the target condition. The conceptual model defines the target condition as the integrity of LLNP, assuming that maintaining biodiversity depends on the completeness of the park. Team members then used the modeling process to define and demonstrate the interrelated factors that affect the target condition. Clarification of the relationships between these factors aided the design of project activities. The clarification process continues as project managers use monitoring information to adapt and manage the enterprises.

The four main factors that affect our target condition are government policies, park management, economics, and human population (see Figure 2). Changes in any of these factors affect the integrity of the park and the biodiversity we are hoping to maintain. Some of these factors are interrelated; an increase in population size, for example, could result from an improved local economy or from government policy, but it could also negatively affect the economy due to surplus of labor and lack of available land for cultivation.

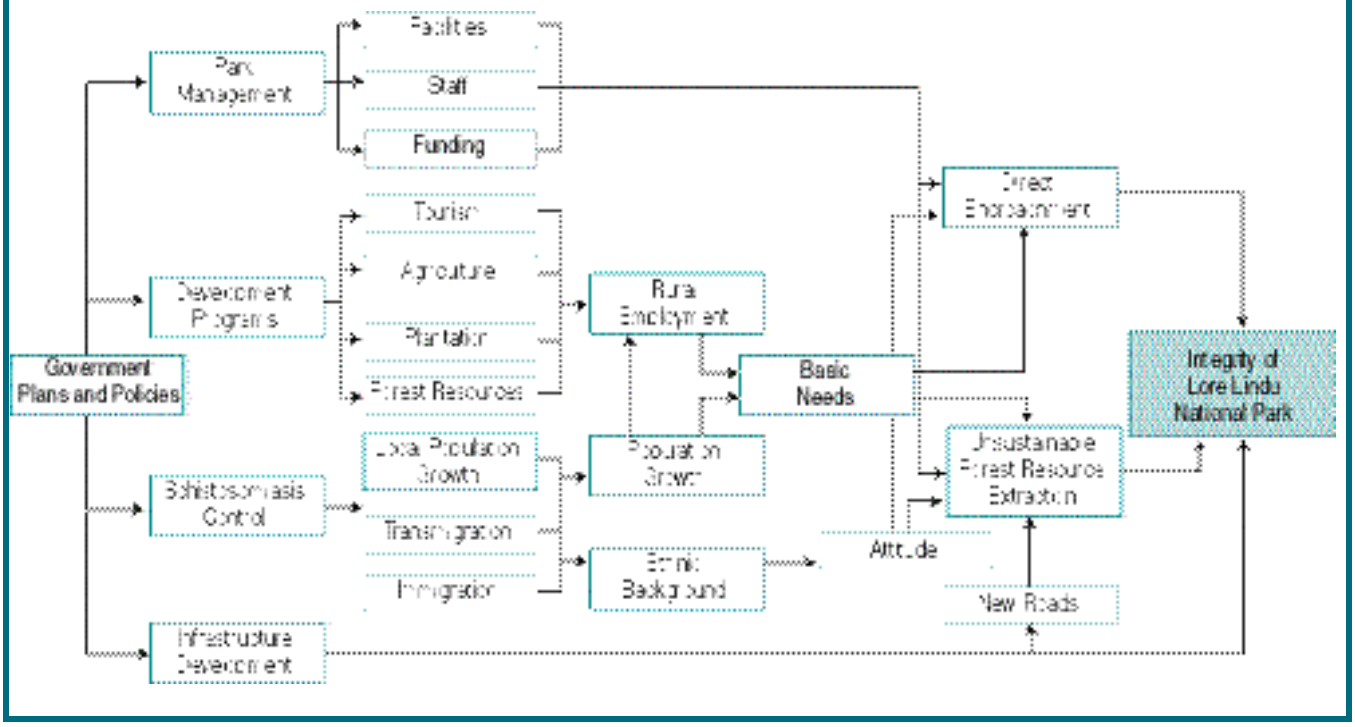
Breaking the model down into more detail, the project team identified direct encroachment, either from agriculture or plantations, and unsustainable forest resource extraction, including hunting and rattan collection, as the major factors directly affecting the integrity of the park (see Figure 3). The major factor driving direct encroachment and unsustainable forest resource extraction is the need of the local population for land, food, and basic cash income. If basic needs go unmet, direct encroachment and unsustainable resource use are more likely.

A growing population obviously affects people's ability to meet basic needs. Population growth results from simple biological increase, immigration, and transmigration. Government policies and actions affect transmigration; for example, efforts to control schistosomiasis by cultivation of its snail host's swamp habitat lead to increased transmigration.

Changes in national and provincial economies may produce increased rural employment opportunities; if more opportunities are available, basic needs can potentially be met outside park boundaries. In our original model, the major areas of rural employment were agriculture (including plantations of coffee and cocoa), forest resources, and tourism. For simplicity, we omitted other areas, such as trading and civil service employment, from the original diagram developed in the Philippines. In retrospect, however, we find that these areas are significant. For example, incoming traders from Palu who are willing to purchase certain commodities at relatively good rates can pressure communities into exploiting a particular commodity or resource quickly. Civil servants, owing to their greater status and regular incomes, may play a significant role in contributing to new enterprises and influencing projects started in the communities. A socioeconomic monitoring plan remedied these omissions. Government development programs have important influences on all of the above areas of employment.

Figure 3

Conceptual Model, Including Factors That Directly Affect the Integrity of Lore Lindu National Park



As elsewhere in the world, park management, through its enforcement role, mainly influences direct encroachment and forest resource utilization to the extent that it can overcome the usual lack of facilities, staff, and funding. Again, national and provincial government plans and policies shape the implementation of park management.

Additions to this basic model include the effects of ethnic background and origin on attitude toward encroachment and resource extraction. Some groups, such as the Da'a, have more experience with resource extraction, while others, mainly newcomers, have less respect for the forest. Infrastructure development, such as the building of roads or dams, can have a direct effect on the integrity of the park; the effect of new roads on increasing the rate of encroachment and rattan extraction is obvious at several sites.

Microenterprise development is planned to add to rural employment opportunities through honey production, butterfly farming, rafting, and rattan enterprises, which should have a direct effect on unsustainable forest resource extraction (see Figure 4). Ongoing conservation education and awareness-building activities are also expected to improve attitudes toward the use of park resources. (BCN originally developed this figure with BCN-funded interventions in mind. A more complete rendering would also include interventions by TNC's partners, most notably CARE Indonesia. CARE is working in LLNP boundary communities to improve dryland agriculture and introduce more sustainable farming methods.)

Figure 5 reorganizes the conceptual model to reflect the influence of government policies on the integrity of the park. The main issue is human welfare, which results from the needs of an increasing population, caused by local population growth, transmigration, and immigration. In dealing with this issue, the Government of Indonesia has developed programs to meet short-term human needs. As in many parts of the world, the main threat to the integrity of LLNP is the conflict between ensuring long-term conservation needs for future generations and meeting people's short-term survival needs.

Assumptions

One disadvantage of this conceptual model is that, for the sake of clarity, it excludes several factors, including the impact of international, national, and provincial economics on resource extraction. The model neverthe-

Figure 4

Improved Conceptual Model, Showing Anticipated Impacts of Microenterprises

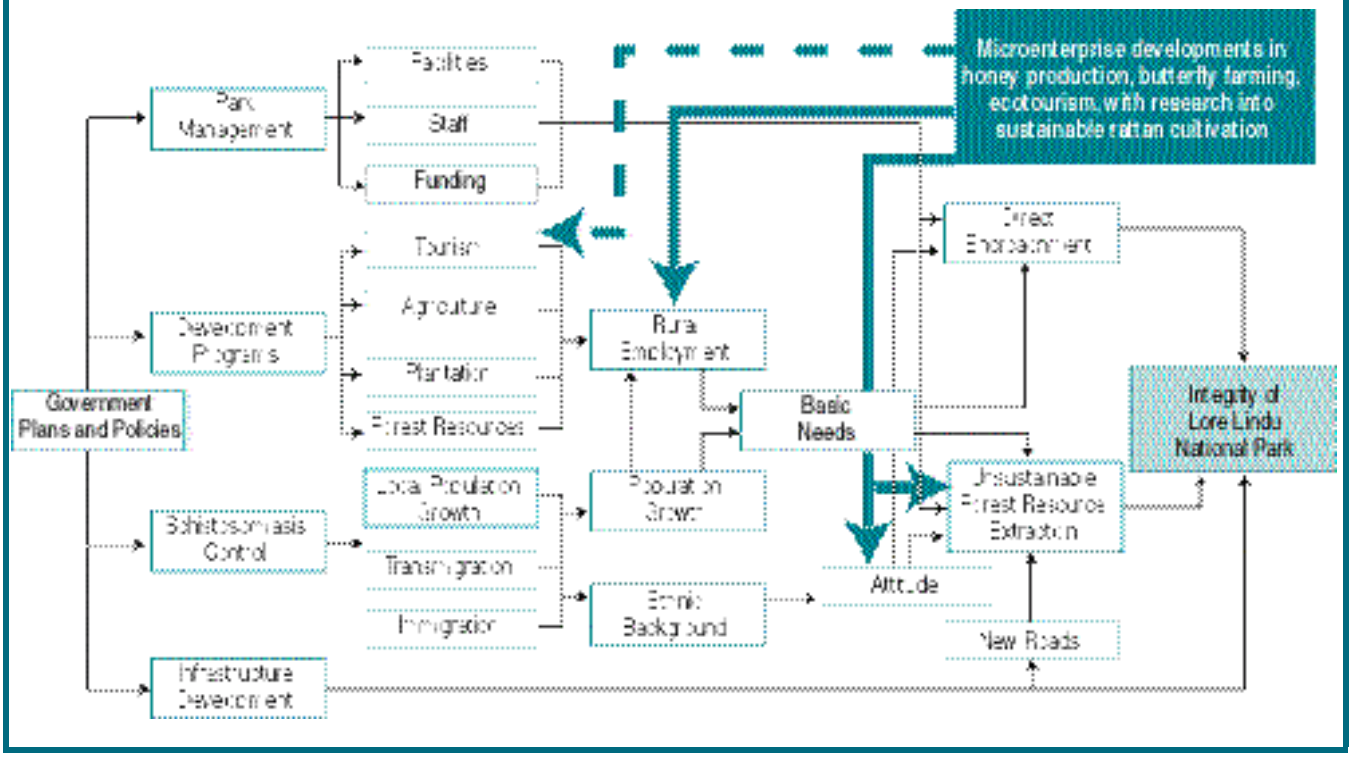
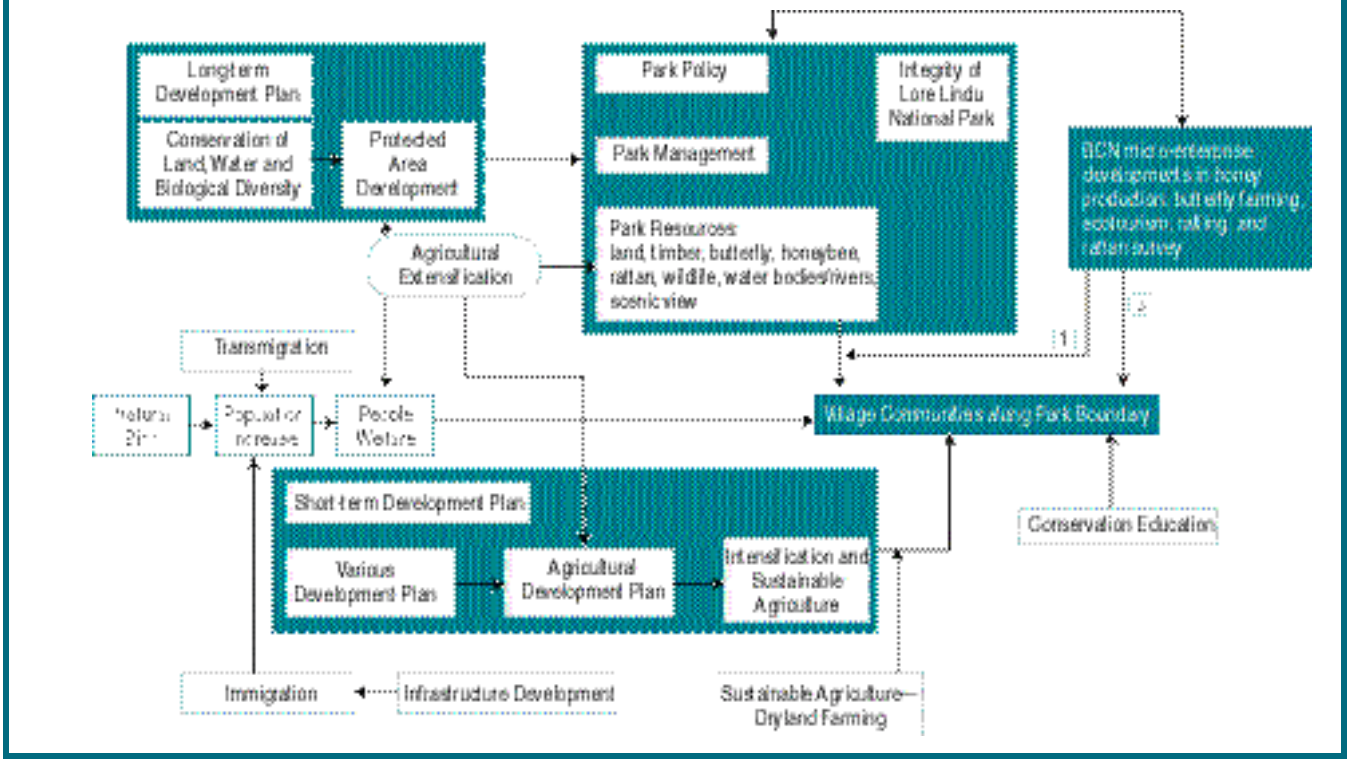


Figure 5

Reorganized Model, Showing Influence of Government Policies on Park Integrity



less generates assumptions for later testing. Key assumptions are as follows:

- The poorest people cause the most damage to the park, as they are least able to meet basic needs outside the park.

- Enterprise projects will have measurable effects on rural employment; new income will replace that from resource extraction, e.g., when the rafting enterprise employs people who once worked as rattan collectors.

Data from socioeconomic and enterprise monitoring will help us test these assumptions.

Lessons Learned

1. The modeling process functions best when community members are fully involved from the outset.

After applying BCN's modeling process to ongoing BSP-funded projects in Indonesia and the Solomon Islands, TNC staff adapted the process for use in workshops in the state of Pohnpei in the Federated States of Micronesia. TNC simplified the process and used it during workshops that introduced compatible economic development concepts. Even though many participants were already deeply knowledgeable about their forest resources, diagramming the influences, threats, and sources of threats on a large chart led to rich discussion about where education, enforcement, information programs, and compatible development programs could make the most difference. Based on these experiences, we suggest that the following points are essential whenever using the conceptual modeling process:

- *Ensure proprietorship by community members:* Representatives from the communities involved should be part of strategic planning, especially development of the conceptual model. Not only will they have valuable insights about the conservation area unanticipated by outside scientists, but they are also more likely to become committed to subsequent threat mitigation strategies if they have a sense of ownership of those strategies. It is particularly helpful if the community members assisting in the monitoring are also involved with strategic planning.

- *Relate the conceptual model to everyday life:* Relatively sophisticated concepts can be communicated by drawing pictures, telling stories, and discussing them. This process may take several days to complete. By giving people time to think through, change, and make the plan "theirs," the conceptual modeling process serves the ultimate goal of putting the community in charge of resource management.

2. The model is a starting point; we expect information from monitoring to improve the model and subsequent management as we progress.

In our discussion of Figure 3, for example, we cite rural trading, markets, and civil service employment as important omissions from our original model. During recent monitoring activities, staff observed teams of some of the poorer people from the communities clearing and planting land for plantations within the park boundaries. Entrepreneurs outside the communities, or even civil servants, may have organized and paid for these teams. This raises the key question of whether we were seeking the appropriate participants for our projects. Testing the hypothesis that it is the poorest people who extract most of the park resources then becomes an objective of the baseline socioeconomic monitoring program and will probably change the monitoring workplan.

3. The modeling process must focus on threats and sources of threats.

During development of the modeling process, BCN suggested identifying all factors influencing the conservation area. While this part of the process is essential, TNC learned that the model must focus on threats and sources of threats. There is a moment of truth in the modeling and planning process in which conservation planners should find themselves asking, "What is the 'killer' threat? Do our staff, project, or partners really have the means to address this threat? Can we make a difference? If not, what then is the best use of our resources?"

The original LLNP model, however, begged the question of the killer threat, population increase. Indeed, we are not equipped to address this source of all threats directly; however, where conservation and compatible development work is relatively new, successful on-the-ground demonstrations of profitable and sustainable enterprises can provide the evidence and legitimization for starting discussions and potentially changing policy at higher levels. Positive experiences with benefits from the projects should also enable government and nonprofit partners to influence others, acquire funding, and gain commitment. In

short, once we recognize the killer threats, even if we cannot fully act on them immediately, we can set wheels in motion.

4. The modeling process is more useful when it is linked to an overall management process.

Our experience thus far suggests that, for the modeling process to be most useful, the ensuing management objectives, workplans, and monitoring must be integrated into an overall adaptive management process. In the course of ongoing work, team members found it convenient to draw up the resulting monitoring plan objectives such that they would also become the objectives of enterprise workplans. This should start to ensure that the projects are directly addressing the factors we identified in the conceptual model. Furthermore, if project staff write reports linked to the objectives, it will become clear when an objective is falling out or needs to be changed. Subsequent management decisions should become obvious.

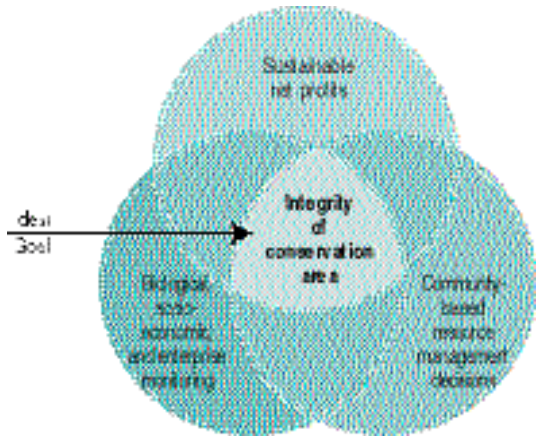
5. The conceptual modeling process should enable integrated monitoring.

The process used to develop the conceptual model should lead to an *integrated* monitoring program. This means people involved in the ecological and socioeconomic monitoring and enterprise development, community members, and entrepreneurs are all communicating with and learning from each other so that information from each group can be used in decision-making. For example, in order to test the hypothesis that it is the poorest people who engage in the most harmful resource extraction, the socioeconomic monitoring team will require information from ecologists and enterprise managers. This is not easy to coordinate in a complex program. The simplest solution is to ensure that all parties are brought in to work on the plan during the original planning process. The learning and planning that result will outweigh any initial expense.

Goal

Our ultimate goal is to maintain the integrity of the conservation area (see Figure 6). The conceptual modeling tool can be used to develop threat-based strategies and monitoring. Sustainable net profits from the enterprises help motivate communities, and monitoring information helps inform community-based resource management decisions. Subsequent work will enable policymakers, communities, and entrepreneurs to gather and use information to make their own sustainable resource management decisions long after we are gone.

Figure 6
Interrelated Factors Affecting the Integrity of the Conservtion Area



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Part III

Interdisciplinary and Participatory Data Collection Methods

W. Ulfelder

Introduction

Measuring conservation success is impossible without reliable data. Project monitoring and evaluation (M&E), which is fundamental to adaptive management and impact assessment, relies on collecting data across time or sites; it is always based on making comparisons. While data collection may be viewed as necessary, the activity is often perceived by project managers as an additional responsibility on already overburdened staff and as diverting financial resources from program activities. Also, many managers view data collection as a specialized skill that only researchers can do. Finally, many project teams simply feel they do not know where to begin to determine what data to collect and how to collect them. These perceptions and realities must be addressed so that M&E is indeed valued as a tool for better decision-making and impact assessment.

To benefit project teams, M&E must be fully integrated into project design and management. It must be done in a way that proves useful to project managers and staff, while detracting as little as possible from program activities. Selection of the appropriate methods for collecting data can be a challenging task since so many options are available. Generally speaking, data collection methods should be accurate and reliable, cost-effective, feasible, and appropriate.

For any type of M&E activity, the choice of methods for collecting data is determined by the information needs of the project team; availability of information; skill level of those who will be collecting and analyzing the data; and the amount of time, money, and other resources available. In conservation and development projects, a spectrum of biological and socioeconomic data are usually required to monitor project success. While these methods may have a dizzying assortment of names, many are, in essence, the same. For instance, wildlife census data collection can use virtually the same sampling and data collection techniques as a household survey in a community adjacent to a protected area.

Data collection methods can be divided into two main categories: those that produce quantitative data and those that generate qualitative data. Quantitative methods include tracking project records that contain numerical data and formal surveys. Qualitative methods include key informant interviews, focus groups, direct observation, and mapping, among others.

The two papers presented in this section demonstrate how project teams can use specific methods or a combination of methods to collect the data they need to assess impact and better manage their projects. Both papers illustrate the importance of collecting a range of social and biological data for conservation and development project monitoring. These papers also stress the importance of using participatory approaches to data collection that involve stakeholders in M&E whenever possible.

In Chapter 5, Ulfelder and Dugelby focus on the key element of community participation when selecting appropriate methods to conduct project monitoring. Their work, carried out in collaboration with various organizations, led to the testing of an approach called PALOMAP (Local Participation in Protected Areas Management). This paper describes the results of the authors' work in the Cayambe-Coca Ecological Reserve in Ecuador. The Reserve includes about 400,000 hectares (ha) of tropical lowland forest, cloud forest, and high Andean grasslands. For the purposes of this study, the PALOMAP team divided the human settlements into seven distinct socioecological zones.

Ulfelder and Dugelby define and describe two classifications of monitoring methods: macro-monitoring

and micro-monitoring. Macro-monitoring includes stakeholder analysis, involving key informant interviews, mapping, and ethnographic interviews; threats analysis, involving a series of workshops of key stakeholders; and human ecological profiles. Micro-monitoring methods tested by the PALOMAP project include rapid vegetation assessment, involving transects primarily; formal interviews; focus groups and group interviews; and community meetings.

The authors explain the importance of addressing these two levels of monitoring in order to achieve conservation objectives. They clearly demonstrate how these approaches can be used as effective planning and adaptive management tools that allow project managers to evaluate strategic choices continuously and make needed corrections as a project unfolds.

In Chapter 6, Kremen, Raymond, Lance, and Weiss present their work developing new methods in quantitative ethnobotany that were used to select and monitor natural resource indicator species and to design a buffer zone for the Masoala Integrated Conservation and Development Project (ICDP) in northeastern Madagascar. This ICDP was designed to protect 310,000 ha of rain forest by declaring 210,000 ha as national park, and developing sustainable-use strategies for the remaining 100,000 ha that address the economic needs of the surrounding communities.

Kremen and her colleagues explain how various samples were selected and describe the team's use of a multidisciplinary approach to measure both ecological and socioeconomic impacts of the ICDP. The methods primarily used by Kremen and her team were household surveys, direct observation, and harvest transects.

The authors used these methods in innovative and practical ways to determine specific indicators to measure and monitor various indicator species. This team paid considerable attention to the use of information for adaptive management, whereby project managers can use information from the monitoring of natural resources to improve the implementation of resource management plans.

Both papers in this section present a wide variety of quantitative and qualitative data collection methods available to conservation practitioners for project monitoring and evaluation. They focus on collecting a wide range of biological and socioeconomic data to address and monitor threats to biodiversity. These chapters also highlight the need to involve local communities in data collection and decision-making in ICDP design and management. Finally, the two papers demonstrate that, when determining which monitoring methods are appropriate for a given situation, one should rely on tried-and-true data collection methods when possible, but adopt new approaches when needed. Creativity and innovation are required to discover the synergistic combinations of methods that will provide the greatest returns on investments of time, effort, and funding.

5

Local Participation in Protected Area Management: The PALOMAP Study and Methodology[1]

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INTRODUCTION

It is now a widely accepted premise that the participation of local communities in protected area management leads to greater probability of achieving conservation objectives. Acting on this premise, many international and national conservation organizations have invested heavily in participatory conservation initiatives (PCIs) (Western and Wright 1994, Wells and Brandon 1992, West and Brechin 1990). Unfortunately, this assumption has yet to be formally tested, as there are scant data regarding the impacts of PCIs on participating communities and the reserves, natural resources, and ecological systems they are designed to protect. In short, as of yet we have little evidence whether or not this approach is effective in achieving conservation and development goals, and if so, under what conditions. Similarly, no standard or tested monitoring and evaluation methodologies exist for assessing the socioeconomic and biological impacts of these projects. This paper presents the results of an effort to develop a methodology, or set of tools, for assessing the impacts of PCIs.

PALOMAP STUDY

Responding to the need for methodologies to monitor and evaluate the impacts of PCIs, in 1995 The Nature Conservancy (TNC) and the Latin American Social Sciences Faculty, known by its Spanish acronym, FLACSO, launched a collaborative effort to develop such a methodology, called PALOMAP (Local Participation in Protected Areas Management). With funding from the Ford Foundation, TNC and FLACSO carried out the study in the Cayambe-Coca Ecological Reserve in Ecuador between November 1995 and December 1996.

The objectives of the PALOMAP study were to:

- Develop a methodology to measure the impacts of PCIs that could be applied to protected areas throughout the Andean-Amazon region.

- Generate a series of "lessons learned" regarding PCIs that would provide suggestions and strategies on how these initiatives might be improved in the future.

[1] A complete summary of the PALOMAP study is available in Ulfelder et al., 1998.

[2] Other principal PALOMAP researchers were Susan Poats (FLACSO), Jorge Recharte (currently with The Mountain Institute), and Cecilia Scurrah.

The Cayambe-Coca Ecological Reserve spans nearly 400,000 ha and three major ecosystem types: tropical lowland forest, cloud forest, and high Andean grasslands (*paramo*). To facilitate the study of this large reserve, the PALOMAP team divided it into seven socioecological zones (see Figure 1). These zones represent areas with relatively homogenous ecological, socioeconomic, and historical characteristics. They also represent distinct spheres of interest among local villagers; that is, most villagers in one zone typically are interested in the events that occur within that zone but not outside it, as events outside the zone do not often directly affect their day-to-day lives. The PALOMAP team identified and described the various PCIs within each zone. From a total of 24 PCIs, investigators chose 7 as case studies (see Table 1).

Monitoring and Evaluation

Although the PALOMAP study was not designed to monitor the impacts of the seven PCIs described above, many components of the study's methodology serve as excellent monitoring and evaluation tools. TNC widely applies some of the methods in other preserves and protected areas throughout the United States and Latin America, although for use in PALOMAP these methods have been expanded or refined. Other methods are new and innovative, and TNC and its partners are beginning to use them more widely in other community conservation efforts.

The monitoring and evaluation methods presented in this paper are those of the PALOMAP study, not those of the seven case studies analyzed. Of the seven case studies examined, none had a monitoring and evaluation component. The majority of the projects were implemented with money and faith, based on the assumption that, if executed as planned, they would provide conservation benefits to the protected area and socioeconomic benefits to the participating communities. It thus appears that the question of whether those goals were achieved would depend on the subjective judgment of implementing staff, rather than on measurable indicators.

