SEEING THE COMMUNITY FOR THE TREES: ASSESSING LOCALLY-DEVELOPED SUSTAINABILITY INDICATORS FOR THE ANGKOR COMMUNITY FOREST PROJECT, CAMBODIA

By

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ABSTRACT

The vision behind community forestry is to ensure the sustainability of local forests, by engaging the local communities who depend on these resources. Community forestry is practiced widely across the globe, with varying degrees of success.

This study focuses on alternative approaches and tools used to evaluate project performance (in terms of sustainability) and increase participation at the evaluation stage of a project. I selected a representative case study, the Angkor Community Forest Project, located in Siem Reap, Cambodia. I conducted a comparative analysis between a participatory 'bottom-up' approach and conventional 'top-down' approach to develop indicators as tools to assess sustainability. I assessed performance of the indicator sets against the Sustainability Indicators Standard (SIS).

Locally-developed indicators perform better than the conventional indicators. However, neither set is a perfect match for sustainability. The Local Indicators (LI) perform better in gauging site-specific measures, identifying intangible benefits, and targeting participation, capacity building and education as critical measures of project success. The conventional or Project Indicators (PI), are better at measuring economic viability of the project, identifying both the short and long-term benefits, and capture a blend of local and broader goals associated with the public good. Overall, I found that the two indicators sets are complementary and could be used together for a more comprehensive evaluation. Participatory approaches are not suited for all projects, and guidelines have been established to help decide under what circumstances participatory project evaluations should be used.

My research demonstrates that alternative forms of project evaluation exist, and that a participatory approach can assess sustainability of community forestry projects and as well, increase participation by local beneficiaries. By using a mix of approaches and tools, it is possible to produce a comprehensive set of indicators to measure sustainability.

Project evaluation is a necessary part of the learning process for international development agencies and local communities. Invigorating the process with new approaches and tools could produce more accurate project evaluations and engage meaningful participation by local beneficiaries.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

APDO	Angkor Participatory Development Organization
APSARA	Authority for the Protection and Management of Angkor and the Region of Siem Reap
BCA	Benefit-Cost Analysis
BC FSC	British Columbia Forest Stewardship Council
CBA	Cost-Benefit Analysis
CBM	Community-based Management
CBNRM	Community-based Natural Resource Management
CFA	Community Forest Agreement
CIDA	Canadian International Development Agency
CIFOR	Center for International Forestry Research
CPPA	Community Participation in Protected Areas
FAO	United Nations Food and Agricultural Organization
GDP	Gross Domestic Product
IDRC	International Development Research Centre
IUCN	World Conservation Union
LI	Local Indicators
MATA	Multi-attribute Trade-off Analysis
MCA	Multi-criteria Analysis
MSY	Maximum Sustainable Yield
NGO	Non-governmental Organization
NRTEE	National Round Table on the Environment and the Economy

OCED	Organization for Economic Cooperation and Development
ODI	Overseas Development Institute of the United Kingdom
PAR	Participatory Action Research
PFM	Participatory Forest Management
PI	Project Indicators
PRA	Participatory Rural Appraisal
RRA	Rapid Rural Appraisal
SBA	Systems-based Analysis
SIS	Sustainability Indicators Standard
SSI	Semi-structured Interview
SWOT	Strengths, Weaknesses, Opportunities, Threats
TOR	Terms of Reference
UNDP	United Nations Development Program
UNESCO	United Nations Environmental, Science, Cultural Organization
UNV	United Nations Volunteers
WCED	World Commission on Economic Development
ZEMP	Zoning and Environmental Management Plan

Chapter 1: INTRODUCTION

1.0 Overview

Community forest projects were introduced by international development organizations in the late 1970's throughout India, Africa and Asia, as a way to achieve "…sustainable development of natural resources through community-based management" (Brendlar and Carey 1998:3). The community-based project favours the decentralization of forest management and uses a participatory, grassroots approach to manage local forests. The project objectives are often a blend of social, economic, and environmental criteria chosen to reflect sustainable development (Arnold 2001, Veron 2001, Robinson 1998). Participation is thought to be the key to success by empowering people to address their livelihood needs, ensuring representation of all groups, building capacity, and promoting democratic decision-making related to the sustainable management of local forest resources (Kleemeier 2000, Human 1984). In recent years, project objectives have evolved that closely match "sustainable development": projects that attempt to fulfill a holistic set of social, environmental, and economic objectives with benefits distributed between current and future generations (Veron 2001, Mitchell-Banks 1998, WCED 1987). Yet after decades of practice with community forestry, many of these projects have not achieved expected levels of success.

A review of community forest projects indicates a host of problems: poor quality land, lack of land available, lack of participation or interest from target beneficiaries, lack of adequate capacity building of groups and communities, lack of training and/or technical skills, lack of on-going funding to maintain project activities, lack of supporting legislation, to a lack of political will by governments (Arnold 2001, Carpenter 1998, Ostrom 1992, Wells 1992). However, the

two major reasons most often cited as the causes for the failure of projects are: a lack of meaningful participation at all stages of the project, and a lack of suitable tools to assess community sustainability accurately (Johnson 1999, Robinson, 1998, Carpenter 1998, Burwell *et al.* 1994, Wells and Brandon 1993, Arnold 1991, Guggenheim and Spears 1991).

In my study, I seek to improve the quality of community forest projects by concentrating on ways to address these two weaknesses. I will review tools currently used to assess projects, and investigate new tools that can better assess sustainability. As well, I examine new approaches to improve how local beneficiaries participate in defining and evaluating project success.

1.1 Problem statement

To improve the success or performance of community forest projects, it is necessary to first understand how projects are evaluated. Project evaluations are tools used to measure project performance, using certain indicators or criteria to assess whether project objectives have been satisfied (Hira and Parfitt 2003, Hyman 1994). Dixon *et al.* (1994) situates project evaluations within the standard project cycle of design and implementation, followed by evaluation. Theoretically, the cycle is continuous, such that the lessons learned in the evaluation stages are used to inform the design of new projects.

Unfortunately, the role of project evaluation has not lived up to expectations (Gregory 2000, Cummings 1997). The poor performance of community forest projects over the last 30 years makes it evident that this transfer of lessons-learned is not happening (Arnold 2001, Robinson 1998, Burwell *et al.* 1994, Arnold 1991). I suggest three possible explanations: project evaluations are not being conducted, the results are not being used, or, the evaluations

themselves are not capable of accurately assessing community forest projects. In this study I focus on the last.

There is the growing feeling that the tools and approaches used in conventional project evaluations are not suited to community forest projects (Fine and Coghlan 1999, Byron 1991). Participation is necessary at every stage of a community-managed project and thus project evaluation should be no exception (Hagmann *et al*. 2002, Veron 2001, Cummings 1997, Byron and Griffin 1994). However, typically an external consultant is hired by the development agency to evaluate the project using a 'top-down' approach (Hira and Parfitt 2003, Guijt and Gaventa 1998, Uphoff 1991). There may be only limited opportunities for consultation or participation by the local beneficiaries (Davies and Richards 1999) and the performance measures are often limited to economic assessments of the viability of the project, developed by the external consultant (UNDP 1996, Byron 1991).