The PALOMAP methods useful for project monitoring can be divided into two groups, macro- and micro-monitoring. We define *macro-monitoring* as a data collection process carried out beyond the framework of a single PCI. The information gathered may be commu-

Figure 1
PALOMAP Study Zones in the Cayambe-Coca Ecological Reserve

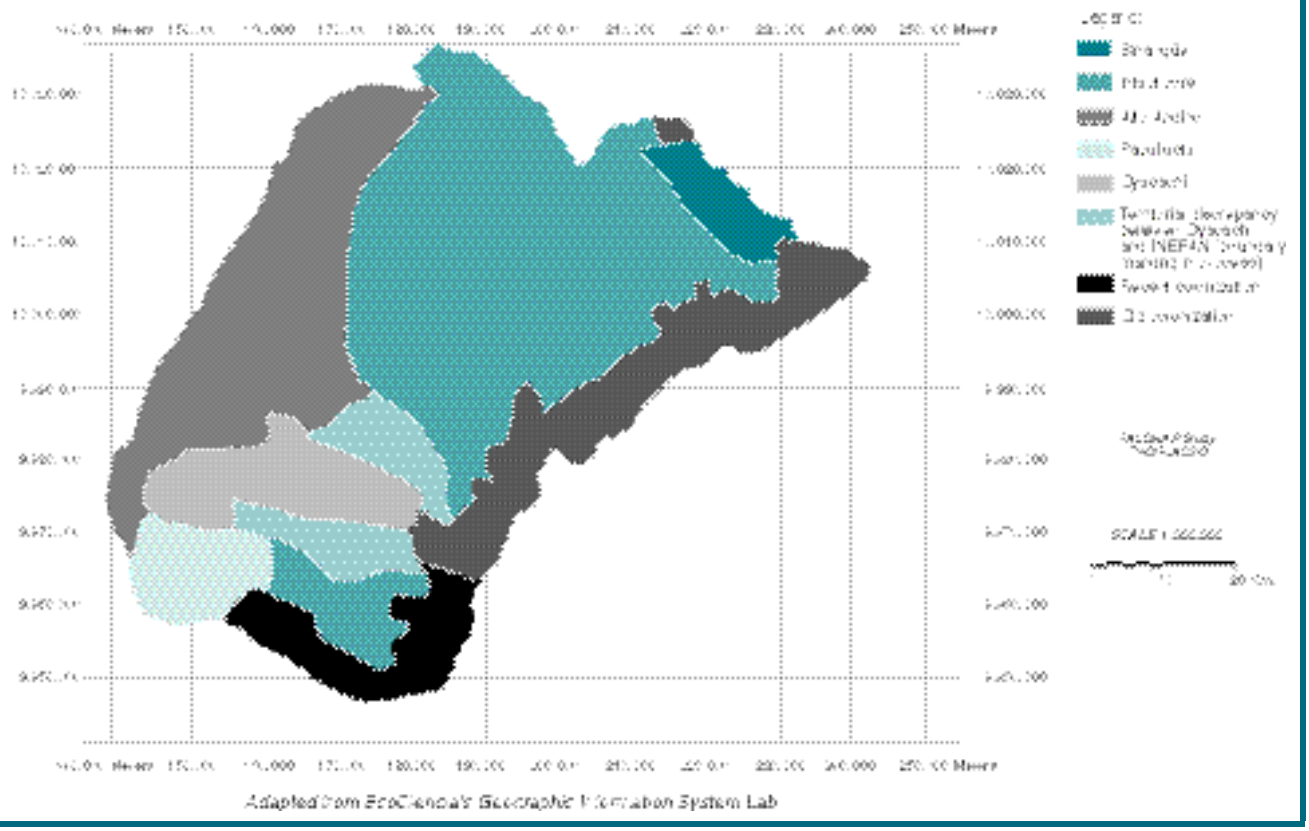

Table 1. Participatory Conservation Initiatives Selected as PALOMAP Case Studies

PCI	*Location*	*Objective*
Thermal baths	Oyacachi	Income generation to reduce poverty
Thermals baths	Papallacta	Income generation
Trout farming	Oyacachi	Income generation to offset cattle expansion
Ecocultural tourism	Sinangüé	Income generation/incentive to reduce hunting and deforestation from subsistence agriculture
Land-use zoning	Sinangüé	Improve resource management/control hunting/gain territorial rights
Paramo management	Juan Montalvo	Improve resource management/gain land rights
Community park guards	Reserve-wide (10 communities)	Patrol borders/build local awareness about the reserve/ improve park relations with communities

nity-wide, regional, or even across an entire protected area, and seeks to capture the broader dynamics that affect or are affected by the conservation initiative. *Micro-monitoring*, on the other hand, refers to data collection specific to a single initiative. In this type of monitoring, investigators ask questions to determine whether initiatives are making or losing money, how many community members are participating in the project by gender, and what the community or project is doing with the money earned (i.e., is it spent on school supplies, food, and medicine, or does it go toward the purchase of shotgun shells, chainsaws, more cattle, etc.?).

In all, five elements used in PALOMAP provide an elementary framework for macro- and micro-monitoring and evaluation of PCIs. At the macro level, stakeholders and threats analyses are important, along with the development of what TNC terms "Human Ecological Profiles." At the micro level, TNC suggests looking at the type of participation used in a PCI and its biological and socioeconomic impacts. We believe that these five components provide a powerful, comprehensive monitoring methodology. In addition, all of these can be performed with the participation of government park agency staff, NGO representatives, and community members. In fact, for the data to be complete and a collaborative process to begin, a participatory approach is necessary.

Macro-monitoring Tools

Stakeholders Analysis

A stakeholders analysis defines the relationships and types of power that exist among the various actors in a protected area, within a community, or among participants in a specific PCI. It is inevitable that one will find differing interests, relationships, and levels of power among the institutions, communities, and individuals in and around protected areas. An understanding of these elements is critical to the success of conservation initiatives.

There are many ways to perform stakeholders analyses. The PALOMAP team used three methods at different sites around the Cayambe-Coca Reserve. With several institutions, a variant of the analysis asked key informants from an institution or organization to locate their organization in relation to all the others with whom they work. First, participants made a list of all the organizations that have a relationship with their own. Then, using paper circles of different sizes and colors, they created a diagram of the existing institutional relationships. Following this step, one can discuss the design features that participants chose for the circles (i.e., institutions), reasons why they made particular institutions larger or smaller, why they located some close to each other while others remained distant, and why they used particular colors. This type of analysis allows an interpretation of the current nature of interinstitutional relations, their historical nature (especially if the analysis is done periodically), and what the participants wish those relations to become in the future. This method proved extremely useful with several nongovernmental organizations (NGOs) working in Cayambe-Coca.

The PALOMAP study used another variation of the stakeholder analysis in the indigenous communities of

Sinangüé (Cofan) and Oyacachi (Quichua). Here, a community mapping activity identified organizations and institutions. Key informants drew their community and the different groups that affect it. These included the government park agency, neighboring communities, business interests, the local church, conservation and development NGOs, and such government institutions as the Ministry of Public Works. Subsequently, a stakeholder analysis was performed with members of the community to understand the different types of relationships that exist among residents and institutions. A similar map was drawn and discussed with the director of the Cayambe-Coca Reserve.

The PALOMAP team used a third stakeholder analysis strategy in the area of Papallacta. Open-ended ethnographic interviews with community members helped identify more than 25 groups and institutions having an interest in a major water project being built by the city of Quito. The interviews revealed that each interest group had a different type of relationship with the project and thus would be affected differently. Investigators organized a community workshop to explore these relationships. Workshop participants drew a map of the community on a large cotton sheet and located on the sheet the different organizations identified during the interviews. The names of these organizations were drawn on large paper circles. If new interest groups were identified, their names were placed on new circles. Remarkably, more than 32 interest groups were identified for a community of less than 500 inhabitants. The participants placed red stars between organizations that suffered some type of conflict. Participants then described the conflict or potential conflict among the different actors.

PCIs can perform these three stakeholder analysis methods periodically to assess how relationships, levels of power, and conflicts change over time. The information gathered through these analyses is essential to understanding how such relationships influence project implementation and success, as well as how they are influenced by the same initiatives.

Threats Analysis

The second research method the PALOMAP team used that has important monitoring implications is a threats analysis. Protected area threats are "those activities of human or natural origin that cause significant damage to the area or are in serious conflict with the management objectives of the area" (Machlis and Tichnell 1985). The threats analysis thus allows for a better vision of how the activities of local communities and other interests (large landowners, timber and mining companies, municipalities, etc.) affect the management of the protected area and which represent the highest priority for management action (West 1995). The PALOMAP team used the methodology TNC developed and applied in several protected areas throughout the United States and Latin America. The methodology consists of five parts, or what TNC calls the "Five S's"—systems, stresses, sources, strategies, and success (Weeks 1996). The threats analysis methodology is often considered a planning tool. Successful project implementation, however, requires an iterative process—one that begins with project planning and comes back periodically to look at what conditions were like when the project began.

"Systems" are the ecosystem components or natural elements in a protected area. If the area is small or relatively homogeneous, it could be considered a single system, such as cloud forest or highland meadow. Larger, more complex areas must be divided into their various elements. Certain species may also be considered if they are "keystone species" or are especially important to successful management of the area (West 1995).

"Stresses" are the impacts that damage the ecosystem or its ecological processes. These include habitat fragmentation, erosion, sedimentation, genetic drift, alteration of natural water courses, and changes in natural water levels. "Sources" are the threats. Deforestation for the opening of cattle pastures may cause habitat fragmentation, erosion, and sedimentation, while the hunting of wildlife results in loss of genetic material and loss of keystone species critical to the natural regeneration of the native habitat. "Strategies" are those alternatives protected area managers, conservationists, communities, and other actors identified to diminish threats. The strategies can be local, regional, or national. Finally, "success" refers to the measure of progress achieved through the implementation of the strategies.

The PALOMAP threats analysis workshop was the first of its kind in the 27-year history of the Cayambe-Coca Ecological Reserve. Representatives of the Ecuadorian park agency, national and international conservation organizations, donors, and grassroots organizations participated. The reserve was divided into four principal systems—tropical zone (less than 1,000 meters above sea level, or masl), semi-tropical zone (1,000-2,000 masl), mountainous zone (2,001-3,000 masl) and the highlands (above 3,000 masl). The principal stresses are habitat fragmentation and destruction,

species loss, loss of ecological functions, erosion, sedimentation, change in river and stream courses, and flow levels. The primary sources, or threats, in Cayambe-Coca are as follows: infrastructure construction from two water projects—one to supply the city of Quito with potable water, the other to provide the arid highlands with irrigation; colonization by people from the Sierra who have moved to the Amazon in search of more available land; the opening of new areas for cattle and agriculture production that use inappropriate agricultural practices; overhunting and fishing of certain species, including fishing with dynamite; mining by artisans and potentially by multinational corporations; the burning of highlands' natural vegetation and grasses to increase grazing lands; and uncontrolled solid waste disposal by local communities and in areas frequently visited by tourists. The PALOMAP study held a second workshop four months later to identify strategies for confronting the threats listed above, as well as to determine how to measure the success of those strategies. The results of this second workshop are being incorporated into the new Cayambe-Coca management plan.

TNC recommends performing threats analyses every five years as part of a monitoring program for the protected area. Periodic analysis provides a picture of how the area is changing and what actions are necessary to keep it intact. Based on the experience of the PALOMAP study, it would be preferable to repeat the threats analysis using individual natural systems or the socioecological zones described above. Most protected areas in Latin America are too big to be treated or monitored all at once. Areas like Cayambe-Coca, which contain incredible diversity due to their altitudinal and precipitation gradients, are especially challenging. In addition, management of such a large area is facilitated by involving only those who have a direct interest in its management because the area influences their lives.

Local communities can and should participate in the threats analysis. Although they do not need to be involved from the outset, they should understand how outside interests and they themselves pose a threat to the long-term management of the protected area. The belief that local communities cannot process this information is both naive and short-sighted, as most conservation organizations attempt to work with local people to minimize or eliminate threats and improve their quality of life through improved income, wealth, and provision of services, such as health and education. The Nature Conservancy's Center for Compatible Economic Development has developed an excellent way of involving local people in threats analyses. Rather than just considering protected area threats, the Center divides the threats analysis into three components: a protected area threats analysis, an economic threats analysis, and a community threats analysis. By involving local people in all three they develop an appreciation of how their lives, including their socioeconomic well-being, are tied to the protected area and the services it provides. The Conservancy's Latin America and Caribbean Division (LACD) has not yet used this exact methodology, though experiments are now beginning.

Human Ecological Profiles (HEPs)

Up-to-date and accurate socioeconomic and socioecological information on local communities is vital for effective protected area assessment, planning, and management. The third research tool applied in the PALOMAP study was the development of a Human Ecological Profile (HEP) of the protected area. An HEP describes the relationships between local populations and a protected area and its natural resources. HEPs can be general, painting an overall picture of how local communities interact with the protected area, or detailed, including extensive information on specific activities, such as hunting and their impacts on the site and biological resources. An HEP generally includes information on the following:

- Size, location, ethnic composition, and basic history of key communities and their interactions with outside institutions;
- Socioeconomic status of residents;
- Importance and extent of local resource use, including, where possible, spatial and temporal distribution and rates of resource use;
- Local social and political structures, including customary institutions for resource management and decision-making hierarchy in the community;
- Social conflicts, e.g., stemming from resource conflict;
- Local awareness and attitudes toward the protected area;
- Level of local participation in protected area management; and

- Important economic, cultural, and political linkages between local communities and outside settlements and institutions.

The process of developing HEPs for Cayambe-Coca allowed the PALOMAP team to develop a comprehensive understanding of the various factors affecting local residents' behavior toward the reserve and outside organizations.

Partner organizations use the HEP tool with partners to (1) engage local people in a participatory assessment of their condition relative to the protected area; (2) identify linkages between local livelihoods and threats to the protected area to better guide the development of appropriate community-based initiatives; and (3) serve as a baseline for monitoring changes in local community conditions, impacts on the reserve, and progress toward achieving conservation objectives.

TNC uses the HEP to (1) build capacity in partner organizations to develop a solid understanding of local communities; (2) build capacity in partner organizations to monitor and evaluate important changes in local attitudes, participation, and resource use patterns; (3) determine site-based gaps in information concerning local communities; (4) identify lessons learned from comparison of multiple sites; and (5) help the LACD prioritize needs of partners for assistance in community work on a site-by-site basis.

Micro-monitoring Tools

In coordination with the three types of macro-monitoring methodologies described above, the PALOMAP team used different tools and methods for measuring the biological and socioeconomic impacts of each participatory conservation initiative. Although the PALOMAP team did not use these tools and methods for long-term monitoring purposes, they are appropriate for such, as they allow researchers and local people to gauge the status of important biological resources, socioeconomic features of communities, and behavioral aspects of local populations vis-à-vis the objectives of the initiative.

Monitoring Biological Impacts of PCIs

The PALOMAP team used various methods to measure the biological impacts of PCIs. Depending on the specific objectives of the PCI, the team used the following framework to determine how to measure the biological impacts of a particular PCI on the habitats or species concerned:

Habitat disturbance

- Vegetation clearing
- Vegetation alteration (e.g., paths, understory removal, clipping)
- Introduction of non-native species

Species affected

- Direct (e.g., loss of food, habitat)
- Indirect (e.g., reduction in one or more species affecting the species of concern)

Alteration or removal of destructive behavior

- Behavior *completely removed* via alternative source of income or subsistence products
- Impact of destructive behavior *reduced*
- Destructive behavior *remains at same level, simply change in actors* (e.g., original actor, now involved in ecotourism, hires neighbor to supply his forest meat)
- Impact of activity on outsider behavior (Has the presence of activity, e.g., tourism, deterred outsiders, e.g., hunters?)

To study the biological impacts of the Sinangüé land-use zoning project (see Figure 2), the team, together with the Cofan community members, used a rapid vegetation assessment methodology developed by Koop (1992) and refined by Bynum (1995). This rapid assessment technique measures anthropogenic disturbance in impacted forest habitats through observations of diagnostic variables. The transects in impacted forest habitats are compared with control transects in undis-

Figure 2
Sinangüé Land-use Zones

turbed forest habitat. The use of this methodology is based on the assumption that variables indicating human disturbance vary among successional states within a forest mosaic. A disturbed forest will have a larger proportion of younger states and therefore an associated change in the diagnostic features associated with each successional stage (Bynum 1995).

In Sinangüé, investigators measured variables assumed to be indicators of forest integrity along transects in 10 × 10 m plots in all three use zones (agriculture, hunting/extraction, and protected) as well as in a control site of relatively undisturbed forest (key informants reported that local people rarely enter the area to hunt or engage in other destructive activities). Forest integrity indicators were classified as follows: 1) direct indicators of human disturbance, 2) indirect indicators of human disturbance, and 3) forest structure indicators. The direct indicators of human disturbance were number of trails, number of stumps, number of agricultural species (coffee, manioc, and natanjilla), number of trees greater than 25 cm diameter at breast height (dbh), and the number of *pambil* (*Ireartea deltoidea*) palms taller than 5 m. A greater number of trails, stumps, and agricultural species indicates a greater level of human disturbance, while a greater number of large-diameter trees and *pambil* palms (used for construction) would indicate a lower level of human disturbance.

Indirect indicators of human disturbance measured along the transects included the number of *dondofa* (*Cercropia ficifolia*) and *pataga* (*C. sciadophylla*) trees. *Cercropia* are pioneer species, emerging after disturbances in the forest open gaps in the canopy. Local guides identified these two species as being common in disturbed areas. Finally, forest structure indicators measured in transects included the number of trees greater than 50 cm dbh, the presence of a typical distribution of tree diameters (a healthy, undisturbed forest has many trees with small diameters and a few trees with larger diameters), and the number of layers in the forest (an undisturbed tropical lowland forest should have three-to-four layers, whereas a disturbed one will have one-to-two layers as trees regenerate).

The PALOMAP team also studied the impacts of the zoning on mammal and bird species. EcoCiencia, an Ecuadoran science organization, had sampled the Sinangüé forests for mammal and bird diversity and abundance approximately three years prior to the PALOMAP study. The PALOMAP study used EcoCiencia's transects to determine how the zoning had affected these same game and non-game forest species. Transects were located in the protected and hunting/extraction zones. Each transect was 2 km long and was walked three times a day. The team traveled the transect at 1 km per hour, identifying both birds and mammals by sight and sound. At each siting, the species name, number of individuals, and, when possible, sex were registered. Researchers throughout the world use this well-established method (Mena and Cueva 1995a and 1995b). The PALOMAP team compared the data collected along these transects across use zones, as well as across times of the day (Mena and Cueva 1996).

In addition, the EcoCiencia team and community counterparts registered all mammals, fish, and birds that villagers caught or hunted during a 40-day period in July and August 1996. The animal's size, weight, and sex were registered, as were the location of the catch, its use (consumption, sale, hide, etc.) and the weapon used in capture.

All the results of the vegetation study, wildlife survey, and hunting census were analyzed and discussed with members of the Sinangüé community. This group analysis led to increased efforts to better protect the area through the establishment of a Cofan indigenous territory. That agreement has now been signed with the government, providing the Cofan with user rights and the obligation to protect the region, along with the park agency, from colonization by outsiders.

Monitoring Socioeconomic Impacts of PCIs

This paper discusses only how the PALOMAP study determined the type of participation that occurred in the implementation of each PCI, and how that participation may have changed through the evolution of the initiative. Many conservation practitioners recognize the importance of local participation without understanding that it can take many forms and that the form will have a strong influence on the project's success. It is important to monitor the form of participation of local populations throughout the life of a project.

Participation Type

Rather than create new typology of participation, the PALOMAP team, using previous work by Biggs (1989) and Pimbert and Pretty (1995), described six types of local participation in PCIs. They are as follows:

Passive participation

The community or group of persons participate by receiving information about something that will happen

or has already happened. The idea or need of community participation originates outside of the community, typically among the agents promoting conservation or community development. The "participtory interaction" is one way (from those making certain decisions toward those who should be listening). Responses of the community are not taken into consideration and the "owners" of information are those professionals or persons external to the community. Sometimes, the participation appears to be passive, but actually, it is coercive, given that there are regulations, rules, or policies that require participation. One example is levying fines from people who do not attend meetings.

Contractual participation
The PCI formally solicits or invites community participation. For example, certain required "services" for a project may be contracted to members of the community. The most common type of contractual participation is where an NGO provides the materials for a project, and the community provides the labor. In this type of participation, the idea of participation also comes from outside of the community, and the manner in which local people participate is largely determined by outside agents. Similarly, information typically flows from the outside to the communities, with limited input by local residents.

Consultative participation
In consultative participation, the initiative also comes from the outside, but it is based on the wishes, opinions, and needs of individuals or communities. Outside agents define the problems and solutions, but they can be modified in light of information obtained through community consultations. The information on the community is normally obtained by the "extractive investigators," and analyzed by experts who present one solution to the community. In these situations, the relationship between the community and the outside agents is similar to that between a doctor and a patient.

Collaborative participation
In this case, both outsiders and community members participate to diagnose a problem, analyze the facts, design the solution, and implement monitoring and evaluation efforts. This type of participation requires good relations and long-term commitment from the community and the outside agents. It requires continuing interactions; this is not a fast process, and it is difficult to establish this type of participation when there are long distances between those involved. Even though project managers try to establish equal and equitable relations, there is always inequality between the outsiders and the community, at least during the first phases of a project.

"Between Colleagues" participation
The fundamental objective of this type of participation is to strengthen the capacities of the community and/or local groups to carry out their own conservation and development projects. The incentive for this type of participation comes from the outside, but the emphasis is on building the capacity of informal systems and local people. The outside agents who promote this type of participation want to "level the playing field" of conservation and development, and look to empower their community associates and strengthen their abilities to negotiate with agencies and outside institutions.

Communitry self-mobilization
In all the types of participation described above, there are two sets of players, the local people or community and the outside agents. In community self-mobilization, the community identifies a problem or solution without the existence of outside initiatives. The local groups look for their own resources and ways to solve their problems or implement conservation activities. They may seek outside technical assistance, but they control the process. There are tendencies to classify this type as the "ideal" form of community participation in the conservation of natural resources. It is important to recognize, however, that community self-mobilization can reflect existing inequities in the community, and can generate conservation activities that fortify the local power and damage socially disadvantaged groups, such as the poor, the young, women, or local minorities.

The PALOMAP team agreed that, although NGOs should work to develop a community's capacity to the point that it can negotiate with outsiders on a more level playing field, projects do not necessarily have to start out with community self-mobilization. A project could begin as "consultative" participation and evolve over time to "collegial" participation. The problem, however, is that project staff often do not monitor this change even though they talk about empowerment and the community's ability to continue the project on its own. Therefore, it is important that projects become more conscious of the type of participation they are promoting and how that participation affects the project's impacts and sustainability.

First, it should be noted that, although local participation in conservation and development projects is a means to an end, it can also be an end in itself. In "between colleagues" participation, the goal is to empower local people so that they can diagnose their own problems, develop responses for solving them, and implement projects independently. As an anthropologist once told a group of Guaymi indigenous people, "We are trying to put ourselves out of business. We want to work with you in a way so that, in the future, you can do this work yourselves" (Stocks 1996). The "between colleagues" participation should be a goal of project staff and participating villagers. Only with this type of participation will villagers be truly empowered.

Second, like any other area of project work, project staff and participating villagers should agree on a series of indicators of participation. These agreed upon indicators are what will be monitored throughout the life of the project. Indicator questions might include the following: Are villagers treated as equals? Are villagers better equipped to negotiate with NGOs and governmental organizations?

Third, gender is an important consideration when measuring participation. Who is participating? Are they participating equally? This goes not just for the work on-the-ground, but also for decision-making, representation, etc.

Local participation can be monitored in several ways. Interviews and focus groups allow people to voice their opinions. Investigators can ask questions relative to the indicators to determine the opinions of local people on the participatory process.

An exercise can be performed in small groups with the six types of participation laid out in front of the group and clearly explained. The villagers can then "place" the project they are working on in one of the participatory categories. The same can be asked of project staff. This can even be done by drawing the spectrum of participation types on paper mounted on the wall. The group then places a sheet of colored paper with the name of the project in one of the participation-type boxes. This can be done for the entire project or subcomponents.

Similar to the institutional analysis done with the colored circles of different sizes, one can ask villagers to place circles of different colors and sizes depicting their projects on paper. The different colors, sizes, and distances between the circles should initiate a discussion about how villagers see themselves participating in a project and the nature of their relationships with other villagers, project staff, and technical experts.

Conclusions

It is important to monitor PCIs on several levels simultaneously. Simply looking at a project's economic impact, for example, will tell you little about whether it is mitigating or eliminating important threats to the protected area that motivated the intervention. TNC and its Latin American and Caribbean partners, like most other conservation organizations, are beginning to develop an integrated model for monitoring and evaluation that will provide site managers and involved NGOs and communities with a monitoring model for successful adaptive management. Five elements of that model are 1) stakeholder analysis, 2) threats analysis, 3) development of HEPs, 4) participatory typology, and 5) development of enterprise monitoring programs.

Many of these components are also planning instruments. Successful adaptive management implies revisiting the planning procedures and information periodically to determine whether reasoning was correct and the chosen data collection methods were appropriate. Managers must be flexible in the implementation of monitoring and evaluation methods. Many managers will not be able to do use all five components of the PALOMAP study at once—they must choose the components that are most effective and efficient for their information needs. Only through trial and error will they develop a better appreciation and understanding of how powerful monitoring is for successful management.

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6

Monitoring Natural Resource Use on the Masoala Peninsula, Madagascar: A Tool for Managing Integrated Conservation and Development Projects

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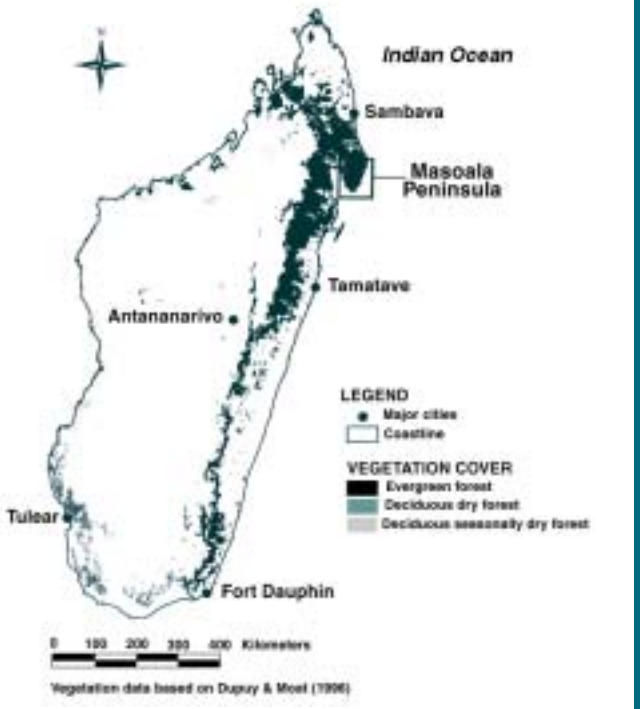
Introduction

Designing monitoring programs that will assess the impact of conservation efforts and provide useful feedback for management requires a careful analysis of both the predicted conservation impacts (the goals of the conservation program or the "final target condition") and the management issues of concern in the area of study (Walters and Holling 1990; Salafsky and Margoluis, this volume). The use of native species by humans presents an important management issue inside and adjacent to many reserves (Robinson and Redford 1991; Hall and Bawa 1993; Bodmer et al. 1994; Bodmer 1995; Fa et al. 1995; Fitzgibbon, Hezron, and Fanshawe 1995). When such useful species also represent key elements in the local economy of the region, then monitoring them provides the opportunity to link the ecological and economic consequences of conservation action. Researchers study many useful species either from a conservation perspective or from a sustainable use perspective; with some additional effort, more of these species could be monitored from both perspectives, to permit critical assessment of the interrelationships between conservation action, development action, ecology, and economy. Thus, useful native plants and animals often could serve as excellent choices for indicator species for monitoring parks (Kremen, Merenlender, and Murphy 1994). Monitoring natural resource use is particularly appropriate for assessing Integrated Conservation and Development Projects (ICDPs), whose primary mechanism for conserving natural areas is by providing economic alternatives to natural area destruction for human populations living adjacent to reserves (Kremen, Raymond, and Lance 1998).

This paper describes new methods in quantitative ethnobotany (Prance et al. 1987, Phillips and Gentry 1993a, Phillips et al. 1994), which we developed for selecting and following natural resource indicator species, and for designing a buffer zone for the Masoala ICDP in northeastern Madagascar (Figure 1). This project's goal is to protect a 310,000-ha block of rain forest by setting aside 210,000 ha as a national park and developing sustainable-use forest management plans for the surrounding forests of 100,000 ha. The goal of development activities in this "multiple-use zone" is to discourage shifting agriculture by local inhabitants by increasing the economic value of the forest through sustainable extraction of timber and non-timber products. The products to be extracted include both species currently used by villagers (e.g., timber) and those for which no use or market has yet been developed (e.g., palm seeds for the ornamental palm market).

Local inhabitants already use more than 100 species of rain forest trees destructively (i.e., thereby killing the plant) for firewood, construction, handicrafts, food, and dug-out canoes (Raymond 1995). The collectors use most of these species for their own subsistence. In general, the well-being of the society depends, to a large degree, on the availability of forest products. Some species have already become rare due to over-exploita-

Figure 1
Map of Madagascar, Showing Location of the Masoala Peninsula



tion and are consequently highly prized. The key question is "How will the presence of the Masoala Integrated Conservation and Development Project influence the availability and use of forest products, as well as the abundance, distribution, and demography of the species concerned?".