The conventional tool to assess project performance is Benefit-Cost Analysis (BCA), whereby success is achieved if the economic benefits of projects outweigh their costs. There is debate in the literature about whether BCA is an adequate tool to effectively evaluate sustainability and by extension, community forestry projects (James 1994, van Pelt 1993, Byron 1991). Economic performance is but one of three parts of sustainability, and conventional BCA is limited in its ability to also measure environmental and social performance, particularly the qualitative measures that are not easily valued in dollar terms (James 1994).

Current thinking on project evaluation recognizes that to accurately evaluate the performance of a project tools must be capable of measuring the project objectives. In the case of community forestry, tools must be capable of measuring both the qualitative and quantitative features of sustainable development: meeting the environmental, economic, and social

components of the project for current and future generations (van Pelt 1993, Gilmour and Fisher 1991, WCED 1987).

"Sustainability Indicators" have risen to prominence as an effective tool to measure the economic, environmental and social outcomes of projects. These indicators can describe the current state of a project, detect changes, show cause-effect relationships, and even highlight emerging issues (Gahin and Paterson 2001, Parkins *et al.* 2001, Fraser Basin Council 2000, Meadows 1998). Thus, I propose Sustainability Indicators as tools to evaluate community forest projects.

The development of Sustainability Indicators can be divided into two approaches: conventional and participatory. The conventional approach involves an external consultant who develops the indicators so that performance could be assessed against the initial project objectives. The organization and content of the 'conventional' indicator set is at the discretion of the external evaluator, and may have little or no consultation of the project beneficiaries. Practitioners in community forestry are critical of this approach for two reasons. The 'top-down' approach is not suitable for projects built on participatory principles and processes. More importantly, the Sustainability Indicators may lack relevance unless the local stakeholders are involved (Bell and Morse 2001).

The second way to develop Sustainability Indicators is through the use of a participatory approach. The participatory approach works by having local beneficiaries develop their own local indicators to assess the performance of their project, normally with facilitation by experts in participatory evaluations. The indicators are developed based on local objectives which may or may not be the same as the project objectives (depending on the level of consultation in defining the original project objectives). In theory, the accuracy of the indicators should be strengthened by the broad range of perspectives brought to bear by the diverse participants, especially if the

project has consistently used a participatory approach and the local participants are already familiar and comfortable with a wide range of participatory tools. Moreover, the local indicators are more likely to reflect the unique local conditions of the project and the chances are greater that the indicators will be used directly by the beneficiaries themselves to monitor, manage and improve their project (Bell and Morse 2001, Nazarea *et al.* 1998, IUCN/IDRC 1999).

In recent years, a great deal of literature has emerged in support of participatory evaluations and the development of local indicators (Hira and Parfitt 2003, Hagmann *et al.* 2002, Parkins *et al.* 2001, Johnson 1999, Nazarea *et al.* 1998, Cummings 1997, Tacconi 1997). Participatory Project Evaluations – using a participatory approach to both derive and assess local indicators – have grown in appeal as a flexible approach to assess the performance of development projects, especially those like community forestry that have a people-centred or participatory focus (Fine and Coghlan 1999). Most of the reviews focus on methodology to implement a participatory evaluation and how to develop local indicators (Hagmann *et al.* 2002, Johnson 1999, Guijt and Gaventa 1998, Cummings 1997). Overall, however, there are few case studies where participatory project evaluations have been used to develop local indicators. Even more rare are case studies that assess whether the local indicators developed using a participatory approach are more capable of measuring sustainability than conventional approaches. In this study, I attempt to fill this gap by developing two sets of indicators – one using a conventional approach, and a second using a participatory approach – and uses a comparative analysis to assess both indicator sets for sustainability.

1.2 Purpose and objectives

The primary purpose of my research is to assess whether participatory approaches to project evaluation (through the development of locally-defined sustainability indicators) can

improve the quality of community forest projects. I selected a community forest project in Angkor, Cambodia as my study site. My research objective was to assess two approaches to the development of indicators (conventional or participatory) and evaluate the indicators for sustainability.

1.3 Scope of the research

In this study, I compare two approaches to developing indicators: the conventional top-down approach (with minimal local consultation) and the participatory approach (using local beneficiaries as the evaluators). I focus only on developing indicator sets and did not conduct a full-scale project evaluation to measure the outcomes of each indicator.

There were certain factors that may have weakened the research results, and my awareness of these limitations influenced the research design. First, I selected the case study site because of my first-hand knowledge of the project, Cambodia, and the language, and also my strong relationships with the local beneficiaries. My familiarity with the project and people was an asset, but also a source of potential bias. To minimize bias, I used a range of tools to encourage transparency and accuracy of the participatory approach (see Section 5.1.5) as well as the conventional approach (see Section 4.4.2).

Time was the second constraint. The participatory 'Local Indicators' were developed over three months. After this period, there was no time for additional review and revision, and the local evaluators did not contribute to the subsequent analysis stage. I specifically acknowledge this weakness in Section 7.1.5. Finally, there are always difficulties when conducting participatory research, particularly in a cross-cultural context. To ensure the highest possible accuracy, I carefully selected and used research methods to validate and verify the accuracy of the information collected (see Section 5.1).

1.4 Report organization

Chapter 1 states the problem and defines the purpose and objectives of the research. The study site is briefly introduced as well as the scope and organization of the research. In Chapter 2, I review literature to provide a brief overview of community forestry, the various approaches to project evaluation, and conclude by describing the role and development of sustainability indicators. Based on the literature review, I introduce an analytical framework to assess sustainability, the Sustainability Indicators Standard (SIS), in Chapter 3, as well as the analytical methods used to collect and analyse data. In Chapter 4, I describe my case study project, the Angkor Community Forest Project, and develop a set of Project Indicators (PI) using a conventional approach. Chapter 5 summarizes the methods and results of a participatory approach and introduces the Local Indicators (LI) for my case study project. In Chapter 6, I combine results from Chapters 3, 4, and 5 to assess and discuss the performance of the local and project indicator sets (the LI and PI) against the SIS. Chapter 7 presents the major lessons learned from my study, describes the strengths and weaknesses of participatory approaches, and also discusses the applications of participatory project evaluations. Chapter 8 concludes my research report with a brief summary of my principal findings and recommendations.

Chapter 2: LITERATURE REVIEW

2.0 Introduction

In this chapter, I review the evolution of community forestry projects and why the "…practical implementation frequently falls short of expectations." Leach *et al.* 1999:225. The ultimate goal of the review is to identify key areas where community-based projects can be improved. I discuss how to measure the performance or success of such projects and examine both conventional and new participatory approaches to project evaluation. I extend my review beyond project evaluation into the realm of performance indicators and particularly, new developments in the field of Sustainability Indicators as useful tools to evaluate community forestry projects.