Evidently, the two prongs of the Masoala Project's strategy—absolute protection and development of new markets for forest products—will have important influences on the way that local people use plant resources, with subsequent influences on rain forest ecology and the local economy. By expanding access to existing domestic markets and developing new international markets, people will begin to have access to cash, which may encourage them to substitute purchased items for products they formerly got from the forest (e.g., tin roofs instead of thatch). Extraction of some species will diminish, but people will now collect for sale species they once largely ignored. The restriction of collecting inside the park may lead to an intensification of collecting for certain species outside of the park. Thus, the type, quantity, and location of forest products extracted will change over time. In turn, the management programs for different species will need to be adjusted according to these changing use patterns. Similarly, the switch to a cash economy will significantly affect the standard of living of people adjacent to the park and the multiple-use zone, as well as their attitudes and behavior toward conservation and natural resource management issues (Godoy and Bawa 1993).

We monitored people's use of tree resources, using a multidisciplinary approach to look at both ecological and socioeconomic impacts. The monitoring of natural resource use on the Masoala Peninsula is one component of a larger monitoring program established in 1995, based on initial studies begun over the previous four years. The broad goals of this monitoring program are to (1) assess the integrated conservation and development strategy as a mechanism for natural areas protection and (2) provide feedback to guide the park and multiple-use management plans. This paper describes the monitoring of natural resource use within the context of the larger program, with special emphasis on selection of natural resource use indicator species and monitoring methods.

Context

The Masoala Peninsula contains the last remaining large area of lowland tropical forest in Madagascar, in addition to many other terrestrial and marine habitat types, and has long been recognized as a conservation priority by Madagascar's Environmental Action Plan (World Bank et al. 1988). Home to countless Madagascar endemics, including species and sub-species known only from Masoala (Rakotondraibe and Raharimalala 1994; Fisher, In press; Sterling, In press; Kremen, Raymond and Lance 1998), the area is accessible only by boat. Eleven major watersheds dissect the area.

A consortium of international nongovernmental organizations (NGOs), including Cooperative for Assistance and Relief Everywhere (CARE), Wildlife Conservation Society, and the Peregrine Fund, has run the Masoala ICDP since 1993, under the guidance of Madagascar's Direction des Eaux et Forêts and Association Nationale pour la Gestion des Aires Protégées. The project conducts three principal groups of activities aimed at conserving the biodiversity of the region:

- Conservation includes establishment of a new national park of 210,000 ha, with three satellite marine reserves, and development and implementation of the park management plan, which includes patrolling, development of ecotourism, ecological

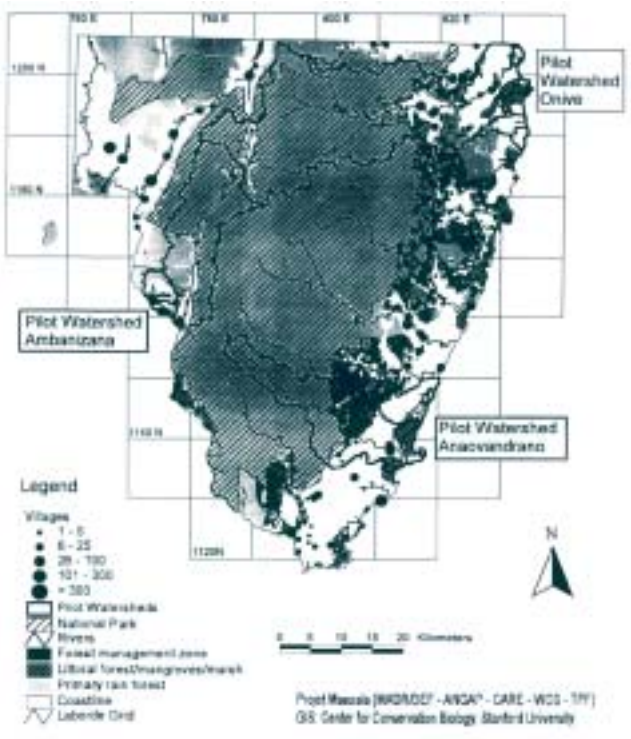
monitoring, environmental education, and habitat management/restoration activities.

- Development emphasizes the organization of the rural community into associations that work together to improve the social and economic development of the Masoala region in a sustainable fashion compatible with biodiversity conservation. Examples of activities undertaken by individual associations include intensive rice cultivation, stabilization of shifting cultivation through crop rotations, artisanal production, and sustainable eco-certified forestry. A socioeconomic monitoring program provides feedback on the impacts of these activities.

- Feasibility studies support the conservation and development units by assessing the viability of such activities as ecotourism and sustainable forestry.

While conservation activities currently occur around the entire Peninsula, the development activities are restricted to three pilot watersheds (Figure 2), since the available human and financial resources did not permit working in all areas simultaneously.

Figure 2
Map of the Masoala Peninsula



Both the ecological and socioeconomic monitoring programs therefore consider pilot watersheds as "experimental areas," and non-pilot watersheds as "control areas." In fact, the latter areas are not strict controls because the conservation team is carrying out activities there, but this design allows a comparison between integrated conservation and development and traditional conservation. This design also allows for a further comparison between areas inside the park and areas in the peripheral zone around the park. The peripheral zone consists of a multiple-use forestry zone, areas where forest management is unregulated, and agricultural lands (Figure 3).

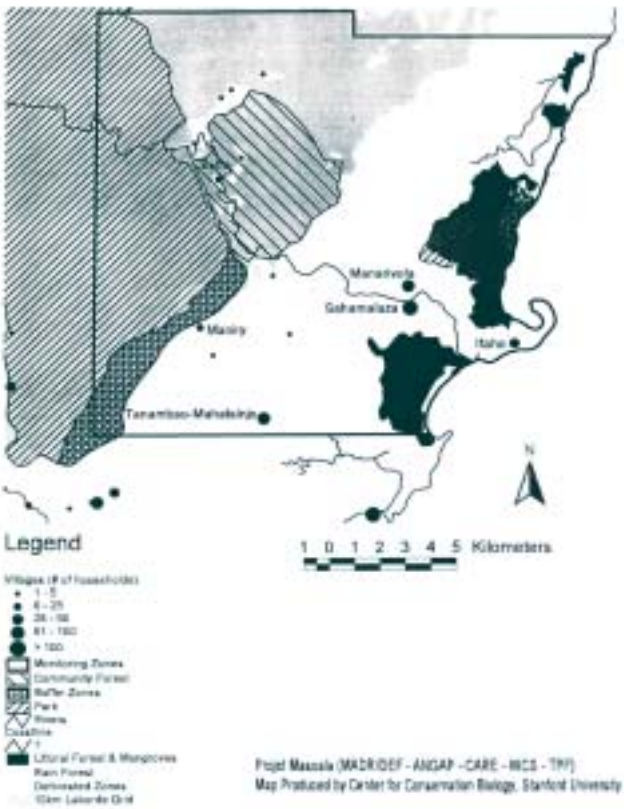
Methods

Site Description

Forests of the Masoala Peninsula

Primary vegetation still covers about 72% of the 4,200 km^2 Masoala Peninsula (15°22' to 15°59' S latitude). The vegetation consists primarily of lowland evergreen

Figure 3
Map of the Anaovandrano Pilot Watershed and Monitoring Zone



humid forest (less than 600 m, referred to in future as "lowland rain forest"), although isolated fragments of littoral forest, a coastal evergreen forest growing on sandy soils, also occur along the coast. These two forest types are among the most threatened habitats found in Madagascar (Du Puy and Moat 1996). Both forest types occur in the Anaovandrano watershed in the southeastern part of the Peninsula where this study was carried out (Figure 3), and harbor important useful tree species. Littoral forests differ in species composition and structure from rain forests (Dupuy and Moat 1996, Rahajasoa, unpublished data), and can be distinguished from rain forests by texture and gray-scale intensity on Satellite Probatoire d'Observation de la Terre (SPOT) panchromatic satellite imagery (unpublished observations).

A rainfall gradient occurs from the eastern ocean side to the western bay side of the Peninsula, with western areas receiving on average 1,000 mm more rain per year (Andriamampianina 1995). This rainfall gradient may significantly affect the floristic composition and diversity (Gentry 1993, Abraham et al. 1996); and indeed, both floristic and faunistic inventories on the Peninsula have demonstrated differences in species distribution and community composition between the eastern and western rain and littoral forests (Kremen et al., In press; Andriamampianina 1995; G. Rahajasoa, Unpublished data). Household use surveys conducted in western (Raymond 1995) versus eastern villages (this paper) confirm that use patterns also differ based on local preferences and plant abundances.

Human Population of Masoala

The current population of the Peninsula is approximately 44,500 (Banque de Données de l'Etat and Masoala Project, Unpublished data). The majority of people belong to the Betsimisaraka tribe. The Betsimisaraka people traditionally practice shifting cultivation to grow rainfed rice on slopes (*jinja*), but some people also grow rice in irrigated paddies in valley bottoms (*horaka*). The Betsimisaraka people are not hunter-gatherers in the strict sense; nonetheless, many people have substantial knowledge of the forest, its plants and animals, and their uses.

The bulk of the population lives in villages along or near the coast, and subsists through a combination of rice cultivation and fishing. The heavily settled area is largely deforested, with the majority of deforestation having occurred in the last 40 years, as in the rest of the eastern rain forest region (Green and Sussman 1990, Nelson and Horning 1993). Typically, the only forests remaining near coastal villages are small patches of littoral forest, in which villagers nonetheless gather most of the forest resources they need.

New immigrants and the offspring of landed villagers can no longer find land in the coastal or nearby inland villages, driving a wave of settlement up the watercourses, where settlers now cut primary forest to claim land and cultivate rice (Figure 3). People living in these settlements gather forest resources from the nearby humid evergreen forests.

Village and Household Selection

Given that village types have different resource needs and utilize different forest types, we chose representative villages along a coastal-inland transect to develop a complete picture of watershed resource use. A similar pattern of village settlement and resource use is repeated in each of the eastern watersheds of Masoala (Unpublished data). Figure 3 and Table 1 show the villages occurring in the study area, their sizes, straight-line distance from the river's mouth and from the nearest forest the villages use, forest type they primarily use, and the number of households sampled.

One hundred households distributed among 7 villages were sampled from among the 288 households in the watershed (35%). In general, all or most households were sampled in villages with fewer than 25 households, while 20–27% of the total households were sampled in villages with more than 50 households. In these large villages, household selection was stratified among four socioeconomic categories that typify households of the Masoala Peninsula (R. Lemaraina, Unpublished data). The poorest households are landless, and work as sharecroppers or fishermen. The next category owns *jinja* fields (shifting cultivation), but no *horaka* (valley bottom land). The next category has both *jinja* and *horaka* lands. The wealthiest category, in addition to *jinja* and *horaka*, also has some or all of the following: cattle, a tin roof, a wooden plank house rather than a traditional house (*tranogasy*), and a shop. Only the wealthiest category, usually not more than 5% of the village, has truly entered into a cash economy.

Household Survey Techniques

We always conducted interviews with the head of the household (usually male). Prior to the interview, we explained the purpose of the study by stating that the information to be collected would help design and

Table 1. Village Characteristics and Number of Households Sampled

Village	*Number of households*	*Population size*	*Households sampled*	*Distance from river mouth (km)*	*Distance to forest (km)*	*Forest type primarily used*	*Major activities*
Ifaho	22	94	21	0.0	1.3	Littoral forest	Fishing, Farming
Sahamalaza	131	605	32	3.4	1.2	Littoral forest	Farming
Manarimbola	55	266	12	4.0	1.7	Littoral forest	Farming
Tanambao-Mahatsinjo	52	233	14	8.5	5.1	Rain forest	Farming
Antsofitsoa	5	20	4	9.0	0.5	Rain forest	Farming
Maniry	10	44	10	10.9	1.2	Rain forest	Farming
Iketra	13	—	7	14.2	0.5	Rain forest	Farming
Total	288		100				

monitor sustainable forest management plans. The interviewer collected the following basic information: village, date, name of informant, sex, and age. This information can be linked with existing demographic data on each household (R. Lemaraina, Projet Masoala, Unpublished data). The interviewer then asked each informant to give the common names of the species of woody plants that s/he harvested for each of the following use categories (adapted from Phillips and Gentry [1993a]) : (1) food/beverage, (2) house construction, (3) firewood, (4) weaving, (5) dug-out canoes, (6) medicinal use, (7) lumber, (8) fiber, and (9) household use (e.g., broom, mortar and pestle).

For each tree species named by the informant, we collected the following information: (1) vernacular name in greatest detail (see below), (2) minimum distance traveled to obtain product, (3) maximum distance traveled to obtain product, (4) forest type, (5) name of forest, (6) part taken (e.g., trunk, branch, leaf, or bark), (7) amount taken in stems per year, (8) stem diameter required, (9) specific use(s), (10) price obtained if sold, and (11) name of substitution products. In the case of species for which collectors utilize only the leaves or bark, we collected additional information to determine whether the harvest was destructive.

To determine preferences for individual species, we also asked a smaller number of informants (N = 40) to name the five most preferred species in each use category, and whether they collected the plant in littoral forest or rain forest.

Vernacular versus Scientific Names

Many vernacular names refer to a set of species, as in Hazovola, which refers to *Dalbergia* species (Fabaceae). However, Hazovola mena is *D. chapelieri* and Hazovola fotsy is *D. madagascariensis*. During the survey, the interviewer would ask for the most detailed level of information that the informant could provide.

A certain number of the plant species referred to by vernacular name in the household survey have been identified from collections made from the Masoala Peninsula (Raymond 1995; G. Rahajasoa, Unpublished data). We collected vouchers for the remaining unidentified species, and are in the process of identifying them. The scientific identification of tree species, however, requires access to specimen and literature resources often not available within Madagascar, and depends for accurate results on the availability of fertile specimens. In addition, many of the plants from Masoala are new to science (G. Schatz, Personal communication), and may not be described until a botanist examines the group in question. The urgent need to select indicators, establish a monitoring program, and monitor resources annually required the use of vernacular names for data gathering.

A number of difficulties exist, however, in using vernacular names. First, the same common name may refer to different plants from locality to locality. Conversely, more than one name may exist for the same plant. Prior to data analysis, we constructed a list of equivalent names and standardized the data set. A sec-

ond problem is that many folk names lump together several species (see Annex). These species generally belong to the same genus, occasionally to different genera in the same family, or rarely, to species in more than one family.

The use of vernacular names is not ideal. However, the fact remains that a villager recognizes "folk species" (Phillips and Gentry 1993a) and will therefore report household use by this entity rather than by a scientific name. Even if the interview is conducted in a marked permanent plot in reference to an identified voucher (Phillips and Gentry 1993a, b), the informant's concept of a species may be broader than that represented by the specimen, and the uses reported will reflect his/her species concept. Therefore, monitoring at the folk species level is unavoidable. An advantage is that such an approach will keep costs down by reducing dependency on outside experts. Researchers must make an effort to describe each folk species and include it in a database, by collecting multiple voucher specimens for all vernacular names and mapping the relationship between voucher name, scientific name, and locality.

Definition of Indices and Calculations

We calculated the following indices for each folk species from the general survey: 1) average minimum and maximum distances to obtain the product (D_{min}, D_{max}) and 2) average quantity extracted per year in stems per household (Q_{ave}). We assumed that individuals did not use the product if they did not report it. Note that Q_{ave} incorporates data on extraction of the species over all its uses (should it have more than one).

To determine the most preferred folk species in each use category, we calculated the choice value for each species reported on the preferred species list. We define the choice value (C_s) as the percentage of informants who cited species *s* in category *c* ($P_{c,s}$), divided by the total number of species mentioned for category *c* (S*c*) by all the informants.

$$C_s = \frac{P_{c,s}}{S_c}$$

The choice value varies between 0 and 100, with higher values reflecting greater preference and/or fewer alternatives. Comparison of choice values between use categories emphasizes the number of available choices, while comparison of choice values within categories emphasizes the degree of preference for a given product. Because littoral and rain forests have different species composition and therefore differ in availability of substitution products, we calculated choice values separately for littoral and rain forest.

Selection of Indicator Species

Only species harvested destructively were considered in the selection of indicator folk species for the monitoring of impacts of extraction. First, we redefined the original broad use categories to reflect groups of substitution products. Categories based on groups of substitution products represent economic categories, while the broader categories used by many ethnobotanists can be artificial (Phillips and Gentry 1993b). For example, the broad category "house construction" actually included four separate groups of substitution products: palms for roof-thatch, poles for house frames, palms for walls, and palms for floor. These materials are used to build traditional huts (*tranogasy*), while lumber is more often sold or used for furniture or boat-building. Once we defined the sub-categories based on groups of substitution products, we assigned each folk species to the one subcategory for which it was principally used (even if multiple uses existed).

After structuring the total set of folk species used destructively (N = 105) in this manner, we established the number of indicator species to be chosen within each use sub-category, based on the number of species principally used in that sub-category and the extractive importance of that sub-category (Table 2) . No medicinal plants were to be selected because none were harvested destructively.

To select indicator species for each sub-category. we considered the annual quantity extracted per household (Q_{ave}) and the choice values for littoral forest and rain forest (C_s), selecting, in general, those species that were high-ranking in both of these characteristics within their sub-category. However, additional information was also considered in some cases, such as the average maximum distance traveled to obtain the product, the forest type, and the commercial potential of the species.

Extractive Impact by Category

To assess the extractive impact of households by broad use category, the average quantities extracted per household for all species (Q_{ave}) were summed over all species principally used in that use category. This summation provides a rough estimate of extractive impact per use, because (1) Q_{ave} values included extraction for all uses causing overestimation and (2) only species principally used in the use category are included, causing underes-

Table 2. Major Sub-categories of Use and the Number of Indicator Species Selected per Use Sub-category

Sub-category	*No. of substitution products*	*No. of indicator species to select*
House Construction		
house frame	24	4
floors[a]	3	1
walls[a]	3	1
roof[a]	4	1
Lumber	15	4
Firewood	30	4
Canoe (Pirogue)	12	3
Weaving[b]		
hats	2	1
mats	4	1
Food		
heart of palm[a]	6	1
tubers	2	1
alcohol[c]	2	1
Fiber	4	2
Medicinal	not applicable	0

[a] *Ravenala madagascariensis* is included in each of these categories since it is the most important species for each category.
[b] Includes two sedges collected in marshes outside of forests.
[c] This sub-category was not included in the survey.

timation. These two errors should mitigate each other to a certain extent.

Results

Characterization of Extractive Patterns in the Anaovandrano Watershed

Species Diversity by Category

Figure 4 shows the number of folk species found to be used within each major use category. All known uses of each folk species were considered for each of the 105 folk species found to be used destructively. House construction followed by firewood are the activities that make use of the greatest number of folk species; many species (49% of the 61 species) are also shared between these two categories. People use far fewer species (less than 20) for lumber or for building pirogues, and use only a very small number of species for food or weaving.

Extractive Impact by Category

House construction and firewood are by far the greatest relative consumers of stems annually (Figure 4). If extractive impact by category could be calculated more precisely, house construction and firewood categories would use more stems and less lumber, judging by the number of mis-classified responses due to the dual use of a given species (see "Methods").

Interestingly, the distribution of extraction intensities among categories closely mirrors the distribution of folk species among categories. Both relationships express the principal importance of resources for house construction and for firewood in the daily lives of people of the Masoala Peninsula (similar results were also obtained in the western portion of the Peninsula [Raymond 1995]). One interesting discrepancy, however, is that the pirogue use category, with the lowest overall extraction intensity per family (1.24 stems per family per year), nonetheless uses quite a few different folk species. The use of a large variety of species for pirogue-building may be in response to the declining availability of suitable stems (stems must be of large diameter, straight, and good-quality wood). People on Peninsula often complain about the difficulty of obtaining suitable pirogue-building material, and this may have intensified the testing of alternate folk species.

Selection of Indicator Species by Sub-category

House Construction: House Frame

Local people use 27 folk species principally for constructing house frames (see Annex). Nantonengrita (Sapotaceae: *Faucherea thouvenoti*) was ranked first choice from among trees obtained in littoral forest, and also had the highest extraction intensity per household (Q_{ave} = 5.77 stems per household per year) (Figure 5). This species was therefore an obvious candidate for an indicator species. This species occurs principally in the littoral forest. People collect Mantalanina (Combretaceae: *Terminalia ombrophila*) in both littoral and rain forest, an advantage for making forest type comparisons. While its choice value was relatively low (it was not even rated as a choice for rain forest), its Q_{ave} was high, indicating that its use is substantial. Amaninaombilahy (Sarcolenaceae) had high choice and use values but was collected only in littoral forest, while Tsifo beravina (Rubiaceae: *Canthium majas*) was collected in both, and had a high choice ranking in the rain forest type.

A not uncommon finding was that a less preferred species was more heavily used (e.g., Mantalanina) or

Figure 4
Number of Folk Species per Use Category and Mean Stems per Family per Year

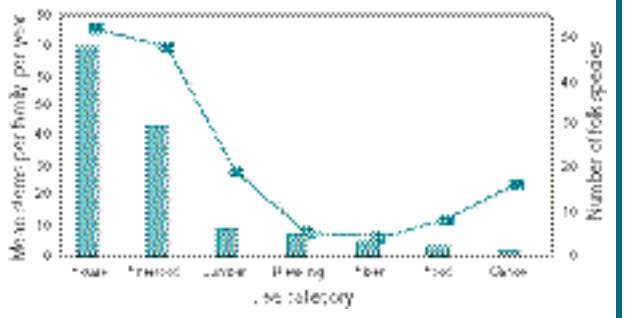
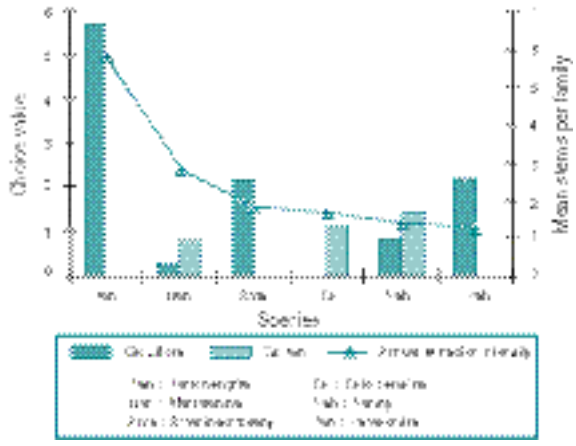


Figure 5
Indicator Species Selection for House Frame Construction



that a highly preferred species was rarely used (e.g., Antohiravina [Bignoniaceae: *Phyllarthron* sp.] and Hazonjahana). Frequently, this result can be explained by the rarity of the preferred species.

Note also that the spread of choice values in rain forest is narrow (the first four ranked values ranged only from 1.39 to 0.56), indicating that there are no strong preferences within this set of substitution products. In contrast, for littoral forest, the first four ranked choice values range from 5.71 to 0.82, showing a strong preference for Nantonengrita among the available set of substitution products. This species could become depleted in littoral forests due to this strong preference, and its depletion would undoubtedly be more important to villagers living near littoral forest than would the depletion of Antohiravina (C_s = 1.39, rank = 1) to villagers living near rain forest, due to the availability of many suitable substitutes.

House Construction: Floor, Walls, and Roof

Ravinala (Strelitziaceae: *Ravenala madagascariensis*), also known as the Madagascar traveller's palm, was by far the most preferred species for floor and wall construction, and was also highly used. The same plant is also most preferred for roof thatch and for food (heart of palm), although these data do not appear in the Annex, which presents each folk species only once within its principal use sub-category. Because Ravinala is such an important plant for so many uses, the breakdown of its use by sub-category is presented in Table 3. Ninety-seven out of 100 informants reported using this plant for one or more uses, resulting in 116 responses.

The next choice for wall construction, Sinkiara (Arecaceae: *Dypsis* sp.), is also extensively used (Annex), and was therefore also selected as an indicator. While not yet extensively used for roof thatch, we selected Vontro (Arecaceae: *Vonitra thouarsii*) as an indicator, because villagers from western Masoala are now depleting Vontro following resource-switching from Ravinala (Raymond 1995).

Firewood

We chose four of the six most heavily used species as indicators (see Figure 6 and Annex). All of these species also have high choice rankings in one or both forest types, and are used in both. We did not select Harongana (Clusiaceae: *Harungana madagascariensis*) despite its high use and choice values, because it is a colonizer species typically occurring in gaps or as virtual monocultures in abandoned fallows. Madagascar has surprisingly few aggressive secondary forest species (Abraham et al. 1996), and we chose not to include them so as to monitor the impacts of natural resource use on primary forest.

Lumber

People across Madagascar recognize the lumber species Hintsy (Fabaceae: *Intsia bijuga*) for its fine timber properties. Interestingly, its choice value was high among littoral forest users but not among rain forest users (Annex). It grows along watercourses and in the littoral forest, so its lower choice value in the rain forest probably reflects the difficulty of obtaining it (we found no stems of Hintsy greater than 10 cm in diameter at breast height (dbh) in three permanently marked 1-ha plots in rain forest in the Anaovandrano Watershed, while abundances of Hintsy in two 1-ha littoral forest plots ranged between

Table 3. Use of *Ravenala madagascariensis*, a Key Resource for House Construction, Food, and Household Use[1]

Use sub-category	*Parts used*	*Number of responses*	Q_{ave}	*Littoral forest*	*Rain forest*
Floor/wall	Trunk	64	2.52	30.4 (1)	77.8 (1)
Roof	Leaf	30	13.74	56.5 (1)	72.2 (1)
Fiber	Fiber	2	0.1	–	–
Heart of palm	Trunk	13	1.23	11.1 (1)	16.7 (1)
Basketry	Leaf	7	0.25	34.8 (1)	11.1 (1)
No. informants (total)[2]		97	24.17 (all uses)		

[1] *Ravenala* occurs both in primary forest, in marshes, and in regenerating slash-and-burn fields.
[2] Out of 100 people interviewed.

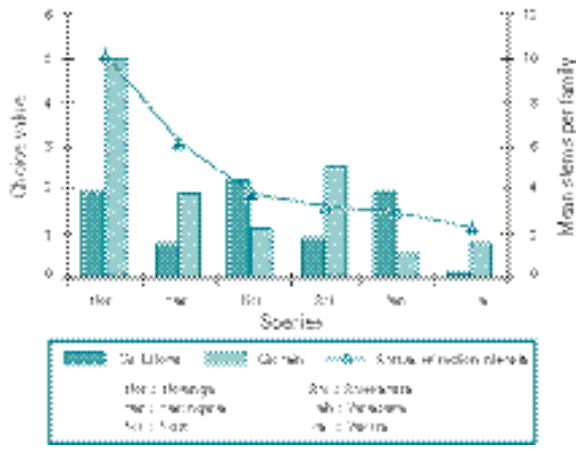
17.8% and 25%). We chose this species as an indicator, and the remaining species, all with much lower extraction intensities (Q_{ave}), were species with high choice values that are harvested from both forest types. Since Q_{ave} values fell to about 0.2 to 0.3 stems per household per year after the second-ranking species, Nanto beravina (Sapotaceae: *Labramia* sp.), the selection of the last two species was primarily determined by choice values (first and second ranked in rain forest) and to select species that will also be managed sustainably as eco-certified timber as one of the Masoala Project's development activities (Guillery, Personal communication).

Pirogue

We selected as indicators the three folk species showing highest extraction intensities and choice values in both forest types (C_s<4): Vintanona (Clusiaceae: *Calophyllum* sp.), Mantady (Combretaceae), and Sary (Rhopalocarpaceae: *Rhopalocarpus macrorhamnifolius*) (Annex). These three species also had high choice values ranked 5 or higher in both forest types. Although littoral forest users chose Hazinina (Clusiaceae) as their preferred pirogue tree, the survey data showed that this species was much more commonly used for lumber.

Note that D_{max}, the average maximal distance people will go to obtain the product, is greater than 5 km for all of the preferred species. Pirogue builders already have difficulty finding trees of suitable size on the Peninsula (Unpublished observations).