2.1 Sustainable development and community-based initiatives

Meadows (1998:11) observed "Development and sustainability are old problems – [however] now they come together on a global scale and in an urgent time frame." Her statement aptly describes the conundrum faced by rural development programs in the late 1960's, as they struggled to find ways to help the poor become self-reliant (Arnold 1991). Spurred in part by the energy crisis of the 1970's in the West, there was an urgency to find sustainable energy solutions for the exploding populations of the under-developed nations. It was thought that Africa and Asia, already suffering from droughts, floods and famines, were facing a severe energy crisis caused by rapid deforestation and fuel-wood scarcity (Arnold 1991). Rural communities in these regions relied heavily on forest resources to supply income and basic household needs, and in particular, the use of fuel-wood as an energy source for cooking and

heating. As Eckholm (1975:2) noted, "…for more than a third of the world's people, the real energy crisis is a daily scramble to cook dinner."

In response, international development agencies such as the United Nations Food and Agricultural Organization (FAO) worked with partner-governments to propose forestry projects "…for the people and involving the people" (FAO 1978). The concept of 'community-based forest management', although perhaps not fully understood or tested, was quickly embraced and projects spread throughout developing nations in Africa, Asia and South America (Martin and Lemon 2001, Klooster 2000, Kleemeier 2000, Mgeni 1992, Gilmour and Fisher 1991).

2.2 What is community forestry?

Community forestry was initially defined by FAO in 1978 as:

> "…any situation which intimately involves local people in a forestry activity. It embraces a spectrum of situations ranging from woodlots in areas which are short of wood and other forest products, for local needs through the growing of trees at the farm level to provide cash crops and the processing of forest products at the household, artisan or small industry level to generate income, to the activities of forest dwelling communities." (Arnold 1991:1).

A simpler definition comes from Gilmour and Fisher (1991:1) who define community forestry as "…the control and management of forests by the people who use them." Community forestry was originally envisioned as an integral component of rural/agricultural development projects with three main goals to help the poor become self-reliant and maintain these self-reliance over the longer term: (1) to provide fuel-wood and other forest products to meet basic household or community needs, (2) to provide an environmentally sustainable source of food, and (3) to provide income and employment opportunities in the rural community (FAO 1978).

Rather than the centralized, government management of forest resources, the community forestry approach favoured decentralization of forest management "…forestry which starts at the

grass roots" (Arnold 1991:2). Thus, community forestry was originally conceived as a 'participatory' approach to promote local management of forest resources, with external support and technical advice provided by government and international aid agencies.

Over the last 30 years, there has been a wide array of projects conducted under the umbrella of community forestry (Li 2002, Davis-Case 2001). Community forestry is practiced globally and the management objectives vary with location, physical resources, funding support and institutional arrangements (Ostrom 1998). Some examples of management objectives are: wood production (timber or fuel-wood), agroforestry, non-wood forest products, conservation and protection, soil and watershed protection, rehabilitation and afforestation, plantations, woodlots, cultural significance, recreation, tourism and more recently, ecotourism and certification of sustainable forest products (FAO 2002, Li 2002, Davis-Case 2001, Veron 2001, British Columbia Forest Stewardship Council 2000, Klooster 2000).

Projects also run a gamut of management arrangements, ranging from complete local management with only technical advice from government (e.g., Community-based natural resource management projects in upland Thailand (Li 2002) to joint forest management partners between the state and villagers (e.g., the Kerala Co-management Forest Project, India (Veron 2001). Many of the labels applied to decentralized forest management are often (mistakenly) used interchangeably, so it is useful to be familiar with the lexicon. Co-managed or joint forest management projects tend to share management between government and the local communities, although the ultimate decision-making powers are still retained by government (Ostrom 1998). Projects that are truly "locally managed", where the communities are given responsibility and decision-making powers to manage their local resources (with some advice and guidance from central government agencies) are normally called community-based management (CBM) or community-based management of natural resources (CBNRM) (FAO 1997). "Social forestry"

is an outdated term that has been replaced by the general "Community forestry"; in part because the social forestry projects of India in the mid 1970's focused on societal and environmental issues at the expense of economic development, and thus do not meet the trio of sustainable development goals associated with current projects (Robinson 1998). More recently the blanket term of Participatory Forest Management (PFM) been used to describe a range of "alternatively managed" forest projects that emphasize collective action and participation (Davis-Case 2001, Davies and Richards 1999). Although projects have various labels, they tend to share common goals of sustainable development, and a common struggle to achieve success (Martin and Lemon 2001, Veron 2001).

2.3 The challenges of community forestry

The first challenge of community forestry is to define and integrate the theory and best practice of participation in all stages of CBM projects. In every review of community forestry, there is recognition that identifying and including the key stakeholders is necessary to improve the quality of community forestry projects. As Guggenheim and Spears (1991:335) wryly note "Participation is not an absolute guarantor of project success, but its absence is a surefire prescription for project failure."

Carter (1996) outlines the basic principles of participation moving across a spectrum of the level of involvement of the beneficiaries – from limited token representation, to co-operation and consultation, up to greater decision-making and collaboration and finally collective participation. Carter defines this final stage as the type of participation when "…local people set and implement their own agenda; outsiders are absent." The World Bank (1997) used a similar definition for participation as a "…process whereby beneficiaries influence the direction and execution of development projects rather than merely receive a share of project benefits." The

noble goals of participation are well stated, yet how to achieve high quality participation remains elusive. Martin and Lemon (2001) suggest that participation must start at project proposal and continue through all stages of the project, including evaluation. To achieve this level of participation requires commitment from project beneficiaries and donors (typically aid agencies) to consistently use participatory tools, techniques and find new approaches to support community-based approaches to forest management (Martin and Lemon 2001, Klooster 2000, Ostrom 1998, UNDP 1996).

The second challenge for community forestry is finding the tools to measure whether the project has been successful – i.e., has the project fulfilled the objectives of sustainable development. Sustainable development has been broadly defined as development that satisfies a trio of economic, environmental and social objectives to meet the needs of current generations, without compromising the ability of future generations to meet their needs and aspirations (WCED 1987). There are a number of ways to evaluate a project, and the challenge is selecting the appropriate approach and tools to best measure the sustainability of CBM projects.

2.4 Conventional project evaluations: are they right for community forestry?

Many have argued that the approaches and tools used in conventional project evaluations are not suited to the complexity of community-managed forest projects. Certainly there are strengths to conventional approaches and tools. However, in this review, I focus primarily on the weaknesses in order to enable understanding of how to improve project evaluations.

Perhaps the most common weakness is 'who' conducts the evaluation (Hagmann *et al.* 2002). Typically, conventional evaluations employ a 'top-down' approach to measure project performance. The performance is measured against a set of project objectives and standard assessments of economic accountability known as Benefit-Cost Analysis (BCA) or Cost-Benefit

Analysis (CBA) (Kottak 1991). Again, the performance measure (BCA) tends to be an externally derived rather than local. The development agency hires an external consultant to assess the project, and there may be very limited input from the local participants on how to assess the project.

It seems redundant to state that a 'top-down' approach contradicts the objective of a grassroots, participatory 'bottom-up' approach used in community-based projects. For this reason alone, conventional approaches lack suitability. After all, if the goal of community-based projects is to empower local persons to sustainably manage their resources, then the local beneficiaries must be actively involved in assessing the performance of their project (Johnston 1999, Nazarea *et al.* 1998, Byron 1991). Without meaningful participation from local beneficiaries, conventional evaluation results may lack relevance, and are certainly not consistent to the principles of participatory approaches.

A second weakness is whether conventional tools, such as BCA, are adequate to assess sustainability, and subsequently evaluate community-based projects (van Pelt 1993, Byron 1991). Conventional evaluations often rely on BCA to measure project performance. Within a project evaluation, BCA reduces all costs and benefits to a single monetary value, the Net Present Value, to estimate project performance over a specified period. Decision-makers are then able to compare which project had the best performance in BCA terms. Their decision is based on which project had the greater return on investment, or, which project had the highest Net Present Value (Field and Olewiler 1995).

A number of complaints stem from how BCA has been conventionally applied. First, decision-makers are locked into a decision-rule that evaluates projects only on economic considerations (Godoy and Markandya 1993). In conventional evaluations, other lessons learned are often ignored in deference to the economic performance of the project. In terms of the

project cycle, this is not the correct use of project evaluations (Hira and Parfitt 2003, Davies and Richards 1999). Second, BCA critics argue that reliance on economic criteria skews the evaluation results and there will be huge gaps in the information collected. Without measuring a full range of project impacts – economic, social, and environmental – the evaluation does not provide a true picture of the success or failure of a project, and it follows that the lessons learned may not be accurate or useful. As well, the social and environmental benefits and costs of a project do not lend themselves easily to monetary valuation, and some argue that it is both inappropriate and impossible to apply a 'market' value to 'non-marketable' items such as the existence value of trees, or the cultural significance of protected land (Whittington and MacRae 1986). BCA applied to community forest projects generally limits performance to the economic valuation of commercial forest products and perhaps this is inappropriate. Byron (1991:176) observed that:

> "The major justification of community forestry may well be the provision of subsistence needs, for fuel, fodder, medicinal plants; or the protection of environmental, aesthetic, wildlife and watershed values; rather than the commercial production of a cellulosic commodity. Why should analysts confine themselves to techniques devised for the latter?"

Even if non-market values can be assessed, BCA may lose relevance if market and non-market values are not stratified according to criteria such as wealth, geographic locale, age, and gender (Whittington and MacRae 1986). Finally, the BCA tool is again an example of external techniques and influence that fails to elicit local knowledge or local values. Byron (1991:176) uses Nepal community forest case studies to argue that BCA is merely a '…remnant of the top-down expert based paradigm…" and thus is not appropriate in community-based, participatory projects.

There have been various attempts to modify BCA to address these weaknesses. Multi-criteria Analysis (MCA) for example, is used to assess project performance via a broad set of

economic, environmental and social criteria (Beinat 2001, Petry 1990). For MCA, the net economic value of the project can be calculated, including market and non-market values. The decision-makers weigh the multiple criteria, and select the best alternative. Although MCA can be used to measure sustainability broadly, it is still plagued by challenges of fitting qualitative criteria within an essentially quantitative framework. It's weakness is how to ensure the numbers generated are meaningful and accurate and whether these measurements accurately reflect how the local communities would assess and value project. Ultimately, these tools do very little to address the major shortcoming of CBM projects, that is, findings ways to encourage local input and active participation of beneficiaries.

The third and final weakness of conventional project evaluations refers not to approaches or tools used, but rather the lack of utility of the project evaluations (Bell and Morse 1999, Hymann 1994). A good example of poor utility is found in Little and Mirrlees (1990) review of World Bank policies for economic analysis of projects, where they found that CBA had little influence or utility in World Bank projects. If the conventional tools of project evaluation lack utility, then the evaluation process itself must be evaluated and improved.

2.5 New tools and approaches to project evaluation

There is widespread discussion among international development agencies of how to invigorate evaluation processes for participatory, decentralized, community-based projects (ref). There is an increasing sense among development practitioners that participatory projects require a different approach to project evaluations (Guijt and Gaventa 1998, UNDP 1996). Agencies such as the United Nations Development Programme (UNDP), World Conservation Union (IUCN), the International Development Research Centre (IDRC), the World Bank, the United Nations Food and Agricultural Organization (FAO) and the Overseas Development Institute

(ODI) are discussing sustainability indicators, developed within a participatory framework, as a new approach to evaluate CBM projects.

Sustainability Indicators are tools that can provide useful information about the performance of a physical, social, or economic system (Fraser Basin Council 2000, Hart 1999). Indicators typically use dollar or numeric terms (BCA is one example of an economic indicator) but the versatility of indicators means you could also use signs, symbols, pictures, or even colours (Meadows 1998). Indicators could therefore be used in project evaluations to measure qualitative and quantitative aspects of project performance. The can also be used to measure the progress over time, or provide ongoing targets to monitor project performance, or, to measure performance in relation to a specific goal (Fraser Basin Council 2000, Hart 1999). Thus, indicators are flexible tools that may be well suited to assess the complex goals of sustainability in community forest projects.

If there is a role for indicators as a tool to evaluate and assess projects with sustainability objectives, what is the most appropriate approach to develop these Sustainability Indicators? I found that indicators can be developed using the conventional top-down approach, or, indicators can be developed using a participatory 'grassroots' approach. And sometimes there is a combination of these two approaches.

Who controls the process is the most notable difference between conventional and participatory approaches. In Section 2.4, I described the conventional approach to project evaluation as an externally driven process. A participatory project evaluation, on the other hand, is an inclusive, collective exercise and, as such, relies on inputs from a wide variety of participants – it is not controlled by a few experts or external consultants (Cummings 1997). An evaluation is considered participatory when "…people involved in a given development programme or organisation, both as implementers and as beneficiaries, start participating in and

take charge of the evaluation efforts" (UNDP 1996:6). The direct beneficiaries are active participants in evaluating project performance and this local input is crucial to effectively measuring the performance of community-based natural resource management projects (Hagmann *et al.* 2002, Parkins *et al.* 2001, Nazarea *et al.* 1998, Byron 1991, Kottak 1991). Some benefits of a participatory approach include (Parkins *et al.* 2001, Hart 2000):

- Greater relevance to local communities, because the results reflect the needs and objectives of local participants, including how these needs change over time.
- Greater diversity and depth of information collected, based on a range of diverse perspectives and participants.
- Ability to measure both market and non-market values over various time frames relevant to local beneficiaries, including whether benefits and costs are distributed equitably.
- Greater interest and commitment in ownership of projects by local stakeholders.
- Strengthened capacity of local participants, and greater understanding of project at local level.

Given the diversity of projects, cultures, organizations and governments, indicators have arisen as a potential tool that could be easily understood and used in project evaluations by local communities, donors and governments. Depending on how the indicators are selected, the indicators can increase the level of meaningful participation of local beneficiaries during project evaluation.