Figure 6
Indicator Species Selection for Firewood



Weaving: Hats and Mats

The palm species Manarana (Arecaceae: *Ravanea lakatra*) is highly prized for making hats, one of the few products from the Peninsula regularly sold at the regional markets in Antalaha or Maroantsetra. Local people already complain about the increased difficulty of finding this species. As can be seen in the Annex, people will travel as far as 16 km on average in search of it. In contrast, Rambo (Pandanaceae: *Pandanus odoratissimus*), a species used for making mats, can still be found relatively close at hand (D_{max} = 1.64 ± 0.19). However, villagers living near littoral forests prefer to make mats and baskets out of Penja, an abundant marsh-growing Cyperaceae not readily available to villagers upriver (Data not shown).

Food: Heart of Palm, Tubers, and Alcohol

The indicator species selected for the "heart of palm" category are not, in fact, palms. *Ravenala madagascariensis* (Streliztiaceae), already selected in the house construction category, is also the preferred species for both littoral and rain forest users (Table 3), followed by Hasimbe (Liliaceae).

Oviala (Dioscoreaceae: *Dioscorea* sp.) is the only tuber species local people use for food. Harvesting of this liane species results in large holes in the forest floor of up to 1 m deep. During the "famine period" in between rice harvests, the poorest people (those who were not able to produce enough rice for the whole year) will collect both "heart of palm" and oviala (whose translation means "potato of the forest") to stave off hunger. While the people who obtain food in this manner are relatively few, the monitoring of use of these products adds to other socioeconomic indicators the Masoala Project is studying to assess the ICDP's impact on poverty and quality of life.

People living on the Peninsula use the bark of Bilahy (Rutaceae: *Evodia bilahe*) to flavor an alcoholic sugar cane beverage. They collect the entire bark of the tree, thus killing it. People travel long distances to collect this species, spending weeks in the forest solely for this purpose. Only a few people collect this species, and they sell the bark in their village or at regional markets. The survey did not specifically collect data on this sub-category; however we selected the species as an indicator because it is universally used, until recently had no substitution products, and appears to be at risk of extinction due to overharvesting.

Fiber

We chose the two most preferred and heavily used species as indicators: Magna and Hafopotsy (Tiliaceae: *Grewia apelata*).

Discussion

We selected 25 folk species as indicators of destructive household use of primary forest plants on Masoala. These species collectively represent all of the major household uses of plants in the area, except for medicinal plants (none of which are harvested destructively). All of the species chosen had the highest extraction intensities and/or choice values within their sub-categories of use; we chose species with these characteristics because such species are most likely to exhibit statistically observable changes in the pattern or intensity of harvesting in the future. Not only are use patterns most likely to change within this highly preferred and utilized subset (due, for example, to depletion of a preferred species), but also the volume of data that can be obtained on these frequently used species will facilitate statistical comparisons.

This set of species includes examples of plants that are rare, abundant, limited to littoral or to rain forest, common to both forest types, economically valuable, of subsistence value only, and near or distant to villages. In addition, several species of diurnal lemurs found on Masoala (these species are among the largest wildlife present in these forests), use the species we selected as food. Local people also use some of the indicator species as food during the famine period. By monitoring the folk species in this collection, representing as it does a gamut of socioeconomic and ecological characteristics, it will be possible to observe effects over time of the Masoala Integrated Conservation and Devel-opment program on resource harvesting, biodiversity conservation, and human socioeconomic well-being. The discussion section first outlines how this monitoring program is being carried out through a combined program of household surveys, direct observations of use and harvest transects, and then shows how this information will be used to guide management plans for conservation and sustainable use of biodiversity. Finally, we give an example of using the "time-zero" data for buffer zone design.

Program for Monitoring Resource Use

The project conducts household surveys biennially as described in the methods for this paper, but using this list of 25 folk species only instead of an open-ended questionnaire. The quantity extracted is being obtained per use sub-category whenever possible so that Q_{ave} can be calculated per species and per use. The survey data will be complemented by directly observing use within the two highest impact categories, household construction and firewood. For household construction, we conducted a one-time study of 156 households that documented the vernacular names and numbers of stems used in finished houses. This study provides baseline data, and it can be repeated if the style of traditional house-building (*tranogasy*) changes in the future. Meanwhile, the survey data provide the information on the amount of wood used in house construction annually, given that most households conduct this activity to repair existing houses, and only build new houses for family expansions.

For firewood use, repeated biennial monitoring of use is important. Since we suspect that people tended to underestimate the number of stems they used for firewood, verifying these results with direct observations is crucial. Also, firewood use varies depending on people's activities; for example, fishermen use firewood to dry fish, while farmers use it to dry rice and/or coffee. Firewood use also changes with the season. In each vil-

lage, we select 10-to-20 households by random stratification across wealth categories. In the morning, we measure wood volumes (length by diameter per stem) and identities of the logs to be used for firewood. At noon, we measure any additional logs brought in from the fields for firewood. In the evening, we measure the remnants of any of these logs and use the difference to determine the amount of firewood consumed. We select the houses to be visited on a particular day at random, and visit each house three days in winter and three days in summer. We also determine the number of meals prepared, the household size, and the amounts in dry weight of rice, fish, or coffee dried.

To obtain density data on useful species and to observe directly the extraction intensities, vegetation transects are established in littoral and rain forests used by villagers to harvest wood products. Pre-existing trails used for collecting wood products are marked at 100 m intervals, and perpendicular transects of 100 m each are extended into the forest from each of these points. This study includes approximately 2-to-3 km of pre-existing trail, heading more or less directly away from the village/forest edge. Along the trail and its perpendicular transects, all living trees and harvested stumps of the 25 indicator folk species are censused if they occur within 5 m of either side of the transect, recording, within each 10 m interval of trail or perpendicular transect, the species name, dbh, height of trunk, height of canopy, and, for stumps, whether the trunk was collected in the last year or in a previous year.

The density and harvest data can be sorted according to the distance along the principal trail and from this trail into the forest. This will allow us to observe not only the overall level of exploitation and changes in per species exploitations and densities with time, but also whether spatial patterns of exploitation change over time (e.g., expand along the trail further from the village or further from the trail into the forest). We hypothesize that non-sustainable resource extraction will lead to depletion, and eventual expansion of the harvesting zone to greater distances from the village and from the trail into the forest. In contrast, if Masoala Project forest management activities promote sustainable forestry practices, expansion of the harvest zone should not occur.

The project will require additional information to manage species sustainably, including regeneration rates and the impacts of harvesting upon regeneration. Certain heavily used species may fare better than less used species, depending on their demography (Bodmer 1995, Boot and Gullison 1995). Hall and Bawa (1993) provide an excellent review of methods for monitoring harvest impacts on tropical plant populations.

Table 4 shows the parameters we will measure biennially for resource use. These parameters can be compared between forest types, between pilot and non-pilot watersheds, between years, etc.

On Masoala, where resource use monitoring is being carried out in two pilot watersheds and one control watershed, this monitoring requires three person-months per year of a university-trained, local field biologist for supervision, data entry, and analysis, and three person-months per year for each of two trained conservation agents (para-biologists) for data collection. Because the management of these resources is critical to human well-being, it should not be difficult to encourage local participation in monitoring the community's use of resources.

As noted earlier, the socioeconomic and ecological monitoring programs, of which this is part, are conducted in three "experimental" pilot watersheds and in a "control" watershed (Figure 2). The difference between the two designations is that development activities occur only in the pilot watersheds, while conservation activities take place in all watersheds.

The natural-resource use monitoring program operates on the east coast in the pilot watershed of Anaovandrano, with villages in the Ampanio and Fampotakely watersheds as controls. On the east coast, most watersheds contain coastal villages using littoral forests, inland villages using littoral and/or rain forests, and upriver villages using rain forests. In both the pilot and control watersheds, we selected villages so as to represent all types of use. For the control watershed, we chose villages to match as closely as possible those in the current study in terms of total number of households, type of forest used, distance to forest, and major activities of the village (fishing, farming, or both). Figure 7 shows the villages where monitoring is occurring in pilot and control watersheds relative to forest type and distribution. Harvest transects were established using existing paths in three littoral and two rain forest sites.

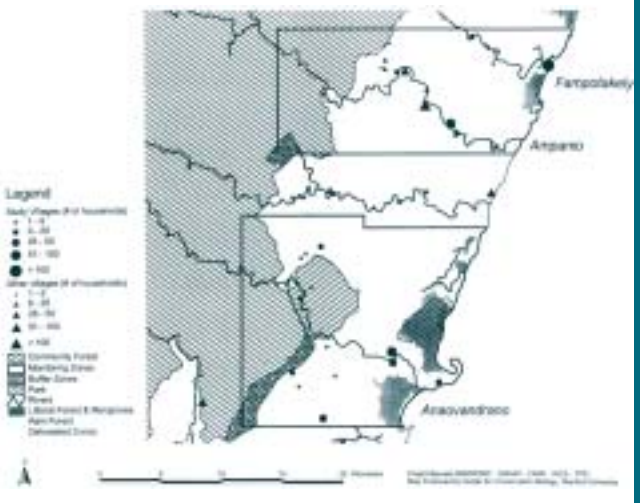
Monitoring and Management

In the Anaovandrano Pilot Watershed, the Masoala Project is developing a forest management plan in collaboration with the local community for a portion of the forests in the peripheral zone outside the park (1,200 ha, see Figure 3). This plan will propose cutting of small plots (5-to-20 ha) on a 60-year rotation for selected timber species. Certain species will be exported as "eco-

Table 4. Methods, Desired Results, and Indicator Parameters To Be Followed for Monitoring Natural Resource Use on the Masoala Peninsula

Method	*Results obtained*	*Indicator parameters*
Household surveys on use of 25 indicator species	Harvesting patterns per folk species, overall harvesting patterns	Q_{ave} (stems/household) per species per use Q_{ave} per species, summed over uses Q_{ave} per use, summed over species D_{min}, D_{max} Average diameter of tree harvested Market value Substitution product(s)
Direct observations of house construction	Extraction intensities per folk species per year	Q_{ave} for construction Q_{ave} per species used for construction
Direct observations of firewood use	Extraction volume for firewood per year and extraction intensities per folk species per year	Q_{ave} for firewood Q_{ave} per species used for firewood Volume of firewood used per household per year Products produced per volume of firewood
Harvest transects	Population structure per folk species; extraction intensities per folk species per hectare; spatial patterns of extraction	Population densities Size class distributions Standing volume D_{min}, D_{max} Extraction intensity/ha Extraction intensity/km from village Extraction intensity/m from trail

Figure 7
Study Villages within the Pilot (Anaovandrano) and Control (Fampotakely and Ampanio) Watersheds



certified timber" while others will be sold locally (R. P. Guillery, Personal communication). Recommendations will be developed concurrently for the management of non-timber forest products for subsistence use. This forest management activity will have numerous socioeconomic and ecological impacts, which will, in turn, influence the patterns of resource harvesting. The monitoring of natural resource use will permit detailed evaluation of this forest management scheme through before-and-after comparisons and by comparison with the unregulated use of forests in the control watershed.

This project provides an excellent opportunity for adaptive management (Walters and Holling 1990), whereby resource and conservation managers can use information from the monitoring of natural resources to improve resource management plans. Table 5 traces the relationship between the project activity to anticipated primary and secondary impacts of this activity, to monitoring questions and tools required to assess the activity, and to hypothetical outputs of monitoring

(feedback). Other opportunities for assessing the impacts of specific ICDP activities on natural resource use and feeding back the information to adapt management exist, and mechanisms for establishing feedback loops can be developed by analogy (Table 5). Developing tables of this kind is a helpful procedure for (1) assessing the linkage between specific development activities and conservation goals, (2) pre-assessing the potential effectiveness of the action proposed through a "thought experiment," and (3) determining whether the monitoring system will be adequate to meet the information needs to allow adaptive management; points (1) and (2) are aspects of the development of the conceptual model (Salafsky and Margoluis, this volume). The monitoring system itself may also need to be adapted (Ringold et al. 1996).

Buffer Zone Design

While the chief purpose of monitoring forest resource use is to assess changes in use patterns over space and time, a great deal of useful information is also immediately available from the analysis of the "time zero" baseline data. For example, we used average extraction quantities in combination with density data from three 1-ha plots to estimate the forest area currently required per household for the harvest of key resources on the western side of the Peninsula (Figure 8). Because forest composition and resource use differ between western and eastern forests of the Masoala Peninsula (Raymond 1995 and Unpublished data), it was necessary to select a new set of indicators for the western forests. Again, we selected these indicator species from each use sub-category based on average extraction quantities and choice values. Figure 8 shows that areas required per household were less than 1 ha per household for most of the indicator species. However, two species, Vontro (Arecaceae: *Vonitra thouarsii*), a species used for thatch, and Moranga (Annonaceae: *Xylopia* sp.), a firewood species, had much larger harvest area requirements. We could therefore use these species as "umbrella indicators:" by basing harvest areas on the species with the largest harvest area requirements, we would then provide for the harvest area requirements for all species. Thus, we used the upper 95% confidence interval around Moranga of 8.6 ha per household as a yardstick for designing buffer zones around villages.

The project designated buffer zones only around villages that did not have access to forest resources outside of the park (e.g., the village of Ambanizana). Although free access forests exist to the north of the Ambanizana River, local people do not collect resources there because it is too difficult to transport materials across the river. Virtually all of the forests to the south of the park were included within the park for biological reasons. Using the 8 ha per household yardstick, the buffer zone area required for the Ambanizana village (N = 111) was 877 ha. The buffer zone was designated in an area where people traditionally collect forest products. Based on the average maximum distance of collection of all forest products studied (N = 129), most forest products are being collected either in the secondary forests outside of the park or close to the edge of the primary forest.

Of the two umbrella indicator species, Vontro is clearly the more meaningful indicator in socioeconomic terms for designing the buffer zone. Vontro is one of only two species used for thatching roofs, and the other species is said to be already depleted in the western region. Each household must re-thatch their roof every 5–7 years, so the availability of a suitable thatching material is evidently a critical need. People already travel up to 6 km from their village in search of Vontro. In contrast, many substitution products exist for Moranga. People do not go far in search of Moranga, despite the high preference for this species, given the energetic cost of transport and the availability of many other firewood species in greater abundance close at hand. In fact, the average quantity extracted per household is low compared to the other firewood species, but the area required for harvest is high due to its low density. In general, it is important to consider such factors as the availability of other substitution products in selection of an umbrella indicator. However, in this case, we arbitrarily selected the indicator species with the largest

Figure 8

Harvest Area Requirements for Indicator Species on the West Coast of Masoala

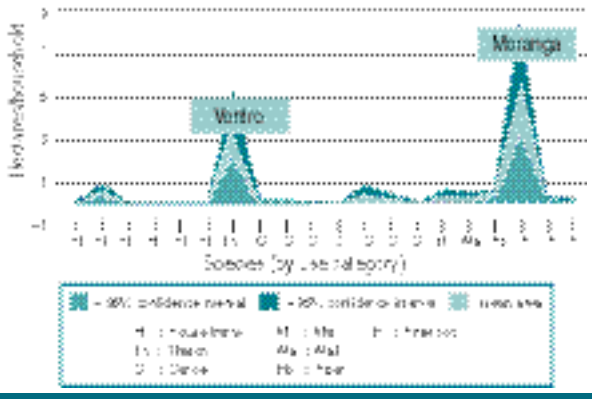


Table 5. From Monitoring to Management: An Example from Natural Forest Management

Conservation and development action	*Primary results (anticipated)*	*Secondary effects (anticipated)*	*Monitoring study*	*Monitoring questions (general)*	*Feedback (example)*
Development and implementation of community natural forest management plans	• intensified harvest of certain species • reduced harvest of certain species • exclusion of outside collectors • more time allocated per household to resource extraction • less time allocated to rice cultivation, including shifting agriculture	**Socioeconomic** • shift to cash economy • change in standard of living • change in population size • change in household activity patterns • substitution of purchased for forest products • change in natural resource use patterns (intensity, type, and location) • change in attitude toward the forest and conservation	• socioeconomic • demographic • remote sensing • natural resource	1. What is the impact of community forest management on the human condition, especially standard of living, activity budget, demography, and attitudes toward conservation? 2. How do the impacts of this activity on households then translate into changing the households' pressure on natural resources, such as slash-and-burn agriculture and resource harvesting? 3. What are the ecological responses to changing anthropogenic pressures?	1. Socioeconomic studies show that more households are abandoning clearing primary forests in favor of timber harvesting from these forests. 2. The rate of conversion of natural vegetation to fields has diminished; thus, the program is accomplishing a key objective. However, certain resources are being depleted due to people using them for commercial purposes in addition to subsistence. Management plans require adaptation. 3. The natural vegetation cover has been stabilized compared to predicted deforestation trends. However, community composition in managed forests is changing dramatically, and regeneration patterns may also be affected. Management plans may need to reduce cutting intensity per parcel and cut larger parcels to meet quotas.
		Ecological • change in plant and animal communities and in forest structure • cascading ecological changes • change in prevailing trends toward conversion of native vegetation by slash-and-burn agriculture	• ecological • natural resource • remote sensing		

harvest area requirement as our yardstick because so many other factors that ought to be considered to determine the sustainability of buffer zone use remain unknown. We therefore preferred to err on the size of a larger buffer zone.

In particular, the harvest areas and buffer zones do not take into account either plant or human demographics, and thus would certainly prove too small as human populations increase. While we do not know the rate of population growth on the Masoala Peninsula, in Madagascar as a whole it reaches 3% (Population Reference Bureau 1995), which will double the population of Madagascar in only 22 years. Clearly this buffer zone could not withstand such a pressure; indeed, perhaps the entire park would have had to be declared a "buffer zone" had we considered future human generations (depending on the number of future generations to be considered). However, this buffer zone was not intended by itself to provide a solution to resource management on the Peninsula; instead, it is part of a multiple strategy that will involve cultivating selected resources that are becoming depleted, encouraging the use of less popular substitution products, promoting commercial sale of timber and non-timber forest products in the multiple-use zones outside the park, and providing health and family planning services.

Conclusions

Monitoring of natural resource use contributes to a battery of monitoring themes and techniques necessary for evaluating the impacts of Integrated Conservation and Development programs on economic development, natural resource management, and biodiversity conservation. Because of its inherent interest to local people, it should be relatively easy to encourage participatory approaches toward monitoring natural resources. Following indicators of natural resource use will lead not only toward improved management of specific resources, but also can provide significant insights into social, economic, and ecological issues, and can assist in evaluating the efficiency of conservation and development actions.

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Annex

Extraction intensity, choice values, and ranks of folk species from littoral and rain forest habitats. Shaded lines are folk species that were selected as indicators. Each species is listed only once, under its principal use sub-category. Within sub-categories, folk species are listed in order of extraction intensity (Q_{ave}).

Common name	Latin name	Family	Other uses[a]	Q_{ave}	C_s littoral	Rank littoral	C_s rain	Rank rain	D_{max} (km)	SE (D_{max})	Voucher specimens[b]
House construction: house frame											
Nantonengitra	*Faucherea thouvenoti* or *F. laciniata*	Sapotaceae	fi, l	5.77	5.71	1			1.85	0.27	RR280
Mantalanina	*Terminalia ombrophila*	Combretaceae	fi	2.78	0.27	6	0.83	3	0.94	0.28	RBE194, 281
Amaninaombilahy	*Leptolaena multiflora* or *Eremolaena rotundifolia*	Sarcolenaceae	fi	1.8	2.17	2			1.75	0.28	RR2850, RBE372
Tsifo beravina	*Canthium majas* or *Ixoro* sp.	Rubiaceae	fi	1.63			1.11	2	1.19	0.31	RR2855, RBE165, 277; GM257
Rahiny	*Cleistanthus capuronii*	Euphorbiaceae	fi	1.36	0.82	4	1.39	3	2.44	0.44	
Vahavohitra		Clusiaceae	fi	1.22	2.17	2			2.49	0.34	
Hazomamy	*Anysophyllea fallax*	Rhizophoraceae	fi, m	0.78					1.21	0.43	
Tsifo madinidravina	*Canthium medium* or *Antirhoca* sp.	Rubiaceae	fi, m	0.7					1.05	0.31	RBE245
Antohiravina	*Phyllarthron* sp.	Bignoniaceae		0.65	1.09	3	1.39	1	1.83	0.32	GM1053, 1128
Hodipaso	*Ficus soroceoides*	Moraceae		0.55	0.27	6	0.83	3	2.15	0.53	RBE203
Tambonana	*Stephanostegia capuronii*	Apocynaceae		0.4	0.27	6	0.83	3	2.65	0	
Tezantrasina				0.33	0.54	5			2.5	0.35	
Vahona			fi	0.28	0.27	6			0.6	0.08	
Ompagavo	*Eugenia pluricymosa*	Myrtaceae	fi	0.23	0.27	6	0.28	5	3.13	1.2	
Hazonjahana			fi	0.21					1	0	
Maroankoditra	*Homalium involucratum*	Flacourtiaceae	c	0.16					1.3	0.49	RBE225
Marody	*Homalium micranthum*	Flacourtiaceae		0.16					1.2	0.57	RBE72, 261
Talanaomby	*Carissa septentrionalis*	Apocynaceae		0.13			1.11	2	0.92	0.84	
Tomenja	*Memecylon longipelatum*	Melastomaceae	fi	0.13					0.75	0.18	
Hazoambo			fi	0.08			0.56	4	1.7	0.92	
Hazombato	*Homalium laxiflorum*	Flacourtiaceae		0.06					5	0	RBE211, 361; RR2888
Tandramirano				0.06					4	0.07	
Hasintohy		Myrsinaceae		0.04					6	0	
Tsiloparimbarika	*Dillenia triquetra*	Dilleniaceae		0.04					4	0	
Jodina			c	0.03					1.5	0	
Matrambody				0.02					4	0	
Vatsikomoto				0.01					1	0	

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Common name	Latin name	Family	Other uses[a]	Q_{ave}	C_s littoral	Rank littoral	C_s rain	Rank rain	D_{max} (km)	SE (D_{max})	Voucher specimens[b]
House construction: floor											
Ravinala	*Ravenala madagascariensis*	Strelitziaceae	fb, fo, hi, th, wa	24.17	30.4	1	77.8	1	2.11	0.22	
Rafia	*Rafia ruffia*	Arecaceae	fo, hi, wa, we	8.64	2.17	2			2.72	0.28	
Lafaza		Arecaceae		1.48					1.38	0.24	
House construction: walls											
Sinkiara	*Dypsis* sp.	Arecaceae		10.07	10.1	2	11.1	2	1.5	0.23	
Tsiriky			hi	0.42					2.08	0.3	
House construction: roof											
Vontro	*Vonitra thouarsii*	Arecaceae		1.9					0.44	0.04	JD6373
Karaka				1.46					1.13	0.11	
Hofa	*Pandanus* sp.	Pandanaceae	fo	0.16					0.4	0	
Firewood				0.17			1.85	2	1.3	0.49	
Moranga	*Xylopia* sp.	Annonaceae	hf	10.01	1.98	2	5	1	0.9	0.09	RBE375, RR2899, GM306, 978
Harongana	*Harungana madagascariensis*	Clusiaceae	hf	6.07	0.79	5	1.94	3	0.79	0.13	
Rotro	*Eugenia* or *Syzygium* sp.	Myrtaceae	c, hf	3.77	2.24	1	1.11	5	1.41	0.23	GM1114; RR2911, 2931; RBE75, JA229
Antevaratra	*Potameia* sp.	Lauraceae	hf	3.22	0.92	4	2.5	2	0.82	0.15	
Vahapaka	*Uapaca* sp.	Euphorbiaceae	hf, l	2.93	1.98	2	0.56	7	1.04	0.11	RBE200, 205, 268, 275, 350, 371; JA245; RR2865, 2874
Valotra	*Breonia* sp.	Rubiaceae	hf	2.29	0.13	9	0.83	6	1.62	0.26	RBE187
Varotro	*Ambavia gerrardii*	Annonaceae		2.02	0.26	8	1.39	4	1.1	0.17	RBE370
Ompa	*Eugenia cloiselii*	Myrtaceae	hf	1.8	0.26	8	1.39	4	0.79	0.2	
Mankaranana	*Macaranga* sp.	Euphorbiaceae	hf	1.6	0.53	6	0.56	7	0.97	0.27	1061GM
Vatsikody				1.34	1.45	3			1.8	0.27	
Menavony			c	1.33	0.79	5	1.94	3	1.24	0.18	
Mampay		Fabaceae		1.2			0.56	7	0.43	0.02	
Tsikodizahana			hf	0.89					1.55	0.58	
Takodizahana			hf	0.83	0.79	5			0.88	0.11	
Gavo		Myrtaceae		0.62			0.28	8	1	0	
Jalahoraka				0.5					0.4	0	
Morangazahana				0.45					2.5	0.85	
Varona	*Antidesma petiolare*	Euphorbiaceae		0.4					0.4	0	
Flao				0.3	0.79	5			0.33	0.05	
Maintimpototra	*Diospyros* sp.	Ebenaceae	hf	0.26					1	0	RR2875, 2879
Hazondamokana	*Rinorea* sp.	Violaceae	hf	0.22			0.56	7	0.9	0.32	
Tendrofony			hf	0.2			0.56	7	1.25	0.53	

Common name	Latin name	Family	Other uses[a]	Q_{ave}	C_s littoral	Rank littoral	C_s rain	Rank rain	D_{max} (km)	SE (D_{max})	Voucher specimens[b]
Fandriantontoroko		Sapindaceae	hf	0.17	0.13	9	0.28	8	0.63	0.15	
Barabanja	*Mascarenhasia arborescens*	Apocynaceae		0.11	0.13	9			0.8	0.14	
Kirandrambiavy		Flacourtiaceae	hf	0.08					1	0	
Fandifihina	*Tinopsis phellocarpa*	Sapindaceae	hf	0.06	0.13	9			0.5	0	
Mandravokina	*Anthostema madagascariensis*	Euphorbiaceae	hf	0.04					1	0	GM913
Mahitsianjahana				0.03	0.26	7			1	0	
Tsilaitry madinidravina	*Noronhia* sp.	Oleaceae		0.03					4	0	RR2849
Ravintsara				0.01					5	0	
Lumber											
Hintsy	*Intsia bijuga*	Fabaceae	c, fi	5.64	6.76	1	1.85	2	1.75	0.17	JA197; RBE269, 284; GM249
Nanto beravina	*Labramia* sp.	Sapotaceae		0.67	1.45	5			2.49	0.89	GM301
Hazinina	*Symphonia* sp. or *Ochrocarpos madagascariensis*	Clusiaceae	c, fi	0.34	0.97	6			3.43	1.15	GM823, 1140, 1147
Nanto mena	*Sideroxylon* sp.	Sapotaceae		0.26			1.85	2	1.04	0.35	GM339
Nantotodinga	*Faucherea glutinosa*	Sapotaceae	hf	0.25			2.78	1	1.62	0.32	GM1127
Hazovola mena	*Dalbergia chapelieri*	Fabaceae		0.23	1.93	4	1.85	2	2.02	0.48	JA179
Nanto madinidravina	*Mimusops* sp.			0.22	0.48	8			2	0	JA199
Hazovola mainty	*Dalbergia baroni*	Fabaceae	c	0.21	0.97	6			5.41	1.72	
Hazomainty	*Diospyros* sp.	Ebenaceae	h, fi	0.14	2.66	2			1.8	0.54	JA182, GM 263, 1142
Andramena	*Dalbergia* sp.	Fabaceae		0.1	2.42	3			2.17	0.49	
Hazovola fotsy	*Dalbergia madagascariensis*	Fabaceae		0.06	0.24	9			9	4.24	
Faho	*Chloroxylon faho*	Rutaceae		0.05					2	0	
Hazomalagny			hf	0.03					2.43	1.46	
Hazovola antanety				0.02					2	0	
Tsifontsoy	*Rhodocolea* sp.	Bignoniaceae	fi	0.01			0.93	3	2	0	
Pirogue											
Vintanona	*Calophyllum* sp.	Clusiaceae	fi, l	0.81	2.05	2	6.16	1	5.71	1.07	GM268, RR2859, MZ288
Mantady		Combretaceae	fi, l	0.21	1.02	4			5.9	1.4	
Ambora beravina	*Tambourissa religiosa*	Monimiaceae	fi, l	0.19	1.02	5	5.8	2	7.56	1.45	
Sary	*Rhopalocarpus macrorhamnifolius*	Rhopalocarpaceae	l	0.06	1.79	3	2.9	3	10.4	3.81	
Aramy beravina	*Canarium* sp.	Burseraceae	l	0.03	0.77	6	2.9	3	8	2.87	
Longotra	*Aspidostemon scintillans*	Lauraceae	l	0.03	0.77	6			10	3.54	
Tafononana	*Ocotea* sp.	Lauraceae	l	0.03	1.02	5			3	0	GM306
Lalona	*Weinmannia* sp.	Cunoniaceae	l	0.03	1.28	4			1.45	0.39	
Fanondamba	*Nesogordonia* sp.	Sterculiaceae		0.01	0.26	8	0.36	5	0.9	0	
Tarantana	*Camnosperma* sp., *Protorhus* sp., or *Rhus thouarsii*	Anacardiaceae		0.01	0.51	7	0.36	5	15	0	
Aramintsitsiha	*Canarium boivinii*	Burseraceae		0.01			0.36	5	25	0	
Albizia	*Albizzia* sp.	Fabaceae		0.01					1.5	0	

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Common name	Latin name	Family	Other uses[a]	Q_{ave}	C_s littoral	Rank littoral	C_s rain	Rank rain	D_{max} (km)	SE (D_{max})	Voucher specimens[b]
Weaving: hats											
Manarana	*Ravanea lakatra*	Arecaceae	hi	2.38	1.09	4			16.1	1.6	JD7638
Weaving: mats											
Rambo	*Pandanus odoratissimus*	Pandanaceae		4.06	19.6	2	41.67	1	1.64	0.19	JA234
Vorondia				0.16	2.9	4			1.5	0.35	
Food: heart of palm											
Hasimbe		Liliaceae		0.52	2.42	5	13.89	2	1.06	0.53	
Tsaravoasira				0.16	2.42	5	6.94	3	4.1	3.15	
Kona		Arecaceae		0.13	2.9	4	6.94	3	3.88	2.53	
Malady				0.1					5	0	
Bireso				0.02	0.48	7			15	0	
Food: tubers			we				61.11				
Oviala	*Dioscorea* sp.	Dioscoreaceae		1.58	30.4	1		1	2.16	0.41	
Food: alcohol[c]											
Fiber											
Magna				2.88	2.17	1	5.56	1	1.61	0.29	
Hafopotsy	*Grewia apelata*	Tiliaceae		1	2.17	1	5.56	1	0.81	0.15	GM333; RBE160, 166
Hafotra	*Nesogordonia* or *Dombeya* sp.	Sterculiaceae		.017			1.85	2	1.3	0.49	
Hafomena	*Grewia* sp.	Tiliaceae		.01					0.6	0	

[a] c = canoe, fb = fiber, fi = firewood, fl = floor, fo = food, hf = house frame, hi = household implements, l = lumber, m = mat, th = thatch, wa = wall, we = weaving.