Conventional approaches to indicator development rely on the expertise of external consultants. The consultants often use a combination of project specific and established indicators that consider broader concerns of donors and governments, such as economic viability of the project (BCA) as well as the protection and conservation of public goods and international standards of biodiversity. Participatory approaches, on the other hand, build on the direct knowledge of the local beneficiaries, and as such, the objectives and indicators to measure

success come directly from the recipients themselves (Chambers 1983). Depending on which indicators are selected, the indicators can also be relevant and useful tools to measure the sustainability of CBM projects.

2.6 Sustainability Indicators

Sustainability Indicators rose to prominence after the Bruntland Report in 1987, as a set of tools to gauge the complexity of sustainable development. Subsequently, countries throughout North America and Europe have struggled to develop comprehensive Sustainability Indicators that focus on the linkages among social, economic and environmental factors (Gahin 2001, Hart 1999, Meadows 1998). Indicators vary considerably, depending on the underlying view of sustainability they embody, the organizing framework they employ, the interests and goals of their authors and the ultimate end-use of the indicators. There is diversity and disagreement over which indicators to choose and how many; the only consensus is that the indicators must represent all three components of sustainability (Bell and Morse 1999).

A number of different indicator sets have been developed and are currently in use – such as the United Nations Sustainability Indicators (2001) and the World Bank Indicators of Environmentally Sustainable Development (2001). The indicators are primarily international, but progress has been made in the regional and city level, such as the Seattle Sustainability Indicators (1993). More recently, there has been a strong movement to use Sustainability Indicators as a tool to evaluate international aid projects in developing countries, particularly those projects with objectives congruent with sustainable development, such as community forestry projects.

2.7 The process of developing Sustainability Indicators

The organizations and governments that are developing sustainability indicators range from the international to the very local, using a variety of processes to do so. Thus, Hart (1999:8) noted that the "…process of developing a sustainability indicator set is as valuable as the set of indicators that results." Many of the recent sustainability indicators projects undertaken have relied on the Bellagio Principles, a standard methodology for indicators developed by international researchers and practitioners in 1996 in Bellagio, Italy. The Principles are based on four concepts (Hart 2000, Bell and Morse 1999, Hart 1999, Bellagio Principles 1996):

1. Those who develop indicator sets must have a vision of sustainability that is appropriate for the particular place and people involved;
2. The indicators should reflect a holistic view of the linkages between the economic, environmental and social aspects of development. They should consider both inter- and intra-generational equity, and they should consider the ecosystem as the base of all systems over various temporal and spatial scales;
3. The process of developing indicators should be open, inclusive to a wide variety of stakeholders, and take advantage of existing techniques and technologies for effective communication, and;
4. The developers need to conduct ongoing assessments of the quality of the indicators in the set.

The actual selection of each indicator should be based on the following checklist of what constitutes a 'good' indicator. Hart (2000) and Bell and Morse (1999) suggest that sustainability indicators should be:

> Easy to understand (even by non-experts) – tells us what we wish to know,
> Relevant – a direct measure of what we want and need to know,
> Reliable – information is trustworthy and valid,
> Accessible – information is available and can be gathered while there is still time to act,

> Useful – there is a purpose.

Indicators can be reported individually, as part of a set, or in the form of a composite index combining various individual indicators into a single number. Indicators can also be divided into two groups: state and driving force (or pressure) indicators. For example, state indicators describe the environmental conditions, while the driving force or pressure indicators refer to the human activities that impact the environmental conditions (Bell and Morse 2001, 1999).

2.8 Examples of Sustainability Indicator frameworks

Sustainability Indicators sets are often developed within a framework to organize them and ensure that they reflect a balanced range of concerns regarding sustainability. Selecting the appropriate framework depends on what information you want and how you want to use the results. Below, I discuss some of the more familiar indicator frameworks, followed in Section 2.9 by some new approaches to create and organize Sustainability Indicators that may be better suited for evaluating community forest projects.

A topic-based framework groups indicators by specific topic areas, such as the economy, the environment, pollution or transportation. Some common examples where this framework is used are measuring the Gross Domestic Product (GDP) to evaluate the state of the economy, or, calculating the Maximum Sustainable Yield (MSY) to estimate a sustainable fisheries harvest. Within this framework, you can easily compare topics to make sure they have a balanced number of indicators, but it has the disadvantage of not being able to measure the links between topics. For example, what is the link between industry, industrial wastes and subsequent impact on

fisheries? Without these links, indicators become static and lose their effectiveness to respond to ever-changing environmental conditions.

The goal-based framework organizes indicators into a matrix determined by the different goals of an interest group. The matrix brings together a variety of indicators that relate to sustainability goals for government, organizations, business or communities. The Canadian National Round Table on the Environment and the Economy (NRTEE) for example, has developed a sustainability indicator framework that uses a "…capital approach that will track stocks of key types of capital – produced, human, natural – needed by future generations" (NRTEE 2001:4). As long as the goals are representative of the constituents, the framework can reflect a range of desires, linkages and trade-offs between the various components of sustainability. If the goals are not representative, than the indicators set will be less useful.

The pressure-state-response framework was developed by the Organization for Economic Cooperation and Development (OECD) as a tool to analyze environmental indicators (Bell and Morse 1999). This framework focuses on the human activities (pressure indicators) that lead to environmental conditions (state indicators) and ultimately to remedial actions (response indicators). Other organizations, such as the United Nations Commission on Sustainable Development, also use this framework but interchange driving force for pressure. Bell and Morse (1999:134) use the following example to illustrate the pressure-state-response framework:

> "Poor air quality is a *state* and one of the contributing *pressures* is automobile emissions; therefore one possible *response* would be to establish automobile emission standards."

The pressure-state-response framework is useful for describing resource problems and for understanding the cause-effect relationships among society, the economy and the environment. However, because the framework is designed to describe complexity, a great deal of time is required to develop clear indicators with values to indicate whether an increase or decrease is preferred.

2.9 Developing new Sustainability Indicator frameworks

New Sustainability Indicator frameworks are being developed to reflect different approaches to measuring sustainability. For example, Bebbington (1999) expands the concept of economic valuation to develop a framework that analyzes the viability and livelihood of rural communities. The framework measures five forms of capital – produced, human, natural, social and cultural – and how the local communities modify this capital, and thus increase their ability to address their livelihood needs. In addition, there are Quality of Life frameworks that include indicators that are necessary to sustain a desired standard of living, using societal norms and people's willingness to pay for these desirable things as a basis (Parkins *et al.* 2001). Rees (1996) developed a set of area-based indicators to measure the impact on human activities, known as the Ecological Footprint model. This model assesses sustainability by measuring the environmental carrying capacity of the land according to human uses, and does a good job of highlighting the inequities of 'footprints' between the developed and developing nations.

Bossel (2001) proposes a systems-based framework to develop sustainability indicators that analyse the performance of interdependent human, natural and support systems. He proposes a systematic approach to developing high quality indicators that measure the performance or sustainability of a system. The framework is based on the concept that all things are part of a system, and that these systems mimic the interdependent and complexity of the natural world. The framework uses indicators to measure the viability (the health) of each system. To measure the viability or health of a system, you must select the essential indicators crucial to the viability of the system. Bossel argues that only be selecting "essential" indicators can we accurately measure the performance of the system over time.