[b] Voucher specimens are stored at Missouri Botanical Garden, Kew Gardens (JD only), Parc Botanique et Zoologique de Tsimbazaza, and FO.FI.FA. (RR only). Collectors: JA = Jao Aridy, JD = John Dransfield, GM = Grace Rahajasoa, RBE = Roget Bernard, RR = Raymond Rabevohitra.

[c] Bilahy (Rutaceae: *Evodia bilahe*) was selected as an indicator species, although no quantitative data was available.

Introduction

Conservation and development practitioners carry out project monitoring and evaluation (M&E) for one primary reason—to take action. All of the steps discussed in previous chapters are designed to maximize the quality of the data upon which project managers and other stakeholders can make sound and appropriate decisions. If this final step is not taken, if the data and information collected during M&E activities are not used, then all of the work invested in M&E by the project team up to this point is for naught. This is, unfortunately, an all too common final scenario: huge investments of time, staff, and money in M&E data collection and analysis, resulting in volumes of published results that end up on someone's bookshelf, never to be applied.

While most conservation and development practitioners agree that M&E is an essential component of project management, few conservation and development projects have effective M&E systems that permit project managers to adapt and learn systematically. In addition to the many obstacles to carrying out M&E activities described throughout these chapters, others are more specific to the use of results. These include negative experiences, in which volumes of relatively useless data were collected; poor understanding of what information is needed for monitoring; lack of experience using systematically collected data for decision-making; and information analyzed and communicated in ways that make interpretation and use difficult.

To increase the likelihood that information generated by M&E activities will be used, project managers and stakeholders must clearly envision direct utility of the information. Full understanding of the importance of reliable data does not usually come to project decision-makers spontaneously. It happens only after they have had a positive experience, in which specific and reliable data were collected, analyzed, and used to make decisions that were subsequently judged as appropriate. For decision-makers to use monitoring results, they must be involved in the project's conceptual design; formulation of project goals, objectives, and activities; development and design of a monitoring strategy and approach; selection of the indicators that will be used to monitor progress; analysis and interpretation of data; and use of data and information to make sound decisions.

Conservation and development project monitoring allows decision-makers to test assumptions they may hold about conditions at the project site and the effectiveness of the interventions they are applying. Testing assumptions is fundamental to ensure that project activities are designed and implemented in ways that most efficiently lead to the achievement of the project goals and objectives. Testing assumptions also forms the basis of adaptive management and learning.

The two papers presented in this section provide outstanding examples of how use of data can have profound impacts on project management and, ultimately, project success. Both papers stress the importance of precise and reliable data for decision-making; formal mechanisms for collecting, analyzing, and using M&E data; and the willingness of project managers to adapt and change project activities when M&E results indicate it is essential to do so. One of the strongest currents running through both papers is the need to include decision-makers in all phases of M&E so that they will be more likely to use the results.

In Chapter 7, Bawa, Lele, Murali, and Ganesan describe their work with the Soliga tribe in the Biligiri

Rangan (BR) Hills region of South India. The Soliga collect a wide variety of non-timber forest products (NTFPs) for subsistence and commercial use. Most collection occurs in the Biligiri Ranganswamy Temple Wildlife Sanctuary, which covers an area of about 540 km^2. Previous studies showed that the Soliga rely on NTFP collection for more than half of their total household income, but that they have little control over resource management or processing.

The aim of the project described by Bawa and his colleagues was to increase the amount of economic returns per unit of collected NTFP to provide Soliga tribe members an incentive to sustain the natural resources upon which their livelihoods depend. The project focused on four NTFP-related activities: beekeeping and the processing of honey, food, and herbal medicine. In order to measure progress toward goals and obtain essential information for decision-making, the project team promoted enterprise, biological, and socioeconomic monitoring.

To demonstrate how data were used, the authors present an insightful table that provides examples of specific findings generated by the M&E systems and the management actions the team took in response to the information. For example, as a result of enterprise monitoring, the team discovered that procurement of raw materials, processing, and marketing activities were not well coordinated. In response, the team developed and implemented precise schedules for procurement, processing, and marketing for each product. As a result of the biological monitoring, the team discovered a reduction in thai sac brood disease in bees. The team responded by developing enterprise plans for box beekeeping. Finally, through socioeconomic monitoring, the project team learned that low interest in the enterprises was caused by the community members' perception that only a few households benefited. To rectify this problem, the project team worked to restructure local cooperatives in order to pass on the benefits of higher NTFP prices to collectors.

Bawa and his colleagues conclude with recommendations for developing effective community-based enterprises and the monitoring systems that are required to ensure their success.

In Chapter 8, Renzi discusses his work with the Living in a Finite Environment (LIFE) project in Namibia. According to Renzi, LIFE is simultaneously an empowerment, conservation, and economic development project. One of the underlying assumptions of the project is that if Namibia's natural resources (primarily wildlife) are managed sustainably, then these resources can serve as the foundation for continued economic development to meet the needs of some of the country's poorest citizens.

Renzi writes that LIFE is implemented "using an adaptive management approach that recognizes it is impossible to predict all of a project's requirements from the outset. Rather, M&E is intended to provide accurate and timely data on project progress and external factors so that the government, NGOs, and LIFE staff can adapt their implementation plans to respond to emerging circumstances." LIFE M&E depends on the participation of a wide spectrum of stakeholders who are involved in defining information needs, collecting and analyzing data, writing reports, and communicating results.

Renzi describes how some of the M&E tools developed by the LIFE project team have been used. Application of the Institutional Development Toolkit (IDT) led a local partner cooperative to consider strategic options for its future. This exercise helped the cooperative improve its financial and project management systems, as well as its client relations and project activities. The Community Management Toolkit (CMT) helped community-based organizations manage their resources more effectively. For example, use of the CMT led the Nyae Nyae Farmers Cooperative (NNFC) to conclude that the cooperative had become too far removed from the community it was designed to represent. To remedy this, NNFC involved community members in holding new cooperative elections, increasing the size of the management committee to make it more representative, planning for future monitoring, and developing a program for monthly NNFC institutional strengthening workshops. These are but a few of the examples of the use of M&E results found in Renzi's paper.

Renzi focuses squarely on one of the major challenges to using M&E data: the effective communication of important and relevant results. Renzi argues that, unless project staff can package results so that decision-makers will pay attention to them, M&E activities are bound to fail. One approach the LIFE staff used to communicate lessons learned from project monitoring was video. The project team interviewed ministers, chiefs, headmen, project staff, farmers, hunters and others to produce a video that would make the M&E results *come alive*. This medium proved extremely effective in communicating findings at all levels of stakeholders-from Namibia's National Council to villagers.

The project experiences reflected in these two papers clearly demonstrate how M&E data can be used to make informed and sound management decisions. Both papers stress the importance of developing feedback mechanisms that provide for data collection and use that allow project activities to adapt to changing realities. While use of M&E results usually occurs at the end of monitoring activities, both papers address the importance of identifying and planning for the collection of specific data at the beginning of a project to ensure that sufficient data will be available to manage adaptively.

7

Extraction of Non-timber Forest Products in Biligiri Rangan Hills, India: Monitoring a Community-based Project

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INTRODUCTION

Human societies throughout the world derive vast amounts of goods and services from their surrounding natural ecosystems. The livelihoods of millions of people depend upon the continuous stream of materials and other benefits from their immediate surroundings. These livelihoods would not have been sustained for millennia without strategies designed to conserve the resource base. Indeed, most societies that rely on natural resources have evolved cultural and social practices to discourage their overexploitation.

In recent years, however, a number of forces have disrupted these traditional practices. Perhaps the most important of these changes is a shift in economic control of resources from indigenous groups to a loose alliance of outsiders, including traders, large landholders, and government organizations and their bureaucrats. In some cases, this shift started long ago. During the last century in British India, the colonial regime started to expropriate large tracts of forest for reserves that were to be brought under scientific management to meet the needs of the Raj and the empire (Gadgil and Guha 1993). Colonial authorities severely curtailed traditional rights of forest dwellers or relegated them to community forests; these forests, being too small to meet the needs of local communities, were soon degraded.

It is now well recognized that, in much of the developing world, progress toward conservation of biodiversity in natural ecosystems requires returning tenured control over ecosystems to local people. Such a shift in control would have to be accompanied by economic incentives to conserve biodiversity. The Biodiversity Conservation Network (BCN) project is designed to test the idea that economic benefits derived from local biotic resources, combined with control over these resources, can motivate local communities to conserve biodiversity.

Our project centers on extraction of non-timber forest products (NTFPs) by Soliga tribes, who have inhabited the Biligiri Rangan (BR) Hills region of South India for millennia. The Soligas traditionally engaged in shifting agriculture and hunting. Soligas also collected a wide range of NTFPs, initially for their subsistence needs, but later for forest contractors as well. Government has discouraged shifting agriculture since the late nineteenth century, and completely banned shifting agriculture and hunting with the declaration of much of the area as the Biligiri Ranganswamy Temple (BRT) Wildlife Sanctuary in 1974. This legislation allocated the Soligas small pieces of land where they could practice settled agriculture. However, the extraction of NTFPs continued under the aegis of tribal cooperatives, or Large-scale Adivasi (tribal) Multipurpose Societies (LAMPS). The LAMPS serve as vehicles for tribal development, particularly to ensure full return on the collection of NTFPs to which the tribals were given sole rights.

The BRT Wildlife Sanctuary is approximately 540 km^2, and is under the jurisdiction of the Karnataka

State Forest Department. Approximately 4,500 Soligas live in 25 *podus*, or settlements, scattered throughout and on the fringes of the sanctuary. Soligas practiced settled agriculture on the lands allotted to the households. The average size of the landholding is 0.6 ha (1.5 acres), but approximately 30% of the households lack access to cultivable land. Extraction of NTFPs is the major source of income (Hedge et al. 1996). The existing situation with respect to NTFP harvesting and marketing in BR Hills is shown in Figure 1a. The Soligas harvest NTFPs and sell them to the cooperative marketing society, the LAMPS, which holds the harvesting rights on lease from the Forest Department. The LAMPS then auction the raw NTFPs to the highest bidder.

In terms of amounts extracted and revenue generated, the most significant NTFPs are nelli (*Phyllanthus emblica*), gallnut (*Terminalia chebula*), taarekai (*Terminalia bellirica*), soapnut (*Sapindus emarginatus*), shikekai (*Acacia concinna*), lichens, and wild honey. Our preliminary studies (Hedge et al. 1996; Murali et al. 1996) indicate that the Soligas (1) rely heavily on NTFPs as a source of cash income (they earn more than 50% of total income from NTFPs); (2) derive inadequate returns from the NTFPs due to a lack of value additions at the point of harvest (Uma Shankar et al. 1996); and (3) have little control over harvest with respect to amount, location, and timing of the collection. Preliminary findings also suggest that many species yielding NTFPs are inadequately regenerating, possibly due to overharvesting.

The project described herein is designed to increase the economic stake of the Soligas in conservation of their biotic resources and to increase their capacity to ensure the ecological sustainability of these resources and the larger ecosystem. The project seeks to enhance economic stakes by increasing Soliga income from NTFPs by processing several of the extracted products at the collection site and marketing them directly, in order to capture a greater share of the final value. Sustainablility is to be achieved by establishing a community-based biological monitoring and feedback system that will regulate NTFP extraction and ecosystem health and by strengthening the local community's access to and control over biotic resources. Vivekananda Girijana Kalyana Kendra (VGKK), a nongovernmental organization (NGO) in the BR Hills region devoted to Soliga welfare, collaborated in the design of the project.

The central aim of the project is to create an enterprise the Soligas will operate. The Soligas will process some of the NTFPs collected through the LAMPS and sell the processed items in the market to generate profits for the local community, while simultaneously ensuring sustainable NTFP extraction and broad-based development. Thus, the enterprise will ultimately include a processing and marketing unit, a biological unit to ensure sustainable utilization of the biotic resources, and a community outreach unit to ensure broad-based participation of the local communities and an equitable flow of benefits to the community. Figure 1b depicts the desired situation schematically. Specifically, the processing and marketing unit will purchase at least four NTFPs (honey, nelli, soapnut, and shikekai) in raw form from the LAMPS; it will then process and market the products so as to capture the highest possible fraction of the final consumer prices.

The objective of the biological unit of the enterprise is to set up a system of resource monitoring to provide continuous information on the extent to which the NTFPs are being sustainably harvested, and to identify the modifications that might be needed in the harvest and management of forest resources. This involves establishing systems for information collection, analysis, and dissemination at two complementary levels: the community level (necessarily simpler and by rule-of-thumb) and enterprise level (more sophisticated, by scientifically trained staff).

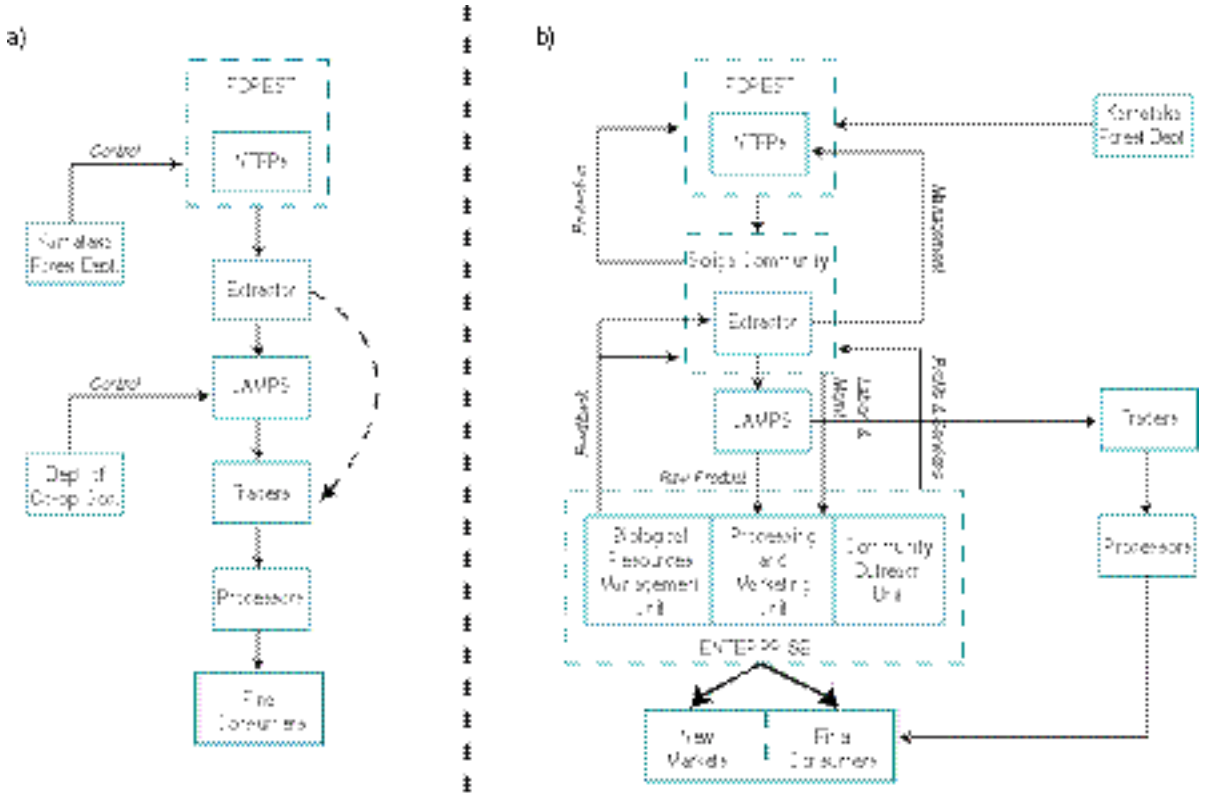
The primary objectives of the community outreach unit of the enterprise are to ensure participation in, training for, and ultimate handover of the food processing unit (FPU) to the Soligas, and to facilitate the establishment of a community-based biological monitoring system. Another objective of this unit is to reform the functioning of the LAMPS, which is critical to making project benefits broad-based and to strengthening community control over forest resources.

In order to achieve these objectives, it was necessary to initiate a monitoring program that would continuously evaluate our success in meeting project goals and would provide ecological and socioeconomic inputs for the project operation, as well as for the conservation of biodiversity.

In the following sections, we first describe the current status of the enterprise and related biological and community outreach units. We then describe the concepts, objectives, and results of the monitoring program. We also indicate how we modified the project activities in response to the findings of the research and monitoring program. We conclude by offering some comments on the concept, methods, and usefulness of monitoring, and constraints in its implementation.

Figure 1

Flow of NTFP and Management Inputs a) Before the Project and b) Envisioned Flow of Goods and Services at the End of the Project



Enterprise-related Action Program

The action program was initiated in March 1995. The progress achieved toward establishing the processing and marketing unit, the biological unit, and the community outreach unit of the enterprise is described below.

Processing and Marketing for Income Generation

The processing and marketing unit is a conglomerate of value-adding activities/units, which are described under four headings: Honey Processing Unit (HPU), Beekeeping Activities (BKA), Food Processing Unit (FPU), and Herbal Medicinal Plant Unit (HMPU). The main features of and physical targets achieved by each value-adding activity/unit are described below, followed by a brief summary of the marketing strategies adopted, the net profits generated, and the level of Soliga staff training achieved.

Honey Processing Unit

The honey processing unit, located in BR Hills, is designed to process honey, currently collected primarily from wild rock bees (*Apis dorsata*). Work on the unit began in 1995, with procurement of equipment. The unit started to function in the beginning of 1996, the second year of the project. It has the capacity to process 30 tons of honey per year. In 1996, the unit processed 8 tons of honey. The total revenue generated in 1996 from honey was 700,000 rupees; the profit margin is approximately 20,000 rupees per ton.

Beekeeping Activities

In 1996, the project initiated beekeeping operations to harvest honey from another species, *Apis cerana*. The project started approximately 34 colonies in two localities. VGKK managed 20 colonies (at a relatively higher altitude), and individual households managed 14. A viral sac brood disease completely decimated the colonies at VGKK; only those located at a relatively low altitude survived. In 1997, the project will establish approximately 150 colonies at various settlements at lower altitudes. The HPU will purchase the honey obtained from beekeeping.

Food Processing Unit

The food processing plant, located in BR Hills, is intended to process pickles, jams, honey, and other food products. The plant processes the fruits of *Phyllanthus emblica* into jams and pickles. In 1996, the plant processed 500 kg of pickles on a trial basis. In 1997, the target was 2,000 kg, with a profit margin of 1,000 rupees per ton.

Herbal Medicine Processing Unit

The HMPU is located at Yellandur (24 km from BR Hills). VGKK originally conceived of and started the unit with funding from the Foundation for the Revitalization of Local Health Traditions (FRLHT). During the planning grant phase of the BCN project, a team from the University of Massachusetts and the Tata Energy Research Institute had confirmed the potential for such an enterprise. When funding for the herbal medicine factory ran out in 1994, VGKK needed funds to procure equipment and machinery, as well as working capital to run the unit. The project invited BCN to take over the unit and to provide inputs on major policy issues, such as management, linkage to conservation of biodiversity, and distribution of profits. During the one year since its inauguration, the Unit has processed and produced more than 10 Ayurvedic drugs. It took much effort and time to forge a marketing arrangement with a major Ayurvedic pharmaceutical company.

Marketing

To facilitate marketing, the project has obtained the necessary regulatory approvals and registered trademarks. In particular, the HPU has obtained "Agmark" certification (a certification of honey quality from the Indian Standards Institution). The FPU has received FPO certification. Both units market their products under the registered trademark "Prakruti" (meaning "nature").

The project has followed a conscious strategy of product and channel diversification in marketing these products. The HPU currently markets honey through the state-owned Khadi and Village Industries Commission, and through wholesale and retail outlets in Bangalore. The FPU will use the same outlets for its products. The project also has opened a retail outlet in BR Hills, which sells all of these products. The HMPU has signed a Memorandum of Understanding with a major Ayurvedic drug company for technical assistance and buy-back. The HMPU is also selling herbal medicines to a Swiss Ayurvedic physician for export markets. However, projected sales upwards of Rs 1 million (over $30,000) in 1996 with a profit margin at 50% have not materialized due to low product quality and staff turnover.

Employment

The HMPU and the FPU provided a source of income to Soliga workers during 1996; Soligas earned Rs 60,000 from the FPU and Rs 12,000 from the HMPU. Skill improvement has been significant on the production side. It is estimated that the Soligas will manage all production activities in the HPU within a few more months. The HMPU has been less successful in providing Soliga employment because the unit is located too far away from the sanctuary. With the viral disease in domesticated beehives still not under control, the beekeeping activities have not yet generated any significant person-days of work for the community.

Enterprise-based Biological Resource Monitoring

Early on in the project, as a result of the BCN-organized Monitoring Workshop, it became clear that monitoring of changes in biological resources or diversity during the three-year life of the project would be unlikely to yield any conclusive results. This is true not only because environmental variability makes it highly unlikely that trends in biodiversity (or for that matter, in incomes) can be spotted within three years, but also because there are typically delays in getting the income-generating activity off the ground. Thus, we saw a clear need to set up a resource monitoring system that would continue beyond the life of the project.*

We visualized enterprise-based biological monitoring at two complementary levels: a simpler, community-based monitoring system and a more scientific system using ecologists employed by the enterprise. The biological research team working on the project currently

* It should be noted that most of the medicinal plant species required by the HMPU are not in the list of NTFPs that the Forest Department permits the LAMPS to harvest. Until collection from the wild is allowed, the HMPU will meet its needs through purchases in the open market and through encouraging cultivation in the *podus* and villages with a buy-back guarantee. (Executed in collaboration with a MacArthur Foundation-funded research project, Ecology, Economics, and Institutions of Forest Use, being carried out by the Institute for Social and Economic Change, Bangalore.)

plays the latter role. Starting in late 1996, one of the ecologists on this team began to work about half-time directly with the enterprise.

Progress toward setting up the community-based resource monitoring system has been slower than expected. The project has trained select Soligas in systematic monitoring of resource extraction and in estimating the availability of NTFPs; the project, however, has not yet generated community participation and interest. Toward the end of 1996, the project conducted a training program on participatory resource mapping. In January 1997, the project initiated a comprehensive program of participatory monitoring of nelli harvest and regeneration, which included preharvest discussions, online monitoring of harvest percentage, surveys of the presence of parasites and seedlings, and postharvest feedback sessions on six harvest days. The response was encouraging; similar efforts were planned for other products during 1997.

Community Involvement, Empowerment, and Benefit Distribution

VGKK has been working for Soliga development for the past 15 years, and most of its staff and board members are Soligas. The enterprise activities have been based physically and operationally at VGKK, which had already initiated a number of vocational training programs and even some small-scale processing activities with the Soligas before our project began. Thus, in one sense, the Soliga community has been aware of and involved in the enterprise from the start. On the other hand, the community outreach unit is still quite far from its goal of true community involvement; i.e., making the enterprise activities entirely owned and controlled by the Soligas. The meetings of the Soliga Managing Committee to oversee the enterprise activities initially evoked little response, but the community outreach program has generated increased interest in the community.

Efforts to reform the functioning of the LAMPS have evoked a somewhat more enthusiastic response from the community. These efforts focused on two levels: reforming the local LAMPS and changing general statewide policies toward LAMPS. The former involved the BR Hills Soliga community, while the latter targeted the Karnataka-wide tribal community. At the local level, reform efforts have generated greater awareness in the community about malpractices occurring in the LAMPS. Soliga members of the LAMPS are demanding revisions in the pricing system, and there have been some attempts to improve the NTFP tendering/auctioning system. At the state level, the project's efforts have generated significant momentum among tribal organizations and tribal development NGOs to push for LAMPS policy reform. This has resulted in the drafting of a detailed action plan that is being finalized and submitted to the government (Lele et al. 1996).

Monitoring Program: Concepts and Methods

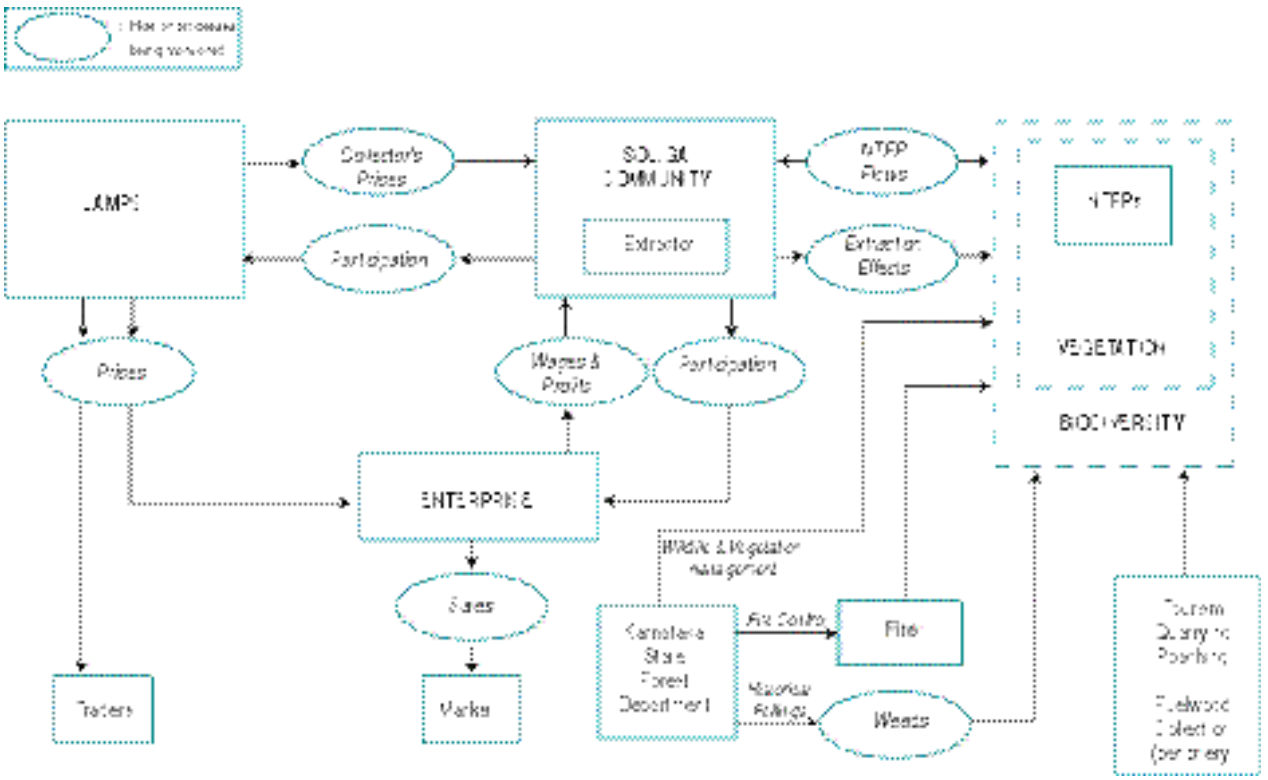
Experience in rural development projects around the world has shown that projects that do not define clear targets and parameters of success and that lack a formal system of monitoring progress toward these targets, often do not succeed in reaching their goals. In projects involving biological resources, the case for systematic monitoring is even stronger due to the difficulty in determining whether a project has made resource use sustainable, enhanced resource productivity, or stemmed the loss biodiversity. Our monitoring program is designed to measure success in establishing the enterprise, as well as success in the support activities that sustain the enterprise.

BCN explicitly tests the hypothesis that enhancement of economic stakes in the biological resources will lead to biodiversity conservation. Hence, BCN also made it mandatory that the project include components that would rigorously monitor changes in biodiversity and economic well-being. Figure 2 depicts the monitoring scheme developed for this project. It involves tracking various parameters of the interactions among the local community, the enterprise, and the biological resources in the sanctuary.

As discussed previously, however, it became clear early on that a three-year period would be too short to yield data to prove or disprove this hypothesis. We responded by making the establishment of a long-term community-based monitoring program a primary objective of the project. Simultaneously, we realized that the term *monitoring* needed to be interpreted in two additional ways. In a literal sense, and in BCN's usage, the term *project monitoring* strongly suggests the use of time-series data to provide midcourse corrections. However, applied research on biological and socioeconomic phenomena, using a combination of historical and cross-sectional data, is also needed to help in project planning, problem solving, and innovation.

For instance, although the biological unit was originally intended to monitor the status of biodiversity con-

Figure 2
Interrelationships among Soligas, Enterprise, and Biodiversity



servation after the initiation of enterprise activities, substantial ecological research was necessary to identify the most important parameters to be monitored. Similarly, the socioeconomic monitoring was originally intended to record the manner of distribution of project benefits. However, an understanding of Soliga community structure and activities was necessary to estimate likely obstacles to community participation in the processing unit and to search for solutions to overcome these obstacles.

Thus, our activities can be better described as an "online project monitoring and research program" that not only helps determine the degree of progress toward project objectives, but also enables the actualization of enterprise objectives through critical feedback from new information, analyses, and ideas. The specific objectives of this broader monitoring program are described below in three parts, along with brief descriptions of the methods used in each case.

Enterprise Unit Monitoring

The monitoring program for the processing units for the first two years aimed to focus on the viability of the enterprise. Specifically, the objectives were to (1) analyze the profit performance of the processing units, (2) evaluate staff performance and training requirements, (3) determine the success of coordination with biological and community outreach activities, (4) evaluate the success in marketing of different products, and (5) undertake a full costing of the products.

Monthly staff meetings monitored the progress of the enterprise unit toward achieving its goals. The staff meetings, in fact, monitored the success of the entire project. In addition to monthly meetings, there were formal and informal discussions among staff members with BCN staff visit teams and management experts. The methods were not formal or systematic. However, as the project progressed, we began to identify clear targets and formal approaches to meet those targets. Progress toward achieving these explicit targets is now reviewed during staff discussions and at monthly meetings.

Biological Research and Monitoring

We designed the biological program to collect basic information about the distribution of resources and the

factors that influence productivity, regeneration, and population growth. Furthermore, the program sought to identify parameters and techniques that the Soliga community could use to monitor and ensure the sustainability of resource utilization. For the first two years, the objectives were to (1) map the distribution and abundance of NTFPs, as well as the distribution of various landscape and vegetation features; (2) determine the effect of harvest, weeds, and fire on regeneration of NTFP species; (3) analyze spatial and temporal variation in productivity and investigate the role of such factors as parasites and diseases on productivity; (4) estimate the levels of extraction and production; (5) explore the potential for beekeeping; and (6) identify parameters and rules-of-thumb for community-based biological monitoring of at least two NTFPs (honey and nelli).

Distribution and Abundance of Species (Landscape Maps)

The project digitized survey of India maps and Forest Survey of India maps, showing vegetation cover, to produce maps that could be updated and used to quantify patterns of change in forest cover and distribution and abundance of species. Moreover, other ecological and socioeconomic information, such as the location of villages, human population density, and patterns of extraction, can be incorporated. The maps also serve as a basis for tracking resource availability and extraction by the community. Ultimately, we expect to have personal computer-based hardware, software, and expertise to update the maps at the field site.

The project undertook a complete survey of NTFPs and other plant species in the entire 540 km^2 of the sanctuary. For this purpose, we divided the sanctuary into 125 equal-sized grids. In each grid (4 km^2 each), a plot 80 × 5 m was laid in the center and all trees greater than or equal to 1 cm diameter at breast height (dbh) were enumerated. Four 1 m^2 quadrants were established in each plot to enumerate herbs, seedlings, and saplings. We are now analyzing these data to ascertain the distribution and relative abundance of various species. The data, once incorporated into the digitized maps, will produce detailed visual images of the distribution and density of various species.

Effect of Harvest on Regeneration and Population Growth

The project is using several approaches to examine the impact of harvest on regeneration and population growth. The first approach consists of establishing transects in areas close to and far from human settlements. Project staff then examine the population structure of NTFPs to compare the distribution of different size classes in the two sets of transects. The second approach consists of harvesting fruits with different levels of intensity (25, 50, and 100%) and then determining the number of seedlings under these focal trees. The third approach examines population dynamics on the basis of recruitment and mortality of various size classes and determines population trends. Thousands of individuals of various size classes in three species, *Phyllanthus emblica*, *Terminalia chebula*, and *T. bellirica*, have been marked and are being monitored for this purpose.

Productivity

Assessing spatial and temporal variation in productivity is critical to determine the levels of harvest that might be sustainable. We are following the phenology of five major NTFP tree species: *Terminalia chebula*, *T. bellirica*, *Phyllanthus emblica*, *Sapindus emarginatus*, and *Acacia sinuata*. We are monitoring the phenology of 50-100 trees of each species, located in different parts of the sanctuary, every month, and estimating crop sizes for each tree.

In order to estimate the productivity of honey from the wild bee *Apis dorsata*, the project established 17 transects along streams throughout the entire sanctuary, as we found that the majority of hives are located around trees close to streams. We also measured the length of these streams. The product of the total length of streams and average number of hives per transect provides an estimate of the total number of hives in the sanctuary. In addition, we have measured the yield of honey from individual hives while the tribal people were collecting honey. The product of total number of hives and the average yield per hive will give us the total production potential of honey across the sanctuary. In addition to transects, we have also collected data on the total number of hives present on rock cliffs within the forest. We have marked 23 rock cliffs, and are periodically observing these cliffs. Project staff visit the transects and cliffs twice a year (June and November).

Levels of Extraction

We are estimating the amount of NTFPs extracted as a percentage of total productivity. Data on extraction patterns is being collected by direct observation in the field, and on the basis of interviews at the household and *podu* levels. Extraction patterns, on the one hand, are being related to ecological features, such as abundance and

tree size, and, on the other hand, to household variables to ascertain biological, as well as socioeconomic, determinants of resource use and harvest.

Parameters for Community-based Biological Monitoring
Our approach to community-based biological monitoring is based on results from ecological, as well as socioeconomic, surveys designed to collect information about traditional Soliga resource management practices. Thus far, we have not encountered much meaningful information from the socioeconomic surveys in relation to the traditional knowledge of resource use. Ecological research indicates that parameters to be monitored are productivity, levels of extraction, density of seedlings, and incidence of parasitism or disease.

Socioeconomic Research and Monitoring
The project redesigned the socioeconomic program to focus broadly on the factors influencing NTFP extraction, overall patterns of economic activity and social relations in the community, and the role of formal and informal institutions in governing the magnitude and distribution of forest-based incomes amongst the Soligas. Specifically, during the first two years, the objectives of this program were to (1) understand the factors influencing quantity, manner, and location of extraction and sale of all commercially harvested NTFPs, with special attention to honey and nelli; (2) analyze factors responsible for LAMPS malfunctioning, identify needed reforms, and carry out advocacy for reforms at the state level; and (3) document community perceptions and knowledge about the conservation and management of the forest.

To achieve these objectives, we initiated: (1) a census and social mapping of all households in all nine *podus* in Yallandur *taluka* (i.e., subdistrict) that are the immediate focus of the project, and also in the nearest three *podus* of Chamrajanagar *taluka*; (2) a rapid assessment of Soliga attitudes, traditional knowledge, and practices of forest use and conservation (including consolidation of existing information on this topic); (3) a household-level monitoring program that covers a stratified random sample of 114 households in 12 *podus* inside the sanctuary and involves biweekly recording of NTFP collection and other income-generating activities by all household members; (4) a similar, but monthly, monitoring of 40 households in two contrasting (one agricultural and one forest-dependent) *podus* in Kollegal *taluka* for understanding the situation in a nonsanctuary region; (5) detailed field-level monitoring of the quantity and manner of extraction and composition of extractor groups for the most lucrative products (*Phyllanthus*, honey, lichen) during their seasons; (6) a study of the functioning and performance of all LAMPS in Karnataka state, followed by lobbying with governmental officials to reform the rules governing LAMPS functioning and tribal access to forests; and (7) a process of continuous consultations with Soliga collectors, *podu*-level and *taluka*-level Soliga political organizations, and key Soliga persons regarding their perceptions about the project, the processing and marketing activities, and their own role in the same.

Preliminary Results from Monitoring and Modification of the Project

Although monitoring has been under way for just over a year and a half, it has yielded interesting insights and resulted in substantial modifications of the project activities, design, and goals. Preliminary findings and their impact on implementation of the program are summarized in Table 1.

Enterprise Unit Monitoring
One of the primary goals of the enterprise is to achieve financial viability and generate profits. We have found it difficult to determine the financial viability of the enterprise for three reasons. First, the enterprise staff have been involved in other activities of the NGO, even though all the salaries were charged to the enterprise. Second, overhead costs were also not proportionally distributed between the enterprise and other NGO activities. Third, enterprise accounts were initially mixed with the accounts of other activities of the NGO. After we identified these problems, it took several months to implement steps to clearly define responsibilities and duties of the staff, maintain separate accounts, and calculate the true cost of the products by taking into account depreciation and appropriate overhead costs.

A major hurdle in the adequate functioning of the enterprise was the lack of skilled staff. While we understood from the beginning that professionals might be required to run the enterprise at the start, we underestimated the need for skilled staff at the entry and intermediate level positions. As a result, training activities at all levels for all aspects of the project, including resource monitoring, became an integral part of the project.

Coordination is one of the keys for success in a project that uses only local resources available in natural

Table 1. Results and Impact of the Monitoring Program

FINDING	RESPONSE
Enterprise	
Enterprise staff are involved in other NGO activities; accounting and bookkeeping of NGO activities are mixed with that of the enterprise. .	Develop clearly defined responsibilities and duties; keep separate accounts for enterprise activities.
Labor pool has inadequate skills and little management expertise.	Train staff in procurement, processing, accounting, and management.
Procurement of raw materials, processing, and marketing activities are not well coordinated.	Develop precise schedules for procurement, processing, and marketing of each product.
There is insufficient marketing information about products.	Assign marketing and sales responsibilities to a particular person; create a local retail outlet.
Biologicial	
There is a lack of data on abundance and spatial distribution of NTFP species.	Map the distribution of NTFP species; use spatial information to develop management plans.
Weeds and fire may influence regeneration of NTFP species.	Map the distribution of weeds and fire frequency in the sanctuary, and examine their effects on regeneration.
Parasite loads influence yield of *Phyllanthus emblica* (amla).	Remove parasite while collecting amla.
There is an absence of information about extraction and production levels.	Collect data on extraction and production levels by direct observations; incorporate the information collected into the participatory resource monitoring program.
There is a reduction in thai sac brood disease in *Apis ceranai.*	Develop enterprise plans for box beekeeping.
There is a lack of participatory resource monitoring.	Develop and institute a participatory resource monitoring program.
Socioeconomic	
There is low interest in the enterprise because it directly benefits only few houses through wages.	Make efforts to restructure local LAMPS so as to pass on higher prices to the NFTP collectors.
Community is not well informed about the project and does not feel in control.	Reconstitute the managing committee with elected representatives, including more NTFP collectors; hold open meetings to discuss unity operations, accounts, and handover; identify and work with a team of Soliga "promoters" for creating tribal organization that will eventually own the enterprise.
NGO is ineffective in community organization.	Hire a trained social worker to coordinate community interaction work and to provide intensive inputs for the same.
Benefits are not sufficient.	Explore possibilities for decentralized processing of NTFPs, including re-activation of beekeeping program.
LAMPS functioning constrained by poorly organized Soligas and by bureaucratic control by Department of Cooperative Societies and Forest Department policies, which constrain resource management.	Lobby at state level for policy changes on LAMPs, while initiating local-level awareness-building and reforms.
There is ineffective control over the enterprise.	Create a new, elected board of directors.
There is low interest in the enterprise because it directly benefits only a few harvesters.	Establish new microenterprises that would benefit a large number of harvesters (e.g., beekeeping). Plan for new, decentralized enterprises from profits generated from the centralized enterprise.
LAMPS operate inefficiently under bureaucratic control.	Initiate efforts to restructure LAMPS.
Community members are not well informed about the enterprise.	Hold regular board meetings; arrange visits of community members to the Food Processing Unit and Herbal Medicine Unit.
There are significant differences between gender and households with respect to extraction of NTFPs.	—

populations. These resources are highly seasonal and perishable. Thus, the unprocessed NTFPs must be procured and processed in a timely fashion. Furthermore, procurement, processing, and marketing must be coordinated. In the first year, the enterprise incurred losses due to a lack of planning and coordination. Project staff addressed this problem by developing precise plans and schedules for various operations.

Successful marketing of enterprise products is another primary determinant of the viability of the enterprise unit. Although the project undertook marketing surveys during the planning phase, as well as during the first year of implementation, actual marketing of the products did not begin until 1996, the second year of the project. Initial success in marketing was low, due to the absence of a person fully in charge of marketing and a lack of marketing plans. Marketing improved after assigning clear responsibilities for sales to the general manager of the enterprise, who also opened a local retail outlet, where sales have been increasing.

Finally, staff turnover, particularly at the senior level, had a profound negative impact on the enterprise unit. There were several reasons for the turnover: low salaries, lack of clearly defined responsibilities, parallel lines of authority, and poor coordination. The project has achieved stability in staff, in part, by improving salary structure, developing a well-defined organizational structure, and planning and coordination. Nevertheless, the staff turnover problems at the HMPU persist. We have been slow to address these problems because of the limited role of the BCN project in HMPU operations.

Results of Biological Research and Monitoring

Information about the abundance and distribution of NTFP species is essential for the viability of the enterprise. Our initial monitoring indicated that most of these species were unevenly distributed, and there was a lack of data on the spatial distribution of NTFP species throughout the sanctuary. We are refining our maps by collecting more information at a finer scale, and will use them for a wide variety of ecological studies, as well as for the development of management plans.

Data on the extent and patterns of regeneration are essential to determine whether the collection of NTFPs is having a negative impact on regeneration. Our preliminary studies indicated that overharvesting may have a negative impact on regeneration. However, further field work seems to suggest that weeds and fire may also have an adverse effect on regeneration. We have initiated studies to examine the impact of these factors on recruitment. As a first step, we are mapping the distribution of weeds and determining the fire frequency and location from satellite imagery. We will eventually correlate the distribution of weeds and fire with frequency of regeneration at sites with and without weeds and fires.

Monitoring parameters that influence productivity of NTFPs is one of the main elements of the biological monitoring program. Apart from phenological studies, which seek to document spatial and temporal variation in productivity, we are also investigating the role of parasites and diseases in limiting reproductive output. The nelli trees are often infected with mistletoe vines. Our field studies indicate that the presence of these semiparasitic vines reduces the output of fruits. Our response to this finding has been to recommend that collectors manually remove the semiparasites at the time of fruit collection. Extractors have indeed started to remove the vines.

The sustainable use of natural resources cannot be achieved if the extraction levels are close to production levels. LAMPS records contain information only on extraction levels, and this information is often inaccurate. We estimated the levels of extraction and production by following the extractors into the forest and recording information about these parameters from the areas where they are working. The project is conveying information about extraction levels to the extractors and they are monitoring levels of production and extraction in a participatory resource monitoring program.

The project abandoned one of its initial goals, the management of *Apis cerana* for honey collection, because of the presence of the sac brood disease. In 1996, there were indications that the incidence of disease had been reduced. We invited experts in beekeeping from the Central Bee Research Institute, Pune, to explore the potential of beekeeping involving both *A. cerana* and *A. dorsata*. Based on their observations in the field, the project initiated beekeeping operations in June 1996.

Difficulties in adapting complicated research methods to the community's needs and capabilities slowed efforts to develop techniques for community-based resource monitoring, particularly since information on research methods was scarce and level of community involvement low. In one experiment, we asked key persons in the community to estimate the size of the nelli crop in their traditional manner, and found their estimates to be similar to the estimates we arrived at through more rigorous and systematic methods. However, we found that this information on nelli avail-

ability, particularly its spatial distribution, was not well distributed across the community, resulting in some households or villages going to areas of low nelli production and coming back empty-handed. This emphasized the need for systematic, community-wide assessments, and we are in the process of experimenting with techniques for such assessments.

Results of Socioeconomic Research and Monitoring

A "social mapping" of the entire target community and monitoring of its participation in NTFP collection is essential to understanding the level and distribution of interest in NTFPs in the community and its overall social structure. Participatory Rural Appraisal exercises, censuses, and monitoring of resource extraction showed that the households are differentiated into traditional ("hard-core" or "full-time") NTFP collectors who collect all products (15-25% of all households), marginal or "part-time" collectors who only get involved in the relatively unskilled and lucrative collection of fresh nelli fruits (40-50%), and those who are not involved in commercial NTFP collection at all (35%).

This level of specialization within the community, along with the fact that the processing units were unlikely to generate any significant levels of employment, had significant implications for the enterprise. A processing unit that generates profits by processing products collected by a variable fraction of the community but that channels its economic gains to the entire community (in the form of profits) was unlikely to generate sufficient support among the NTFP collecting households. If the collectors are to be persuaded to monitor and modify their harvest levels and methods, they must see some direct benefits per kg of produce they supply to the processing unit.

However, to pass on some of the enterprise's margins to the collectors in the form of higher prices for the raw products would require a sensitive and transparent functioning of the LAMPS that mediate between the collectors and the processing units (see Figure. 1). This, and the observation that the per capita increment in economic benefits provided by an improvement in the functioning of the LAMPS would be much higher than the (as yet hypothetical) profits from the enterprise, made a strong case for the reform of the LAMPS.

The state-level study of LAMPS (Lele and Rao 1996) was an important contribution to understanding both the overall status of the LAMPS, and also to evolve recommendations for state-level policy changes. The study highlighted the inherent advantage of the BR Hills LAMPS in terms of a richer forest resource and more secure access. It also provided an analytical basis for devising an alternative structure for the LAMPS. Although state-level policy changes would greatly facilitate reforming the local LAMPS, these changes are unlikely to materialize soon. Our local activities are now informed by this analytical basis and the realization of practical constraints for progress. As a first step, we are trying to set up a mechanism to generally reduce the LAMPS' margins and, specifically, ensure that any premium or bonus offered by the processing unit is passed on directly to the NTFP collectors. We are also exploring the role of credit from the unit for tiding over cash-flow problems of the collectors (which may result in injudicious harvests).

Community consultations are necessary not only as a first step toward generating community interest and participation, but also to generate continuous feedback on enterprise activities. Our process of community consultations revealed that the Soliga community was not well informed about the objectives of the project and their role in it. On the whole, we found the local NGO's ability to communicate with, mobilize, and empower the Soligas to be rather limited. Indeed, the NGO was initially reluctant to accept handover of the processing unit to the community, even though it was a goal of the project. Correspondingly, the community did not feel that it could control the unit, as the unit was located in and run by the NGO. Finally, these consultations also reinforced the feeling that a centralized, capital-intensive, and technologically sophisticated approach to processing was not generating sufficient interest among the Soliga community, which is dispersed, seasonally employed, largely illiterate, and constrained by poor infrastructure. The people repeatedly expressed a need for processing activities that could be taken up at the *podu* or even household level.

To overcome the limitations of the local NGO, we hired a trained social worker to coordinate community outreach. To overcome distrust in the community, we had to reconstitute the ad-hoc managing committee of the enterprise to make it more representative, particularly with respect to the hard-core collectors and senior leaders in the community, hold a public meeting to discuss the units' profit-loss and assets-liabilities, and begin work on a detailed procedure and timetable for handover. To make the activities more decentralized and broad-based, we are exploring the potential for other activities including a re-activation of our earlier idea of beekeeping with *Apis cerana*.

A rapid assessment of traditional knowledge and attitudes was necessary to develop a community-based resource monitoring system. The assessment revealed the limitations and uneven distribution of this knowledge, which made it unlikely that the Soligas would, on their own, be able to ensure the sustainability of recently begun or greatly intensified NTFP extraction. It has also become clear that the LAMPS must be an integral part of any plan to manage the resource. Preliminary participatory mapping exercises indicated the depth and detail of ecological knowledge that resides in the community and the significant potential of mapping as a tool for resource management and for social mobilization. We are now implementing a participatory monitoring and mapping exercise for the few key NTFPs, with a focus on participation by key collectors, enterprise managing committee members, and LAMPS directors. We will be monitoring community responses to this exercise.

A detailed study of wild honey extraction showed that the timing of honey extraction significantly affects honey productivity and possibly sustainability (through its impact on larval loss). The nature of tenure over the honey resource clearly affects the timing of extraction: open-access trees and cliffs are harvested earlier than is optimal. Early harvesting may also be related to the access that tenure-holders have to seasonal credit. The establishment of tenure itself is a complex social process in which LAMPS agents—the emerging tribal elite—play key roles. These findings are being incorporated into developing a detailed plan for community-based honey extraction, training, and experimenting during the next honey season.

Conclusions

We confine our concluding remarks to the issue of monitoring. In particular, we describe the various types of monitoring undertaken, the contributions of each group to this project, and insights relevant to other projects. We also offer some overall comments on the need to expand and to redefine the original concept of monitoring as outlined by BCN.

It is necessary to distinguish three types of monitoring relevant to this project. The first type is research monitoring, or monitoring carried out by researchers to observe the distribution and availability of natural resources and the participation of the community in the management and utilization of those resources. The second type of monitoring is project monitoring, carried out on a monthly basis by the entire project (researchers, NGO staff, and enterprise staff), to gauge the progress of the project in meeting its enterprise-related goals. The third type of monitoring, which is still being initiated, is community monitoring; i.e., monitoring of resource use, enterprise operations, and benefit distribution by the community. This type of monitoring must extend beyond the life of the project.

We believe that our research monitoring program has been successful. The biological monitoring has generated data on the distribution and abundance of NTFP species, spatial and temporal variation in productivity, levels of NTFP extraction, the distribution of weeds and their effects on regeneration, and the impacts of parasites and disease on productivity. The monitoring currently under way will yield information on the population dynamics of NTFP species, the impact of harvests and fire on regeneration, and the foraging ecology of honey bees. The contribution of biological research toward understanding the biological link between the enterprise and the forest is thus invaluable.

The socioeconomic research and monitoring effort has similarly generated critical information on community structure, patterns of participation in NTFP extraction and management, LAMPS operation, the importance of tenure, and community perceptions of the project. The research under way will generate a better understanding of the overall tribal economy. These insights and feedback are key to making the enterprise—its commercial, biological, and community outreach activities—better tuned to community needs, capacities, and concerns.

Project monitoring has identified several factors that influenced the realization of basic objectives. These factors include the inability to maintain a distinction between the activities of the NGO and the enterprise, lack of trained staff at all levels, poor coordination, inefficient attention to marketing, and staff turnover. These phenomena are typical of NGOs working in rural development today and are therefore worth remembering in designing future projects. Lack of coordination was not limited to the enterprise staff. Initially, there was also inadequate communication among enterprise, biological, and socioeconomic units. The continuous project monitoring we used is relatively informal and easy to implement. All it requires is a culture of introspection, something that is critical to the day-to-day functioning of any organization, especially a commercial venture.

The enterprise-based approach to conservation projects that involve relatively small community organizations have little chance of success without an acceptance of or receptivity to change. Moreover, strong professional inputs are required at the initial stages of the project. Few organizations have the ability to seek such inputs or to meet their costs. The project sponsors, therefore, have a special responsibility to ensure that such inputs occur. At the same time, professional managers have to be socially sensitive and concerned not only with the outcome but also with the process, as they must show profits, as well as enable the community to take charge. Finally, if the processing activity were not capital and technology intensive, the tenure of professionals could be considerably reduced and transition from a professionally managed to a community-managed enterprise could be eased.

The delay and limited success in our efforts to set up a system of community-based monitoring of resource utilization, enterprise activities, and benefit distribution highlight five factors important to any enterprise-driven, community-based conservation program. First, the enterprise must generate and must be seen to generate early, substantive, and broad-based economic gains for the community. Participatory monitoring has an opportunity cost, and unless tangible benefits offset this cost, community inclination to participate in monitoring will remain weak.

Second, the community must see a clear link between their activities and the sustainability of the resource and of overall biodiversity. In our situation, where the community ceased to be the major actor in the forest landscape and where it has yet to see the effects of its recently intensified extraction activities, the need for monitoring is unclear. "We are hardly affecting the forest" is the constant refrain from the community members. Focused biological research, combined with proper community outreach, can, however, play an important role in dispelling this illusion while highlighting the big picture.

Third, for interest to be sustained the community must see the results of monitoring translated into tangible and meaningful action. For instance, if absence of fire is a major reason for poor regeneration, the community must be positioned to modify fire management in the sanctuary. This, in turn, requires that the community have substantial and secure rights to manage the resource in question; Soligas, in this particular case, have uncertain and inadequate tenure over the resources they extract.

Fourth, traditional rural communities monitor environmental resources through accumulated knowledge passed on orally from generation to generation. Feedback from such monitoring is often subjective and qualitative, which must be combined with objective and quantitative monitoring.

Fifth, participatory monitoring must be cognizant of traditional practices and adaptive to local conditions. Thus, the key task before us is to devise a monitoring plan suited to a particular situation through a process that is itself participatory.

Overall, the forms, methods, and prerequisites of monitoring in such projects are more complex and multilayered than is apparent from BCN's definition. In its attempt to focus attention on monitoring parameters, criteria, sampling strategies and frequencies, etc., BCN has overemphasized the "project monitoring" aspect. Consequently, it has underemphasized the roles of, on the one hand, focused applied research that also uses cross-sectional and historical data, and of informal, often qualitative, but continuous feedback and sincere introspection on the other. It also appears that the three-year project time frame is insufficient for determining its effects on biodiversity and probably for setting up a system of community-based monitoring that is to continue beyond the life of the project.

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The Miner's Canary: Applying Multidisciplinary Monitoring and Evaluation to Integrated Conservation and Development Programs

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Introduction

Picture a weary coal miner, early in this century, emerging after a long shift. He's squinting against the setting sun, tired, hungry, and grimy. But this tough working man lovingly carries a brightly colored canary in a cage. He's not an avid birder; he needs that little guy to survive.

Among the many fears that haunted miners was the build-up of odorless, colorless, methane gases that could lead to a major explosion. Miners used canaries because the birds responded quickly to drops in the oxygen content. Miners would keep an eye and ear on the canary. When the bird stopped singing, became sluggish, and fell from its perch for lack of oxygen, the miners fled.