Bell and Morse (2001) address the development of sustainability indicators by asking:

- What do we want to know? How will we find the answers?
- Who wants sustainability indicators and why? How will they be used?
- Do these people also want participation from local people?
- If local participation is required than whose mindset counts?

The answers to these questions and indeed, even asking these questions, introduces a shift from how to measure sustainability towards how to ensure that the "right" indicators are developed and are actually used (Gahin 2001, Bell and Morse 1999). There is also a clear movement to integrate local stakeholders in the development of relevant and realistic sustainability indicators. For example, the Center for International Forestry Research (CIFOR) has developed generic templates of criteria and indicators to measure sustainable forest management practices. The indicator sets were developed by evaluation experts, in consultation with a wide variety of stakeholders. There is both a North American (1999) version and a Sustainable Forest Management (2000) version for developing countries. The sets generate comprehensive measures of social, economic, environmental and policy objectives for sustainable forestry. However, CIFOR cautions that these indicators are only guidelines: to develop a complete set of relevant indicators, you must rely on local input to customize each set (CIFOR 2002).

2.10 Challenges for Sustainability Indicators

It is interesting to note that sustainability indicators face the same operational challenges experienced by community forestry projects: (a) how to ensure local participation in the development of relevant indicators, while at the same time, (b) how to align the indicators within a broad suite of sustainability concerns.

The argument for a participatory approach to developing sustainability indicators is repeated throughout the literature (Bell and Morse 2001, David and Whittington 1998, Meadows 1998). The debate resonates with Chambers' (1983) call for more meaningful participation in our relationships with the developing nations, and this also extends to CBM projects. There is clearly a need to identify sustainability indicators that are specific to local communities, "…after all, if one is to make sustainability indicators more effective, than one should include the views of stakeholders who are ultimately intended to benefit from them" (Bell and Morse 2001:3).

Unfortunately, the number of case studies of locally-defined sustainability indicators is small and often limited to Western examples, such as the Seattle Sustainability Indicators (1993). However, there is growing support for locally-defined sustainability indicators within the context of development projects as "…another potential tool within highly localized processes of empowerment and change" (Bell and Morse 2001:22). In the Philippines, Johnson (1999) discusses a new five-year study of community-based management projects using an experimental joint-assessment approach to locally-define the criteria and indicators to verify successful, sustainable, forest resource management. According to Johnson (1999:30) the '…simplicity, feasibility, validity and credibility…' of sustainability indicators will increase if a participatory approach to indicator definition is used. Thus, practitioners in sustainable development have called for participatory approaches within project evaluations as an effective means to develop sustainability indicators (Bell and Morse 2001).

In the next chapter, I apply the lessons learned from the literature to develop an analytical framework and approach with which to conduct my research on participatory approaches to developing local Sustainability Indicators.

Chapter 3: ANALYTICAL APPROACH AND FRAMEWORK

3.0 Introduction

Based on the literature review, I decided to test two approaches to developing indicators: conventional and participatory. The former are called Project Indicators (PI) while the latter are called Local Indicators (LI). The goal of my research was to assess the PI and LI sets and evaluate which one performed best against the criteria of sustainability. I selected a community-based forest management project in Siem Reap, Cambodia as my case study.

Before developing the indicator sets, I had to select an analytical approach capable of assessing indicators for sustainability, and provide the rationale for choosing a comparative analysis approach. I developed a composite of sustainability indicators frameworks. This composite is the Sustainability Indicators Standard (SIS), the benchmark against which I compared indicator sets. Finally, I developed an analytical framework to structure how I would collect data and analyze the results.

3.1 Case study site

The Angkor Community Forest Project was the basis of my study primarily because of my familiarity with the project, but also because the project addressed two areas of research outlined in Chapter 1: the project used a participatory approach, and the project had objectives congruent with sustainable development (environmental, economic, and social). As well, no evaluation of the performance of the case study project has been undertaken.

The study site is also representative of community forest projects previously undertaken in developing countries. Table 1 lists some of the key characteristics of Community-Based

Management (CBM) projects summarized from the literature, the majority of which are shared by the Angkor Community Forest Project.

Table 1 **Key characteristics of Community-Based Management (CBM) projects in developing countries shared by the Angkor Community Forest Project.**

Characteristic	Angkor Community Forest Project (Y/N)
Clear boundaries for community forest land	Yes
Community Forestry Committee established and functioning	Yes
Management plans	Yes
Management of both flora and fauna	No
Objectives of conservation and socio-economic development	Yes
Mechanism to distribute benefits	Yes
Dispute-resolution mechanisms	Yes
Ability to address gender inequities	Uncertain
Recognition and approval by government (local or regional)	Yes
Community forestry legislation (national recognition)	In Progress

Source: Adapted from Ostrom (1998), Wells (1994) and Arnold (1991)

Because I had worked for two years on the Angkor Community Forest Project (1997 – 1999), I was knowledgeable about the history of the project as well as the people and language of Cambodia. The site was accessible in wet or dry seasons and I was able to secure support and co-operation from the key organizations and government departments that work with the villagers and in forest management in Angkor Park. Most importantly, the villagers were willing to participate in the research, and graciously offered to share their homes, knowledge, experience, and valuable time.

3.2 Analytical approach

To conduct the research, I required an analytical approach that could assess the performance of the Local Indicators and Project Indicators, in terms of sustainability. I reviewed the literature to find a suitable analytical approach that meets the following criteria:

- accounts for qualitative and quantitative aspects of sustainability (social, economic and environmental);
- able to work with objectives and performance indicators;
- able to assess indicators regardless of how they were derived (e.g., conventional or participatory), and;
- suitable to work with a one-time *ex post* evaluation of a five-year project.

I immediately rejected statistical analysis (tests of significance) for the following reasons. First, there was no cause-effect relationship to be tested because I did not isolate independent-dependent variables. The only variable being tested was the approach to developing the indicator sets and the two approaches did not affect each other or the results. Second, the sampling process to select the case study site was not random, and tests of significance are properly used to assess to what extent the results are possible within a random sample. Thus, it would be inappropriate to use tests of significance to analyse the results (Jackson 1999).

I also rejected inductive analysis. Inductive analysis sorts out patterns, themes, and categories of analysis arising from the data (Patton 1980). However, in my research, the categories of analysis were pre-selected (ecological, social and environmental sustainability) and inductive analysis would not be feasible.

Systems-based analysis (SBA), described in Section 2.9, seemed capable of assessing sustainability by measuring the complexity within and between systems, and like my research, SBA uses indicators to measure the resilience or viability of these systems over time (Bossel

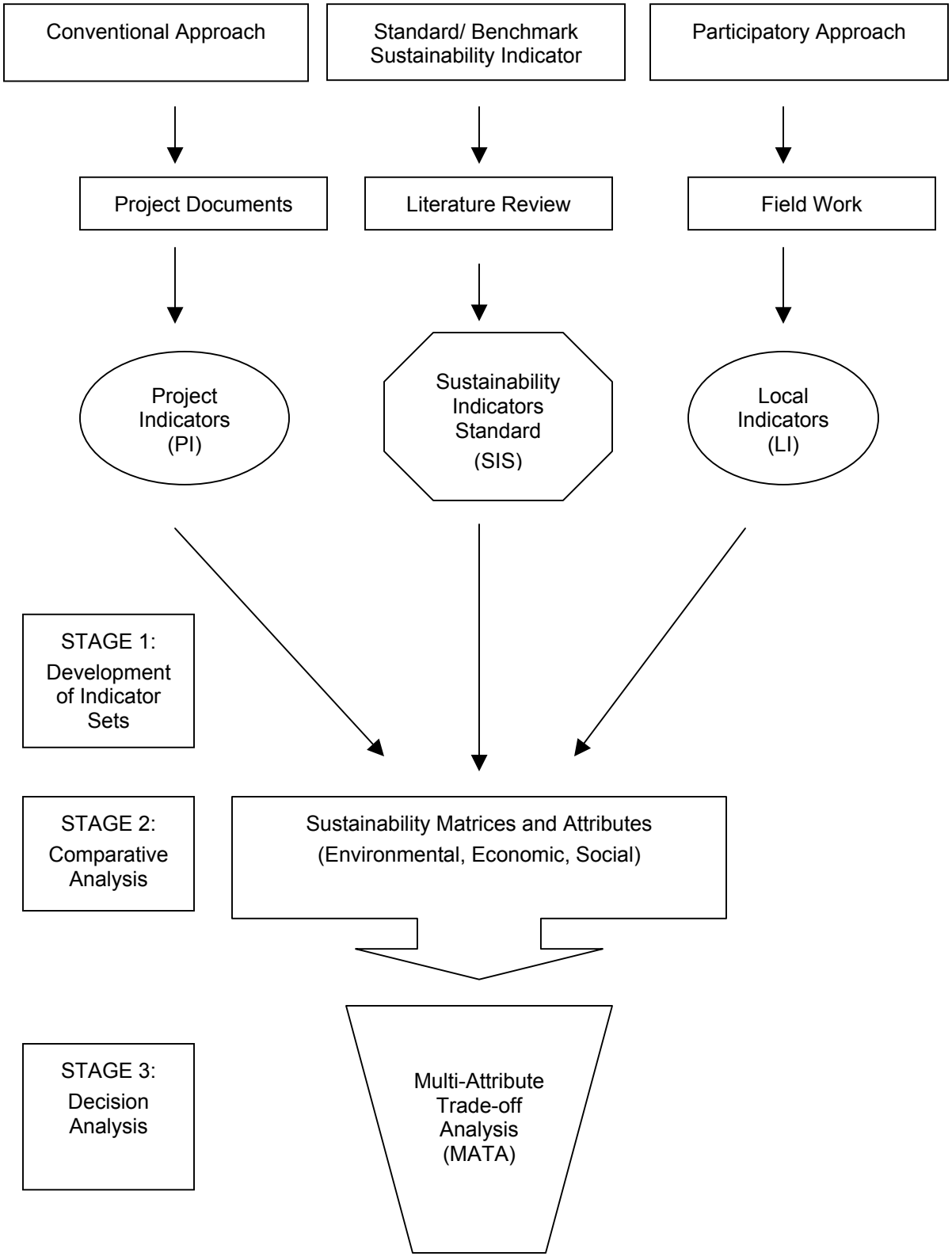
2001). SBA was rejected because my indicator sets were derived only once, and the SBA requires continuous evaluations to assess the viability (sustainability) of the indicators and systems over time.

I initially considered case study analysis but had to reject it. Case study analysis involves organizing the data into one or more specific 'cases', with an in-depth study of these cases. The case study is often a descriptive narrative of the research (e.g., how the indicator sets were developed, project history) but this approach does not help me assess the performance of the indicators (Patton 2002).

As my research was a comparison between two groups, I decided to use a comparative analysis approach because it was flexible enough to fulfill all my research criteria. Comparative analysis is an analytical approach used to establish equivalence between two or more 'units' against a benchmark or 'standard' (Patton 1980). Comparative analysis assumes that if a standard is valid, and the units being studied meet certain criteria of equivalence against this standard, it is then possible to infer that the units will also be valid (Jackson 1999). For my research, the indicator sets (PI and LI) are the 'units' being compared against a 'standard' of sustainability (SIS) to infer which set better meets the criteria for sustainability.

The analytical approach was used to collect information and analyze the research results. Figure 1 illustrates how data were collected, summarized and comparatively assessed. Each stage of the analytic approach is described in greater detail below.

Figure 1 Analytical framework to comparatively assess the sustainability of Project and Local Indicators for the Angkor Community Forest Project.



Stage 1 of the analysis develops the indicators and sustainability standard and provides a preliminary discussion of the LI, PI and SIS. It concerns how the indicator sets were developed, organized, and what objectives were used. The development of the SIS is discussed in Section 3.3. The development of the LI and PI are described in Chapters 4 and 5 respectively. Chapter 4 describes the conventional approach, whereby I act as an external consultant to develop a set of PI to evaluate the case study project. I rely on secondary sources of information, mainly project documents, as well as field visits and indicator literature to develop a set of PI. Chapter 5 describes the participatory methods employed by the study team and local beneficiaries to develop a set of LI, and relies on the local beneficiaries as the primary source of information. The study team employs a number of participatory tools to elicit information, to verify the data collected, and to minimize bias.

In Stage 2, I comparatively assessed the LI and PI against the SIS using sustainability matrices. Chapter 6 describes how the three matrices were prepared, using the environmental, economic, and social objectives of the SIS. I divided the indicators from the LI and PI into these three matrices to assess their performance. Total performance for the LI and PI was calculated by comparing two measures of performance derived from the sustainability matrices (Section 6.1). At the end of Stage 2, I used these performance measures to assess the sustainability of the LI and PI (Section 6.2).

Stage 3 complements the comparative analysis by conducting a decision-analysis using Multi-Attribute Trade-off Analysis (MATA). MATA was selected for it's role as a decision-making tool to help objectively assess which indicator set – the LI or PI – performs best against the SIS. For MATA, certain performance measures or 'attributes' of the indicator sets were weighted and summed to decide which indicator set performs better against the SIS. In this case, the two performance measures used in Stage 2 were also used as the multiple 'attributes'. Both

measures were weighed, normalized, and compared to help reach a decision on which indicator set has the best performance. The decision-rule for MATA states that decision-makers should choose the alternative or option that dominates, regardless of weighting (Doyle and Green 1995). The MATA is an additional tool to help decide which indicator set performs best (dominates) in terms of sustainability (Section 6.3). The decision analysis concludes with a discussion of the results in Section 6.4.