A burly miner and a colorful singing bird—now that's an odd couple: individuals who would have little to do with each other if humans didn't require fossil fuels. Today we would refer to them as an "interdisciplinary team." The miner needed data (ambient methane), he needed it promptly (to survive), and he needed the information reported in a way that he could understand unequivocally (the canary drops), and make a management decision (run!).

Similarly, programs that seek simultaneously to support human development and conserve vital biological resources also require a mix of professionals who understand how people, plants, and animals behave: biologists, botanists, ecologists, anthropologists, organizational development experts, business experts, and so on. They need data promptly and communicated clearly so that all stakeholders can understand and act on the information. What is less obvious is that those same disciplines are necessary to monitor project success and warn of difficulties. A Community-Based Natural Resource Management (CBNRM) project in Namibia can fail as much from an anthrax epidemic as from a political backlash that rescinds government initiatives to enlist rural residents as allies in conservation. Project managers need multidisciplinary monitoring to avoid these calamities.

This paper provides a framework for using specialized monitoring tools, each incorporating particular disciplines. Combined, these tools comprise an effective multidisciplinary monitoring and evaluation system for Integrated Conservation and Development Projects (ICDPs), like a row of singing canaries alongside a khaki-clad conservation biologist.

The approach presented is the one used in the Living in a Finite Environment (LIFE) program in Namibia. We do not believe we have found the single answer, but we hope readers will find enough that is familiar in our project to spark some fresh insights into their own work.

We use participatory approaches to monitoring and evaluation that emphasize special monitoring events, rather than the elusive "continuous monitoring" systems that some practitioners advocate. We use simple, yet rich, tools that integrate various disciplines into one continuous learning process. We discuss some of these

tools in detail below, sharing our experience of where they have been used to improve project management. They are presented under the rubrics of monitoring, evaluation, and reporting, as follows:

Monitoring

- Application of an institutional strengthening tool helped a national-level nongovernmental organization (NGO) overcome organizational constraints and double its output;

- Application of participatory monitoring tools helped a CBNRM cooperative become more representational.

Evaluation

- Participatory evaluation helped the Namibian National CBNRM program revisit fundamental conceptual assumptions.

Reporting

- Communicating data through video is playing a significant role in supporting the passage and implementation of key CBNRM policy reform in Namibia.

The LIFE Program: Conservation, Development, and Empowerment

The LIFE program is simultaneously an empowerment project, a biodiversity conservation project, and an economic development project. Although an extremely arid country, Namibia possesses spectacular scenery and diverse wildlife capable of attracting significant revenues in park fees, tourism income, and hunting levies. If the natural resources are managed sustainably, these resources could be the essential ingredients in applying sustainable resource-based economic development to meet the needs of some of the country's poorest citizens.

Sustainable management of wildlife in Namibia, however, has turned out to be more than a matter of designating land for parks and managing the animals and their habitat efficiently. During the German and South African colonial era, the state owned all wildlife. While villagers had to suffer the constant threat of wildlife destroying their crops or eating their livestock, they were forbidden from maintaining traditional hunting practices. Moreover, many villages that had the richest wildlife populations were relocated to make room for national parks that were the exclusive preserve of the colonials. Under these circumstances, many rural Namibians came to view the only useful animal as a dead one, and poaching flourished. Government allocations proved insufficient to effectively maintain its police role in controlling poaching and crop and livestock loss. Wildlife numbers plummeted.

But since independence, Namibia, like its neighbors in Zambia, Botswana, Zimbabwe, Mozambique, and South Africa, is working on a new kind of rural development fueled by local resource management. The communities in northern Namibia—especially in the Kunene, Caprivi, and Nyae Nyae areas—are now beginning to think about how to manage wildlife for themselves and their children. The Government of Namibia is poised to adopt policies enabling communities to form local natural-resource management bodies called "conservancies." These policies would devolve authority for managing wildlife to communities. Communities would gain the opportunity to benefit from increased wildlife, both economically through hunting and tourism fees, and culturally by being reunited with wildlife. With these rights would come responsibility for sustainably managing the animals.

A significant portion of the challenge to these communities will be adapting their considerable natural resource knowledge to changes brought on by population increase, modernization, and state intervention. We refer to this as the "conservation challenge." Ultimate success in this complex social environment depends on a number of human resource and institutional factors. Namibia's human resource and institutional base still bears the scars of decades of apartheid: black Namibians are generally poorly educated and inexperienced in working with formal government and business institutions; NGOs are sparse and generally inexperienced; and the central government is still learning how to cater to the needs of the majority population that lives in rural areas. Private ownership of land in these areas does not exist. Land is communal, controlled by a combination of the state and traditional authority. Most natural resources, on the other hand, are common property.[1]

[1] An important exception is wildlife that is currently owned by the state. The project hopes to change this by passage of the conservancy policy, which would give communities the right to manage wildlife as they do other resources (described in more detail in "Building Blocks" section of this paper).

The state and the communities must reach consensus on how the resources will be exploited, how benefits accrued will be distributed, and how these norms will be enforced. These are the "social challenges."

The LIFE program must integrate human and biophysical concerns. Poorly managed range lands will reduce the opportunity for people to earn a living from the resources. At the same time, dysfunctional social systems will return these areas to the "poach now, care later" syndrome of the colonial era.

The program provides subgrants and technical assistance to NGOs, community-based organizations (CBOs), the University of Namibia's Social Science Division, and the Ministry of Environment and Tourism (MET).[2] These inputs are intended to assist communities to develop social, political, and natural resource management systems for sustainable utilization of their natural resources.

The Monitoring and Evaluation (M&E) Challenge

The objective of LIFE's monitoring and evaluation Institutional Development Toolkit (IDT) system is to provide information on two levels: *outcome* data that will help managers know whether they are succeeding in their tasks, so that inputs can be adjusted as required; and higher level *impact* information that lets us know whether we have succeeded in our empowerment, conservation, and development objectives. This must be done at a level appropriate for the implementers (NGOs, CBOs, university, and MET), that also tell us something at the *program* level (that is, considering all the subgrants and technical assistance as a whole).

Before we could measure anything, we had to know what to measure. And before we could know what to measure, the partners had to agree on a collective strategy. A quick glance at Figure 1 reveals that we will never meet our "biological" objectives if we do not first secure "social" requirements. Conversely, if the biological and physical aspects are mismanaged, the strengthened institutions will have nothing to do. The miner needed the canary; the conservation biologist needs social scientists.

Figure 1
Hierarchy of Objectives for LIFE Program

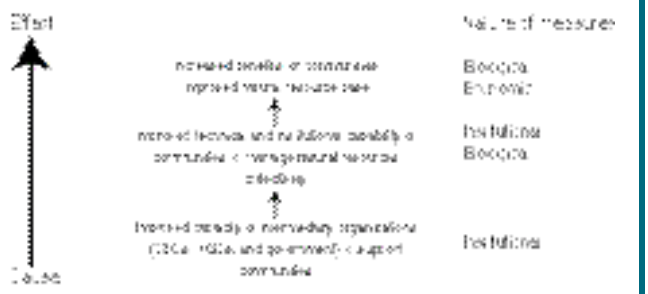


Figure 1 also implies that each area would need to have expertise in institutional matters (organizational development and, perhaps, anthropology), ecological matters (possibly including wildlife biology and botany); and economics (and perhaps business). Given that the program is working in five geographic areas, this would require substantial human resources. A further challenge is that, while the approach to CBNRM is similar in all areas, the specifics vary widely among locations in targeted resources, language, supporting NGOs, and traditional experience with resources. The LIFE program M&E approach indicates how we have structured our response to these challenges.

LIFE's M&E Approach

Philosophy

We implement the project using an adaptive management approach that recognizes it is impossible to predict all the requirements of a project from the outset. LIFE's M&E is intended to provide accurate and timely data on project progress and external factors so that the government, NGOs, and LIFE staff can adapt their implementation plans to respond to emerging circumstances.

The LIFE program team uses a participatory approach to M&E, usually including grantees, MET officials, community management bodies, community subgroups, and enterprise groups. All stakeholders participate, to varying degrees, in defining information requirements, collecting and analyzing data, reporting, and learning from the information.

[2] The $16 million project is jointly funded by World Wildlife Fund (WWF)/USA and the United States Agency for International Development (USAID). Most recipients of subgrants also provide matching contributions. Overall direction for the project is provided by a steering committee, which is comprised of WWF, USAID, the Ministry of Environment and Tourism (MET), subgrant recipients, and representatives from the tourism, social research, and legal sectors. Other members of the LIFE program team include Management Systems International, Rössing Foundation, and World Learning, Inc.

Advantages to using a participatory approach include:

- *Increasing the credibility of the data and analysis among project implementers.* If grantees collect and analyze data on program impact, they are more likely to believe in the need to adjust implementation in light of the results.

- *Transferring M&E skills can be empowering.* As uneducated men and women learn how to gather and analyze data, draw conclusions, and implement recommendations, they gain important tools for natural resource management and participatory citizenship.

- *Sustainability.* If one considers M&E an important component of successful program implementation, then gaining M&E skills is an important aspect of institutional development. A participatory approach is generally the preferred alternative, as local people and institutions are collecting information to meet their needs, not to meet the demands of outside agencies.

Monitoring Tactics

Lessons from Other M&E Efforts in Similar Projects
Most monitoring efforts for similar projects in other countries have failed for the following reasons:

- Monitoring was meant to be integrated into daily work of the participating organizations.

- Those NGOs and government organizations were overworked.

- Monitoring was a final priority among all the pressing tasks before the organizations.

- Often different stakeholders were responsible for data collection, analysis, and decision making.

As a result, NGOs and government organizations rarely collected data, and even when they did, the analysis was weak or missing. Often decision-makers gave little credence to data that emerged from internal monitoring or external evaluation, as they had no respect for the former and scorn for the latter. As a result, the monitoring system was not a useful component of project implementation. Rather it was an easily avoided, donor-driven requirement.

Proposed Solution
LIFE attempts to avoid replication of this scenario by taking the opposite approach. Monitoring is chiefly accomplished by *special monitoring events*. Rather than asking field staff to set aside 20 minutes each day for project monitoring, we ask them to schedule, in advance, several days a few times each year. This helps us circumvent the prioritization issue and enables the partners to compress the learning (research, analysis, and decision-making) of a monitoring visit into a short block of time. Where possible, we try to include a cross-section of the relevant organizations so that decision-makers participate directly in all stages of the process and have "ownership" of the results.

We still encourage our partners to collect as much basic data as they consider worthwhile on an ongoing basis. This data will feed into these special monitoring events. But we are not solely reliant on it.

Building Blocks
Successful ICDPs typically integrate conservation biology, education, community organization, and enterprise development so that communities can gain benefits from improved natural resource management. However, we have found that we must break down these various components into manageable analytic chunks to examine progress. For each target area, we examine training, NGO institutional issues, CBO institutional issues, natural resource-based enterprises, biological status, and overall success of the integrated program. Each component requires a different analytic lens to understand its internal dynamics and gauge progress, as illustrated in Table 1.

Clearly, each NGO or CBO working in a target area will not be able to maintain staff with all the skills described in Table 1. Accordingly, what we have attempted to do is build into each tool the insights of relevant disciplines (see third column in Table 1). In this way, someone unskilled in institutional strengthening, for example, will still be able to track an NGO's progress by using the IDT. This is useful not only in measuring progress, but also in helping individuals gain exposure to key lessons from each discipline. The project can complete the analysis needed without requiring unsustainable human resources.

Application of these tools forces the NGO, CBO, enterprise, or program to systematically ask itself the same important questions that a consulting anthropologist or businessperson might pose. Either way, the organization must find its own answer to the question and

Table 1. Skills and Tools for ICDP Monitoring and Evaluation

Component	*Required Skills*	*LIFE M&E Tools Used*
1. Training	• Training • Organizational development • Topic-specific expertise	Training Impact Assessment Tool (TIA)
2. NGO strengthening	• Organizational development • Topic-specific expertise	Institutional Development Toolkit (IDT)
3. CBO strengthening	• Organizational development • Anthropology • CBNRM theory	Community Management Toolkit (CMT)
4. Natural resource-based enterprise development	• Business • CBNRM theory • Topic-specific enterprise	Activity Management Profile (AMP)
5. Wildlife monitoring and conservation	• Biology • Ecology • Wildlife management	• Aerial census • Strip census • Game Guard Reports
6. Overall ICDP integration	• All of the above • Evaluation	Program Monitoring Visit (PMV)

the problems that emerge. This approach, however, ensures that the organization asks the right questions in the self-inquiry.

By using this building-block approach we are able to assemble, for example, the IDT for the implementing NGO, a CMT for the CBNRM management body, and activity management toolkits for the various businesses spawned in the target area. These can then all be considered together in assessing the overall success of the ICDP. The best opportunity for synthetic review is during the program monitoring visit (described in the "Evaluation" section of this paper), which is much like an overall evaluation, using data gained from the tools described above.

Another advantage of the building-block approach is that it is possible to compare components across target areas. For example, one can gain useful insights into the types of programwide institutional strengthening workshops that would be appropriate by comparing the IDTs completed for the various NGOs.

These tools provide a general framework that can be adapted to suit the institutional, ecological, social, political, and economic circumstances of the target area. Each tool is like a set of socket wrenches, with attachments of many different sizes. One tool is described in detail below to provide a sense of how these tools work.

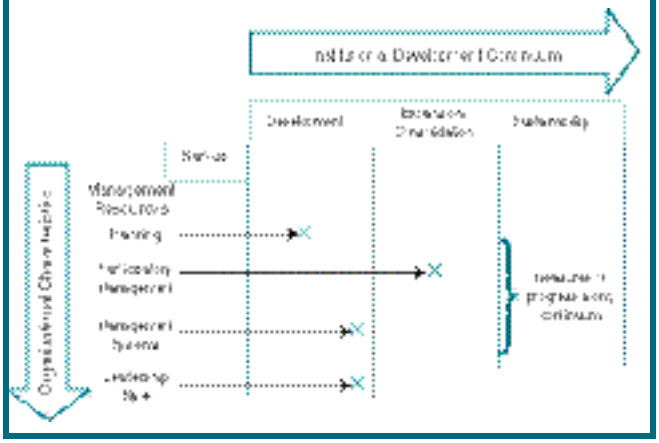
Monitoring

A Tool Explained: The Institutional Development Toolkit[3]

The IDT consists of an analytic framework (Institutional Development *Framework*, or IDF), a table presenting the results of the analysis (Institutional Development *Calculation Sheet*, or IDCS), and a graphic representation of the results of the analysis (Institutional Development *Profile*, or IDP). In developing the IDT, we reviewed existing literature on institutional development and measurement and asked NGOs what they thought were important measures of progress. A simple but rich framework for expressing institutional progress emerged. We call it the IDF. It is presented schematically as Figure 2.

[3] A more detailed description of the Institutional Development Toolkit can be found in "Integrated Toolkit for Institutional Development," Renzi, 1996.

Figure 2
Schematic View of Institutional Development Framework



In the far left-hand column are the various organizational characteristics that NGOs identified as crucial to success. They are sorted by major resources at the organization's disposal: oversight/vision, management resources, human resources, financial resources, and external resources. Each of these categories represents a potential asset to support the organization. If the resources are not fully realized, success will be impeded. Each major resource includes key components, as shown in Figure 2.

The framework contains a number of "progress cells" designed to track natural development from left to right, according to the "Institutional Development Continuum" shown at the top of Figure 2. The framework describes four stages of an organization's development: start-up, development, expansion/consolidation, and sustainability. These distinctions are somewhat arbitrary, and one might quibble with any particular entry. Taken as a whole, however, the framework sketches a reasonable blueprint for an organization's development. Although it is described as a continuum, an organization can regress, and the expansion/consolidation phase could also represent a restructuring.

The challenge of the framework is first to fill in the progress cells with descriptions that help an organization consider where it may be located along the continuum at any given time.[4] We have made a first effort at defining the progress cells for the framework, several rows of which are excerpted in Figure 3.[5]

The first task for the NGO is to adapt the tool to suit its needs. Perhaps staff disagree on how a row is described, or whether it should even be included. The staff make changes until the framework accurately reflects the direction the group would like to pursue. The NGO can then plot its progress, resulting in a graph, as illustrated in Figure 4.

Here, an organization has marked its progress as of a certain time (*solid bars*), and set goals for itself for the future (*clear arrows*). (Please note how the organization has adapted the column titles to suit local vernacular.) Once the organization has repeated this process a few times, we end up with a profile like the one completed for the Namibia Nature Foundation (NNF) (see Figure 5).

Integration of Expertise from Other Disciplines

By using these tools, we are able to accomplish the following:

- Help an organization define how it would like to develop
- Use a rigorous qualitative approach to measure progress
- Provide a graphic representation of the results that can help unite the group's energies
- Install a "ghost expert" in the program, greatly reducing the need for external assistance

The final point may be of interest to remote CBNRM projects that lack the resources to employ experts in organizational development, business, or anthropologists. By distilling the complexities of these disciplines into these simple tools, and by adapting the tools to the needs of each organization and gaining ownership by the organization over them, we greatly

[4] The "X marks the spot" and arrows in Figure 2 convey the concept of measuring progress within the Institutional Development Framework (IDF).

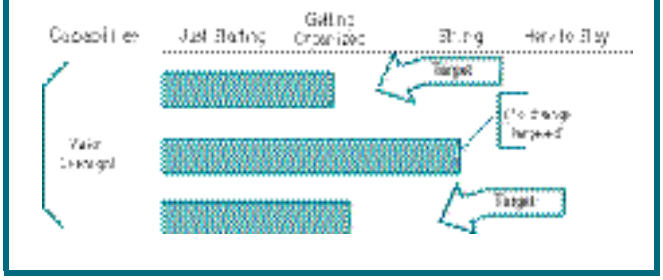
[5] Due to space limitations, only a portion of the IDF is shown in Figure 3. The remaining rows currently include Management Resources: leadership style, participatory management, management systems, planning, community participation, monitoring and evaluation; Human Resources: staff skills, staff development, and organizational diversity; Financial Resources: financial management, financial vulnerability, and financial solvency; External Resources: public relations, ability to work with local communities, ability to work with government bodies, ability to access local resources, and ability to work with local NGOs.

Figure 3
Excerpt from Institutional Development Framework

Resources	*Criteria for Each Progressive Stage*			
	Start up	*Development*	*Expansion/Consolidation*	*Sustainability*
		Management Resources		
Leadership Style	Leadership emanates from the founder.	Leadership comes from founder and one or two Board members.	Vision increasingly comes from Board as Board members improve involvement.	All Board members contribute to leadership and development of the organization.
	Staff provide technical input only.	One or two staff provide organizational impetus, in addition to Director.	Staff increasingly provide vital drive to organization.	Organization would survive without current Director.
Management Systems	No formal file system exists.	Files are maintained, but are not comprehensive or systematic.	Files are systematic and accessible, but significant gaps remain.	Files are comprehensive, systematic, and accessible.
	Few administrative procedures formalized.	Administrative procedures increasingly formalized, but no operating manual.	Administrative manual in place, although not up-to-date or considered the "Bible."	Administrative manual updated, as needed. Considered the arbiter of procedures.

reduce the need for input from the experts once the system is established. In subsequent years, a field biologist, government park warden, or CBO leader can implement the tools. This greatly enhances the likelihood of project sustainability and reduces overall project costs.

Figure 4
Targeting Institutional Development



The next section of this paper uses the actual IDP presented above to show how it was used to improve management at the Namibia Nature Foundation (NNF). The subsequent section on applying the CMT illustrates how an analogous tool for CBOs, the CMT, was used to improve the effectiveness of the Nyae Nyae Farmers Cooperative (NNFC).

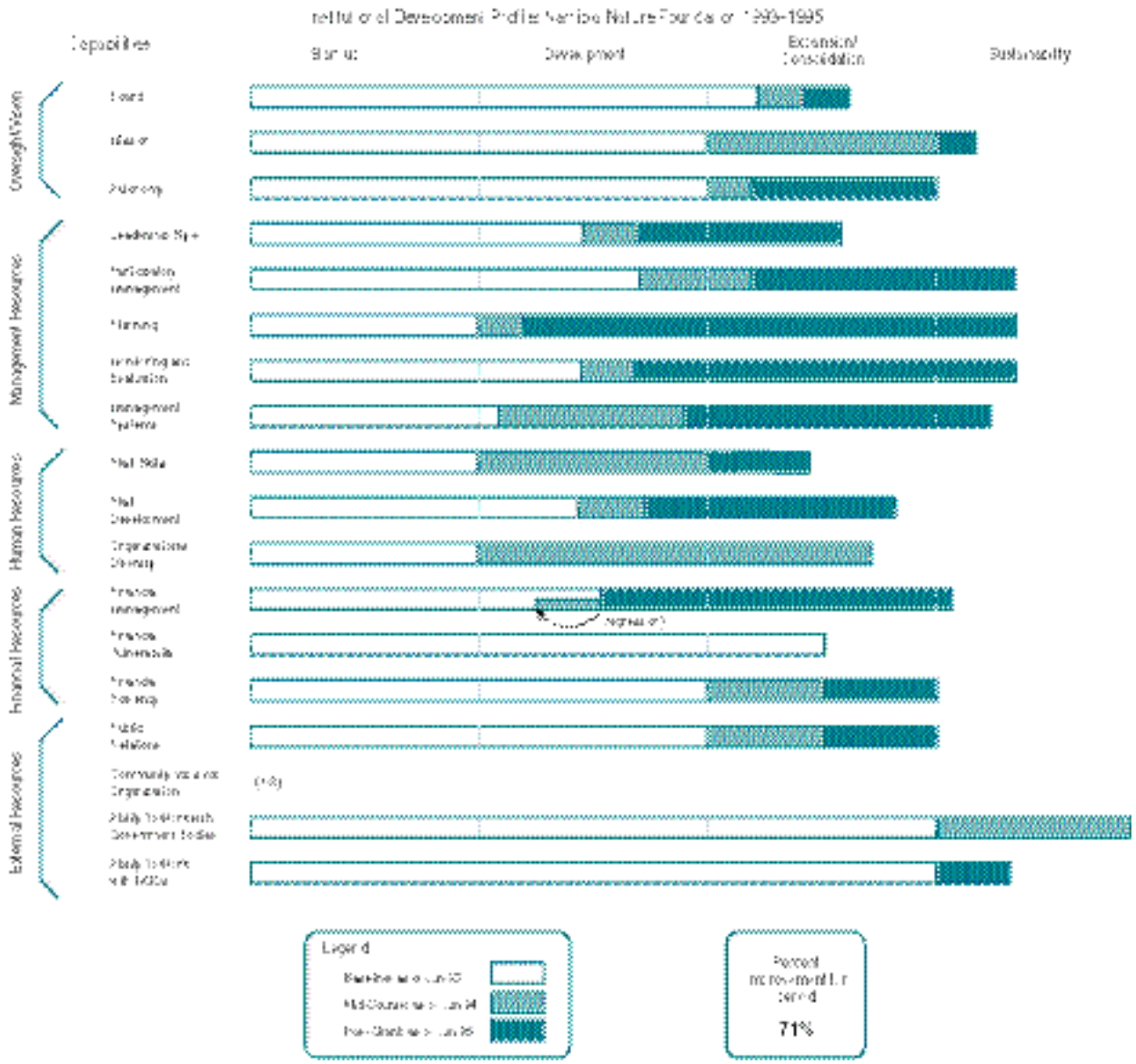
IDT Applied: Improved Management at the Namibia Nature Foundation

NGOs are frequently the implementing agent for ICDPs. In many cases, NGOs are committed but overworked and underskilled in certain areas. ICDPs, and the NGOs themselves, are frequently concerned about which input would be most effective in bolstering the effectiveness of these organizations and therefore ultimate program success. The NNF has found the IDT useful to in lending crucial organizational development insights to the organization at a key moment in the NNF's development.

Background

The NNF is a nonprofit organization that strives to promote and assist conservation and to encourage sustainable development in Namibia and Southern Africa. Although it implements some of its own programs, especially in environmental education, its main function is to provide administrative and accounting support to field-based environment and natural resource projects. The LIFE program gave NNF an institutional-strengthening grant to bolster its ability to support CBNRM in Namibia. In the year prior to the intervention, the NNF had experienced tremendous growth and institutional change, including: (1) more than a threefold increase in total volume of projects managed, from

Figure 5
Sample Institutional Development Profile



$830,000 to $2,778,000; (2) resignation of NNF's founding Director and hiring of a replacement; (3) rapid increase in number of professional staff; and (4) deterioration in client satisfaction with NNF's services.

The Intervention

The LIFE program worked with NNF to use workshops, client interviews, and analysis of existing data to complete the IDT for the NNF over a three-year period. The results are presented graphically above as Figure 5. As a result of participating in the IDT process, the NNF quickly realized that the bars farthest to the left—management resources, human resources, and financial resources—needed immediate attention.

NNF used the results of the IDT exercise to begin considering short-, medium-, and long-term strategic options. In doing so, they used a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats). This process requires that an organization conduct an "internal scan" of its organizational strengths and weaknesses, as well as an "external scan" of opportunities and threats posed by forces outside the organization. The IDT exer-

cise provided good "radar" for the internal scan, complemented by interviews with clients for the external scan.

From the analysis, the NNF decided to focus on improving the following: (1) financial management systems, (2) management systems, (3) quality improvement, and (4) client relations.

In addition, NNF developed a detailed one-year work plan, which assigned to each staff member specific responsibilities to accomplish in order to improve the prioritized areas.

Management Impact

The IDT assisted NNF in identifying the areas most in need of improvement at a time when the organization was stretched to its limits by growth and change. It also demonstrated to the NNF the importance of interviewing clients directly. The NNF used the data from the IDT to embark on its own management improvement initiative in order to address the most urgent challenges. Importantly, the IDT also indicated which areas were in good shape (organizational vision, fundraising, and external relations), which allowed NNF to focus on the problem areas.

An end-of-grant program monitoring visit revealed that the NNF's work had paid off. In spite of a further tripling in the volume of projects managed, clients rated the NNF's service as improved. In subsequent years, the NNF will be able to reapply the IDT to gauge its progress and to adjust institutional strengthening inputs. Now that it is familiar with the IDT, it will not require the assistance of external organizational development specialists to diagnose its needs.

The CMT Applied: Democratization of the Nyae Nyae Farmers Cooperative

The CMT is structured similarly to the IDT. However, it looks at CBOs (rather than NGOs) dedicated to helping their community, manage natural resources sustainably. Thus, it studies an organization that is typically one step closer to actual natural resource management decision-making. In addition to some of the organizational development features included in the IDT, the CMT also incorporates anthropological concerns and fundamental CBNRM theory. For example, the tool reflects the belief that a CBNRM management body is ineffective if it does not represent the community of resource users in a meaningful way. If community members believe the management body does not represent their interests, they may well choose to sabotage the norms and regulations supported by the body through poaching or other means. Applying the CMT helps organizations remember to ask themselves the all-important question of representation in CBNRM.

Background

The *Ju/Wa* Farmers Union was created in 1986. It was formed to facilitate communication links between the community and external bodies. Leaders of the union had no

> right to speak for others, but rather facilitated communication and decision-making by providing information, maintaining contact with outsiders (e.g., government representatives, technicians, donors, and others) and communicating the opinions and ideas of the local residents. The egalitarianism inherent in the *Ju/'hoan* system mitigated against individuals accruing power or authority.[6]

Over time, the Union became more formalized and the organizational structure became institutionalized with a set of statutes and model of leadership imported from abroad.[7] The NNFC was centrally run from a donor-developed training center, called "Baraka," and was led by four officers. Various staff and their families also lived in Baraka. A RADA was developed as a representational body. It consisted of two elected members (one man, one woman) from each of the 35 villages in the area.

The Nyae Nyae area has great potential for establishing local management of wildlife and other natural resources under the government's new conservancy policy. The area is sparsely populated and virtually everyone is from the same ethnic group, *Ju/'hoan*, whom the colonists called "bushmen." Few cattle remain and the grasslands are sound. A wide variety of game exists, although currently in low numbers. Exceptions are abundant elephant, lion, leopard, and hyena. The culture of the *Ju/'hoan* is also an attraction to foreign tourists.

[6] "Nyae Nyae Farmers Cooperative: A Question of Representation," Barbara Wyckoff-Baird, February 1995. LIFE program document, pp. 1-2.

[7] See M. Biesele, 1994. Human Rights and Democratization in Namibia: Some Grassroots Political Perspectives. Paper prepared for the Annual Meeting of the African Studies Association, Ontario, November 1994.

Intervention

To succeed, however, the people of Nyae Nyae must have a representative management body to preside over the conservancy. To assist the NNFC in gauging the strength of their organization, and to help map ways in which it might be strengthened, the LIFE program helped them apply the CMP to the NNFC. The NNFC first examined the instrument with LIFE staff and then attempted to place themselves along the continuum suggested by the instrument. In the course of this process, they modified many of the progress cells to suit their needs. A completed version of the CMP, conducted at two points in time, is presented graphically as Figure 6, and in the calculation sheet in which the data were first collaboratively entered by the LIFE staff person and the NNFC staff as Figure 7.

As part of the process, the NNFC agreed to have a LIFE staff person visit villages in the Nyae Nyae area to ask their "constituents" what they thought of the performance of the NNFC. Community members responded that they felt somewhat estranged from the NNFC, as revealed in excerpts from the CMCS, reproduced as Figure 7.

The NNFC was surprised to learn that the community had, to a degree, ceased to identify the NNFC with its own interests. For the CBNRM project to succeed, it is essential that the Board be representative of the interests of the community. This is true technically, since the community will only abide by the natural resource management regimes adopted by a representative management body. It is also essential legally, as the government's new regulations require that all conservancies have "representative" management bodies. If the body failed to meet this criteria, the community would not be granted a conservancy.

Management Impact

Recognizing these shortcomings, the community took the following steps:

- Placed all the NNFC officers up for election
- Increased the number of members of the management committee (MC) of the NNFC to 12 so that it could become more representative
- Developed a plan for periodic visits by the NNFC to communities for feedback and needs solicitation
- Followed a program of monthly institutional strengthening workshops

The results of the changes taken by the NNFC are reflected in the advancement of the shaded portion of the bars in Figure 8.

Having made these fundamental changes in their structure, the NNFC is better prepared to take advantage of the emerging policy opportunities. In addition to making the NNFC more responsive and competent, the very act of self-improvement has bolstered community confidence in the organization and created a momentum toward community unity essential for the hard work ahead.

Armed with the evidence of progress presented in the CMP (Figure 6), the NNFC is also prepared to argue that it meets the government's requirements for representation and capacity to manage wildlife.

In this case, the assessment of NNFC through the CMT combined organizational development issues (identification of the need for institutional strengthening) with technical CBNRM issues (need to restructure to become more representative.) Neither insight (and subsequent management action) would have been sufficient alone.

Evaluation

In addition to assessing progress toward objectives, evaluation provides an opportunity to step back and consider the entire ICDP, to question fundamental assumptions that underpin project work, and to see whether some component parts could be better integrated. Toward this end, we have initiated what we call a program monitoring visit (PMV). We call it a "monitoring visit" instead of an "evaluation" because we believe it is more participatory and less externally driven and intimidating than the classic external evaluation.

A Tool Explained: The Program Monitoring Visit

The LIFE program pursues evaluation in a participatory manner. We try to incorporate the various tools used in an integrated event called a PMV. We try to include on the PMV team the LIFE subgrant manager, staff from the implementing NGO and CBO, where applicable, and members of the community and MET. In selecting individuals from these organizations, we attempt to obtain a mix of the technical skills outlined in Table 1. The flow of analyses is presented in Figure 9.

In addition to the tools already described, we also use biological data: wildlife sightings from community game guards (staff employed by an NGO and the com-

Figure 6

Sample Community Management Profile

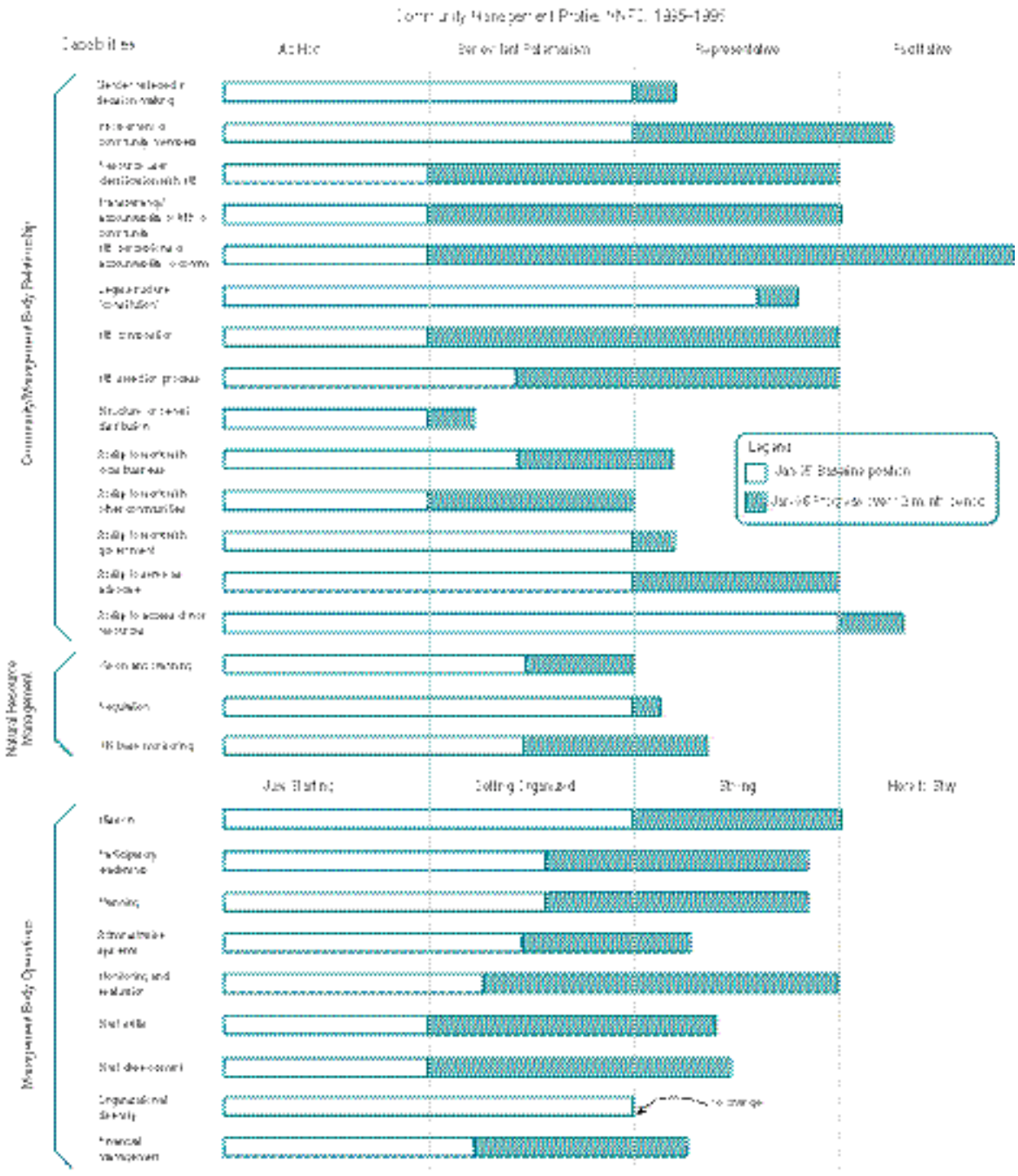


Figure 7

Excerpt from NNFC Community Management Toolkit

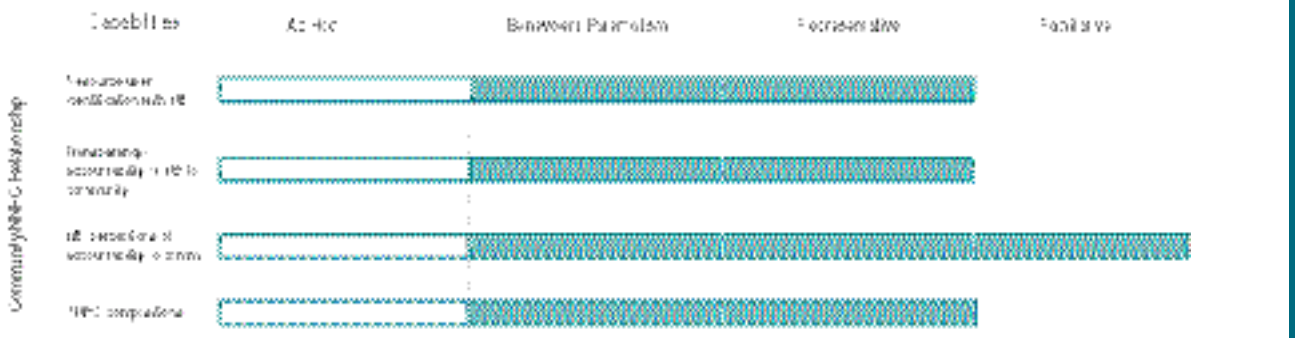
Community Management Calculation Sheet

Date: 19–Jan–95 **Organization: Nyae Nyae Farmers Cooperative**

Capability	*Sub-title*	*Score*	*Comments*
		I. Community/Management Body Relations	
A. Participatory Approach	Resource user identification with NNFC	1	Interviews revealed that resource users see the NNFC/MC primarily as a paternalistic structure, whose aim is to provide services. Resource management, business development, and advocacy were generally not seen as functions of the NNFC.
	Transparency/ accountability of NNFC to community	1	Community members were not aware of operations, including revenue, account balance, policies, or recently-made decisions.
	NNFC perceptions of accountability to community	1	While decisions are taken over resources, there is no centralized structure.
	NNFC composition	1	Does not reflect age groups, gender, or class.

Figure 8

Excerpt from NNFC Community Management Profile – 1995



munity to monitor wildlife and other resources) and census data from the government. In addition, we review the periodic reports submitted by field managers for the area being studied.

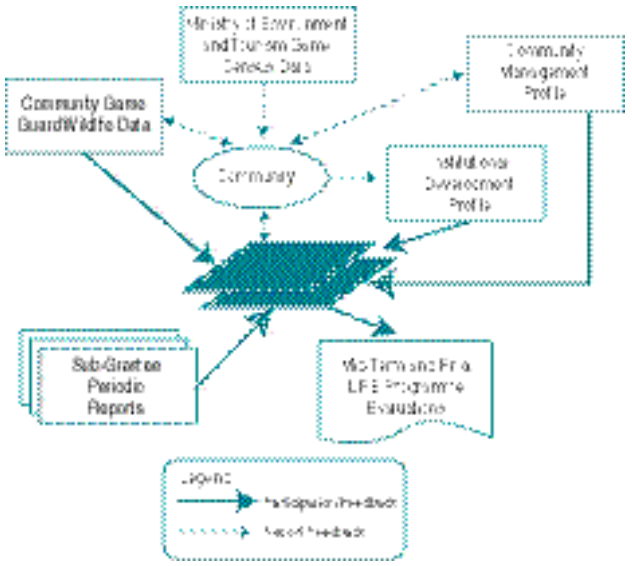
The main objectives of the PMV are to:

- get relevant stakeholders to review the information collected to date;
- identify other management questions that need answering;
- synthesize the data to track progress;
- question basic assumptions; and
- ensure that project design continues to be appropriate for changing circumstances.

We try to pursue the process fully during the PMV event, compressing into one episode the process of identifying questions, collecting and analyzing data, and making management decisions based on what we learned.

A challenge in this process is to involve a wide group of stakeholders, often including government, NGOs, CBOs, and community leaders. Conflicting interests

Figure 9
Flow of Field Analyses Supporting Participatory Evaluations



and differing levels of education can, however, present interesting challenges in designing the process.

Applying the PMV: Revisiting Program Theology at the National Level

Background

Namibia is fortunate to have a small cadre of talented and dedicated men and women in the non-profit and government sectors who are committed to improving the lives of rural Namibians through ICDPs. Several individuals valiantly stood up for the rights of those who live with wildlife to benefit from it. They pursued this objective even when it was dangerous to do so under the apartheid regime of the South African Administration. They were pioneers in CBNRM at a time when Namibia was isolated from the rest of the world, and they themselves were ostracized from mainstream Namibian conservation society for their willingness to assist rural blacks through conservation.

These individuals continue to take the lead in the post-independence national CBNRM program. The ideas kept alive during the oppressive era of apartheid are now gradually becoming more widely accepted, partly from the dramatic shift in politics, and partly as a result of the success of Integrated Rural Development and Nature Conservation (IRDNC), an NGO located in the Kunene region of Northwestern Namibia.

IRDNC has focused on installing a community game guard program and working with traditional leaders to improve attitudes toward wildlife and to help re-ignite an understanding of the potential benefits communities can gain from wildlife. This has led to remarkable improvements over the past decade in both conservation and development. Biologically, there has been a dramatic increase in the number of elephants, a doubling in the number of rhinos, and an increase in springbok from 600 to well over 13,000. Socioeconomically, in the words of Erins Karatjaiva, Chairman of a local development committee:

> We have protected and managed the wildlife here very well. Wildlife is plentiful now, and our areas are very beautiful, so we have been able to attract tourists—bringing us development and wealth. We are going ahead with our normal cattle, goat, and sheep farming, but we also have incorporated wildlife into our economy. It is not one or the other—we work on both farming and wildlife.[8]

The National CBNRM program in Namibia is naturally eager to install similar programs elsewhere in Namibia and several programs are now being supported in the East Caprivi, West Caprivi, and the Nyae Nyae areas. However, in transplanting a model from one social/economic/ecological/political environment to another, one must constantly question the validity of the system in its new home. This is often difficult, given pressures inherent in the day-to-day management of complex field projects. The difficulties can be compounded by what we may consider a "theologization" of project assumptions. If people have been struggling in the dark year after year to convince others of the merit of their ideas, it is possible for the ideas to shift from sound theoretical bases to beliefs, to almost a religion. This makes for committed workers, but can inhibit real questioning of the basis upon which things work. One can keep repeating the same mistake without questioning fundamental principles. It is a constant challenge of conservation and development initiatives to maintain commitment while avoiding treating basic assumptions as dogma. Multidisciplinary M&E can provide useful, objective perspectives.

[8] Excerpt from *There's a Better LIFE at Hand*, a video on conservancy policy produced by WWF-USAID-LIFE program, February 1996.

The Intervention

While CBNRM is a complex undertaking, some of the basic principles, as applied among Namibian practitioners, can be summarized as follows:

- If people benefit from wildlife, then they will conserve it.
- Control of wildlife must be in the hands of people who live with it.
- If these occur, conservation will improve and local communities will become wealthier.

In March 1995, the LIFE program undertook a participatory review of activities in East Caprivi as part of a regular PMV. One objective was to examine in detail some of the project's basic assumptions to ensure their validity. In 1995, we chose to focus on the assumption that if people benefit from wildlife, then they will conserve it.

The entire area had benefited reasonably uniformly from employment of community game guards (considered "community staff," but salaries paid by the NGO through a grant from USAID-WWF-LIFE program), from various technical assistance inputs, and from extension work from the game guards, including both information and problem animal control. Some communities also benefited from various natural resource-based enterprises, such as the sale of thatching grass and tourism. Receipts from enterprises, however, varied widely by community.

The test of the assumption seemed simple: with increased benefits we would expect wildlife numbers to increase in all areas, but the increase would be most marked in areas that received the most benefits. Data to test the assumption were available, but are not yet compiled. AMPs (tools like the IDT and CMT, but geared to measure the progress of enterprises), technical reports, and field data provided socioeconomic information on which communities received the greatest economic benefits. On the biological side, game guards had been collecting monthly data on game observations for over three years, but none of it had been systematically analyzed.[9] The PMV team, comprised of LIFE, the NGO, and MET participants used a "quick and dirty" approach to review wildlife trends in the various regions of the project area. We compared reports of game guards from year to year (to normalize wet and dry season variation) for key game species that were felt to be sensitive to human pressures (Figure 10).

Examination of these records for the area north of Mudumu National Park indicated trends consistent with the theory, as shown in Table 2.

This was encouraging to the team, but as we looked at a wider number of villages in another area of the project, the picture became more complex. One community had been distinguished from the rest as having obtained, by far, the most natural resource-based benefits. Lizauli village was receiving the following :

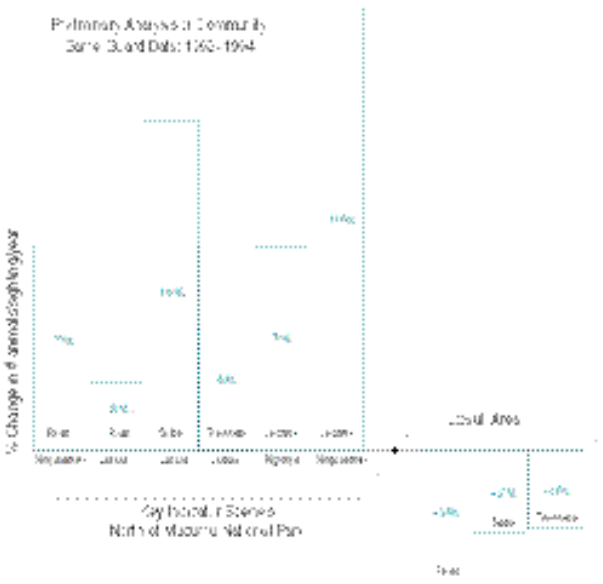
- community-wide income from bed-night levies remitted from a neighboring tourist lodge;
- employment from the Lizauli Traditional Village tourism operation;
- income from the Lizauli Crafts Centre;
- employment of community game guards; and
- community-wide income from sale of thatching grass and reeds for construction.

One would expect wildlife numbers to increase even more in the area around Lizauli. Community members should be persuaded by the benefits they were earning to work especially hard to protect wildlife (the goose that lays the golden egg). However, results of the analysis of the game guard data presented below revealed just the opposite dynamic: poaching appeared to be increasing. For all the species reviewed in the area patrolled around Lizauli, wildlife numbers were down. In fact, they were the only areas reviewed where this was true.

How could this be? Our theory holds that, as benefits increase, so should commitment to conservation. The social data indicate that benefits increased most markedly in Lizauli; however, biological data indicate dramatic drops in animal populations, both absolutely and compared to neighboring communities.

[9] This inability to analyze a wealth of data provides credence to the theory that special events are required to energize an M&E system. All project participants stated an eagerness to analyze the carefully recorded and filed game guard data on wildlife observations, but day-to-day pressures have "put off" the event for four years to date.

Figure 10
Wildlife Trends in East Caprivi, from East Caprivi PMV, 1995



Management Impact

Whenever data appear that are so directly contradictory to the way we think things work, the first impulse is to deny them. In our case, we first pretended that the findings didn't surface, and declared victory everywhere else. The next step was to claim that the data were not accurate or that the analysis was too superficial. Finally, everyone was forced to scrutinize the findings and their beliefs.

What emerged was a fine-tuning of CBNRM theory/assumption/theology. The project needed to consider the timing of fostering benefits, and the linkage of benefits to responsibility. The following conclusions emerged:

- Lizauli was given too many benefits without first assuming sufficient responsibility.
- Benefits without responsibility do not lead to commitment.
- CBNRM projects should lead with responsibility, and then follow with benefit provision.

It is possible that other conclusions could be drawn from the data that would lead one to test other aspects of the model.

This PMV provided an opportunity to analyze objective data (originally captured by the implementer) in a way that forced the Namibian CBNRM Program to objectively review its basic operational framework. We were able to accomplish this by having a multidisciplinary team address both the social and biological issues in an integrated way and by having most of the data collection already prepared through completion of the tool-based monitoring system used by the program.

Table 2. Average Number of Animals per Sighting per Year: Area North of Mudumu National Park, East Caprivi 1992-1994*

Animal	*Community*	*1992*	*1994*	*% Change*
Roan				
	Singalamwe	2.5	3.2	↑ 28
	Lubuta	4.3	7.3	↑ 70
Sable				
	Lubuta	4.3	9	↑ 109
Tsessebe				
	Lubuta	4.6	6.6	↑ 43
Lechwe				
	Ngonga	2	3.4	↑ 70
	Singalamwe	3.2	8.6	↑ 169

* Note: At the suggestion of the field manager, the following sampling procedure was followed: a) field manager identified areas likely to support animals most sensitive to human intrusions, such as from poaching (roan, sable, tsessebe, and lechwe); b) field manager reviewed all community game guard sheets (for game guards known to be reliable) for those animals in those areas for 1992-1994, recording number of animals for each "indicator" species tallied at each sighting; c) an average number of key animals per sighting per year was developed.

Reporting

Strive for the Visual

It is one thing to capture useful data, apply rigorous analyses, and develop sound recommendations. Communicating that information to relevant decision-makers in a way that they understand and can act on is a very different challenge. Unfortunately, project staff often become fatigued just as the analysis and recommendations are completed and do not invest sufficient energy in communicating the results.

In our project, we experience three types of challenges in getting our message across: (1) general apathy —the material is just not interesting; (2) decision-makers who see too much written material and are "numb" to text; and (3) decision-makers who are not skilled at reading.

We have found that the way to address this constraint is to try to make the presentation as visually interesting as possible. For this reason, the IDT and CMT both have graphs (profiles) that summarize the entire exercise on an intuitively presented page. It is easily understood and is something that can be put on a wall to unite a group's energies—i.e., "let's beat that target!" This is also why we used a graph to dramatize the difference between the wildlife trends in Lizauli and neighboring villages in the example above.

Realizing the full potential of the data gathered through a program monitoring system, however, occasionally requires stepping back and synthesizing it in a way that can have a greater, or at least different, impact than a number of reports on each activity. We attempted this in producing a video on the pending conservancy policy in Namibia called "There's a Better Life at Hand." We attempted to integrate social, biological, anthropological, and economic data and to merge it across target areas. We present this as our final example in the following section.

Communicating Results for Impact: Video, Monitoring, and Policy Change for Conservancies in Namibia

Background

Many ICDPs express concern over the "policy environment" that can impede project success. However, we must realize that, from a project management perspective, when we speak of policy constraints we are not speaking only of the need to make changes in legislation. Rather, we include the integrated institutional, political, regulatory, and legal environment that influences daily implementation and the likelihood of success.

The Namibian example is "Conservancy Policy." Under this policy—pursued by the National CBNRM Program since 1994—communities defined areas called "conservancies," which they would manage sustainably and which the government would regulate. Wildlife would no longer be the exclusive domain of the state, but would be returned to communities. Along with this responsibility would come the right to reap related economic benefits, such as hunting concessions, live animal sales, and tourism concessions. A parallel front is attempting to revise national tourism policy to foster development of community-based tourism enterprises.

The National CBNRM Program wished to get the "Conservancy Policy" and "Tourism Policy" under way as the success of their activities depended on it. To accomplish this in a way that would have sustainable project impact, they needed to gain deep and wide support at the following levels:

Political

- National: The lead ministry, the MET, needed support of other key ministries, the cabinet, and the President's office.

- Local: Support from traditional leaders was needed.

Institutional

- National: The MET was internally divided on the idea of conservancies, with only top management and one of four branches firmly in support of the program.

- Local: Many MET field offices were particularly skeptical.

Regulatory

- For the government to help communities effectively install conservancies, they would need to understand the on-the-ground needs and be convinced of the usefulness of the policy.

Legal

- To become law, the policy needed to be enacted by both the National Assembly and the National Council.

Namibia's National CBNRM Program wanted to convince this varied assortment of policymakers to pass and implement the policy.

The Intervention

To promote passage and implementation, the National Program elected to produce a video that would inform these various levels of policymakers of the successes to date in CBNRM and of the potential for the future for the nation as a whole.

In drafting a script, we reviewed all the formal and informal M&E data available to construct a future vision based on actual successes in different parts of the country (see Talbe 1). We interviewed ministers, chiefs, headmen, NGO and CBO staff, farmers, bartenders, hunters, and veld food collectors to obtain data on how resources were used and how they could benefit from the new policy. Those interviews were presented in the video in their mother tongues. The interviews spoke to the realities of each ecological, economic, and social system and how the policies would address their particular needs. We also presented striking visual images of successes and failures throughout the country, supported by local music and ambient sounds.

The mixture of dramatization of past monitoring data, collection of original interview data, and a compelling visual presentation brought a rather dry policy issue to life. It has been used in the following forums:

- A screening and conservancy policy question-and-answer session with ministers, deputy ministers and permanent secretaries for all concerned ministries;
- A screening and discussion for the national council;
- Briefing trips on conservancy policy for MET staff in the capital and the regions;
- Screenings for traditional authorities in the high-potential areas;
- A national television broadcast;
- Regional exchange and lessons learned; and
- Special screening events are planned to be hosted by regional governors.

Management Impact

The result has been to inform the assortment of policymakers of the advantages of conservancies to each of their portfolios and of the commitment of the government to its success. The policy has been approved by the National Assembly and will soon be voted on by the National Council. To rank-and-file MET staff and their regional outposts, seeing and hearing the permanent secretary and minister say that, without conservancies, there is no hope for conservation in Namibia proved 10 times more powerful than a ministry circular. When the chief of a large part of Eastern Caprivi said on television that his people would take care of wildlife as they do their cattle, his local leaders sat up, took notice, and rallied behind the cause. When skeptical MET field staff see community workers handling a Global Positioning System apparatus, drawing maps, and monitoring wildlife, they gain confidence in local skills. And, when villagers considering starting a tourism venture see the color of a tourist's cash paid for a traditional dance in Nyae Nyae, they become convinced of the potential in conservation and development.

The video presents a dramatic example of how data can be presented in ways that hit home far more powerfully than a report. It also has the useful effect of firmly putting policymakers on record and of producing a common vernacular to discuss policy issues. Sometimes it is words that are used. More often, however, it is auditory or visual: "I feel the same way as Chief Moraliswani;" or "we want to make money by showing tourists elephants—like in the video;" or "those community game guards seem to know what they're doing." In this case, data supported an argument and influenced the external environment that, itself, influences project implementation in a multitude of ways.

Conclusion

This paper has provided examples of how a multidisciplinary and participatory M&E system for the LIFE project in Namibia has proven useful to an environmental NGO, a grassroots community organization, a national environmental program, and the overall LIFE program itself. We have emphasized the utility of simple M&E tools. These are useful to capture objective data systematically, to foster a shared vision among stakeholders, and to transfer needed skills to implementers with a wide range of training.

I have emphasized the successes we have enjoyed. A paper outlining the delays, frustrations, setbacks, and outright failures could have continued for many more pages. I hope that readers can find elements from the good news of our project that will be applicable to the work they are doing throughout the world.

Appendix 1

Symposium Schedule

❖

8 – 12 am, Tuesday, August 13
Narragansett C, Westin Hotel
Providence, Rhode Island

I.	**Introduction**	
	8:00 – 8:10	Kathy Saterson *Introduction to the Session (History and Context)*
	8:10 – 8:30	Nick Salafsky and Richard Margoluis *Monitoring and Evaluation in the Context of the Conservation and Development Project Cycle*
II.	**Conceptualization and Development of M&E Plan**	
	8:30 – 8:35	Nick Salafsky *Overview*
	8:35 – 9:00	John Ericho, Robert Bino, Arlyne Johnson, and Chris Filardi Crater Mountain Project, Research and Conservation Foundation, Papua New Guinea *Developing an Interdisciplinary Monitoring Plan To Measure Effectiveness of an Integrated Conservation and Development (ICAD) Project in the Crater Mountain Wildlife Management Area, Papua New Guinea*
	9:00 – 9:25	Jan Crocker, The Nature Conservancy, Hawaii Office *Conserving Indonesia's Lore Lindu National Park through the Promotion of Local Nature-based Enterprises*
III.	**Interdisciplinary and Participatory Methods for Data Collection**	
	9:25 – 9:30	Richard Margoluis *Overview*

	9:30 – 9:55	Barbara Dugelby, The Nature Conservancy *Tools for Monitoring Anthropogenic Impacts in Protected Areas*
	9:55 – 10:20	Claire Kremen, Wildlife Conservation Society/Stanford University Center for Conservation Biology *Monitoring Natural Resource Use on the Masoala Peninsula, Madagascar: A Tool for Managing Integrated Conservation and Development Projects*
	10:20 – 10:35	Break
IV.	**Application of Results for Project Management**	
	10:35 – 10:40	Kathy Saterson *Overview*
	10:40 – 11:05	Kamal Bawa, UMass/TERI/VGKK Project, India *Management of Tropical Forests for Extraction of Non-Timber Forest Products*
	11:05 – 11:30	Mark Renzi, LIFE Project, Namibia *The Miner's Canary: Multidisciplinary Program Monitoring*
V.	**Discussion**	
	11:30 – 12:00	Panel Discussion with all speakers (Kathy Saterson, moderator)

Appendix 2

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