3.3 The Sustainability Indicators Standard (SIS)

The Sustainability Indicators Standard (SIS) represents a standard or benchmark of project performance in terms of sustainability and it was used to assess the sustainability of the LI and PI. The Sustainability Indicators Standard (SIS) is a composite of objectives and performance indicators derived from sustainable indicator frameworks introduced in Section 2.9.

I organized the SIS as an objective-indicator matrix, as described by Hart (1999). I selected the objective-indicator matrix as the simplest approach to present indicators, because it is clearer and reduces delays associated with defining the complex terminology of conventional indicator sets, i.e., principles, criteria, indicators and verifiers (CIFOR 2000, 1999). Indicator sets can consist of 10 to 100 indicators, but based on Bossel (2001), I capped the SIS at the workable number of 30: enough indicators to measure results accurately without the chance of overlap or gaps.

Three indicator sets form the basis of the SIS. The first two were developed by the Center for International Forestry Research (CIFOR) and are known as the Generic Templates of Criteria and Indicators for Sustainable Forest Management – one for developing nations (CIFOR 2000) and one for a North American context (CIFOR 1999). The CIFOR template was selected as the basis for the SIS because: it is a comprehensive list of indicators; it relates to developing

countries; it strives to meet the objectives of sustainable forest management; and it has a simple presentation style. The third set is the Zoning and Environmental Management Plan (ZEMP) Sustainability Indicators prepared as part of a joint initiative in 1994 between the Royal Government of Cambodia and the United Nations Environmental, Scientific, and Cultural Organization (UNESCO 1994). The ZEMP indicators were developed to monitor and improve environmental sustainability and the social and economic conditions within the World Heritage Site of Angkor Park. Not only do the ZEMP Indicators meet the criteria of sustainability, but they are relevant to developing countries and, in particular, apply to natural resource management in the case study area of Angkor, Cambodia. Other sources consulted include Bell and Morse (1999), the Principles and Criteria of the British Columbia Forest Stewardship Council (FSC 2000), Hart (1999) and the Canadian International Development Agency Guide to Gender-Sensitive Indicators (1997).

A summary of the SIS is shown in Table 2 (see Appendix A for full details). The SIS is organized around 3 objectives associated with environmental, economic and social sustainability, with 29 indicators to measure the *ex post* performance of a five-year community forest project in a developing country. The SIS was the benchmark against which the LI and PI would be compared, and as such, I designed it to ensure equivalence of measures necessary for effective comparative analysis (Patton 1980). Thus, the choices made in the design of the SIS influenced how the PI and to a lesser extent the LI were derived. A complete description of the development of the PI and LI can be found in Chapter 4 and 5 respectively. With a standard in place for the comparative analysis, I proceeded to develop indicators sets using conventional and participatory approaches.

Table 2 **Sustainability Indicators Standard (SIS) for evaluating the performance of community forest projects in developing countries.**

	OBJECTIVES/INDICATORS	SOURCE
	Objective 1: The project has met or exceeded a minimum set of goals associated with the health of the forest ecosystem	
1.1	Quality and quantity of traditional forest ecosystem type maintained and/or restored	CIFOR (2000)
1.2	Forest biodiversity maintained or enhanced to an agreed minimum standard (e.g., regional conservation plans, community plans, international convention)	CIFOR (2000, 1999), UNESCO (1994)
1.3	Positive linkages to neighbouring ecosystems and consideration of other land uses (e.g., wildlife habitat, agriculture)	CIFOR (1999), UNESCO (1994)
1.4	Ecologically sensitive areas are protected	CIFOR (2000)
1.5	Rare or endangered species are protected	CIFOR (2000)
1.6	Erosion and other forms of soil degradation are minimized	CIFOR (2000, 1999), UNESCO (1994)
1.7	Levels of genetic diversity maintained or enhanced, particularly indigenous species	FSC (2000), CIFOR (2000, 1999)
	Objective 2: The project ensured the equitable distribution of benefits from forest resources for both current and future generations	
2.1	A comprehensive forest management plan exists for sustainable use of timber and non-timber forest products	CIFOR (2000, 1999), UNESCO (1994)
2.2	Local people have secured rights and access to forest resources	CIFOR (2000, 1999)
2.3	Access to forest resources is perceived locally to be secure and fair	CIFOR (2000)
2.4	Evidence of compliance or successful enforcement of rules governing access and use of community forest.	CIFOR (2000), UNESCO (1994)
2.5	Local people's understand both financial and intangible benefits of the forest (e.g., timber, fuel-wood, subsistence, medicines, socio-cultural, recreational, aesthetic, legacy)	CIFOR (2000)
2.6	Opportunities exist for local people to receive a mix of short and long-term benefits from community forest activities	CIFOR (1999), UNESCO (1994)
2.8	Benefits are distributed equitably over time among all groups (especially among disadvantaged groups – e.g., women, disabled, very poor or elderly)	CIFOR (1999), UNESCO (1994)
2.9	People invest in their forest (e.g., time, labour, money) and the destruction of forest resources is rare.	CIFOR (2000, 1994)
2.10	Regular economic audits to ensure the benefits derived from the project exceed the costs (e.g., Benefit-Cost Analysis)	CIFOR (1999), UNESCO (1994)
2.11	Recognition of resource scarcity and increased concerns for resource availability for current and future generations	CIFOR (1999), UNESCO (1994)
	Objective 3: The project developed or maintained new and existing socio-cultural institutions to support community-based management activities	
3.1	Community-based groups exist and have mechanisms to promote group cohesion and build social capital	CIFOR (2000, 1999), CIDA (1997)

Table 2 (cont'd) Sustainability Indicators Standard (SIS) for evaluating the performance of community forest projects in developing countries.

	OBJECTIVES/INDICATORS	SOURCE
3.2	Key stakeholders participate in all stages of the project	Bell and Morse (1999), CIFOR (1999)
3.3	Inclusive representation of diverse group of stakeholders at all stages of project	CIFOR (2000, 1999)
3.4	Contributions made by all stakeholders are mutually valued and respected	CIFOR (2000, 1999)
3.5	Local communities have a degree of participation in decision-making at local and regional levels	UNESCO (1994)
3.6	Members have satisfactory knowledge of forest use and management plans.	CIFOR (2000, 1999)
3.7	Stakeholders (including children) are educated formally and informally about community-managed forests	CIFOR (2000, 1999)
3.8	Forest management plan includes training needs assessment of stakeholders and training schedule.	CIDA (1997)
3.9	Increased human capital (e.g., technical skills, abilities, education)	CIDA (1997)
3.10	Monitoring results are regularly incorporated into the implementation and revision of management plans	CIFOR (2000, 1999)
3.11	Reduced dependence on external support (financial, technical assistance)	UNESCO (1994)

Chapter 4: DEVELOPING THE CONVENTIONAL PROJECT INDICATORS (PI)

4.0 Introduction

This chapter describes Stage I of the analytical approach – the development of the first set of indicators, the Project Indicators (PI) using the project objectives as spelled out in project documents from the case study. As well, I provide an overview of the case study area and describe the villages, the community forest project, and the initial outcomes of the project. The chapter concludes by presenting the results, the PI, and a brief discussion of the outcomes.

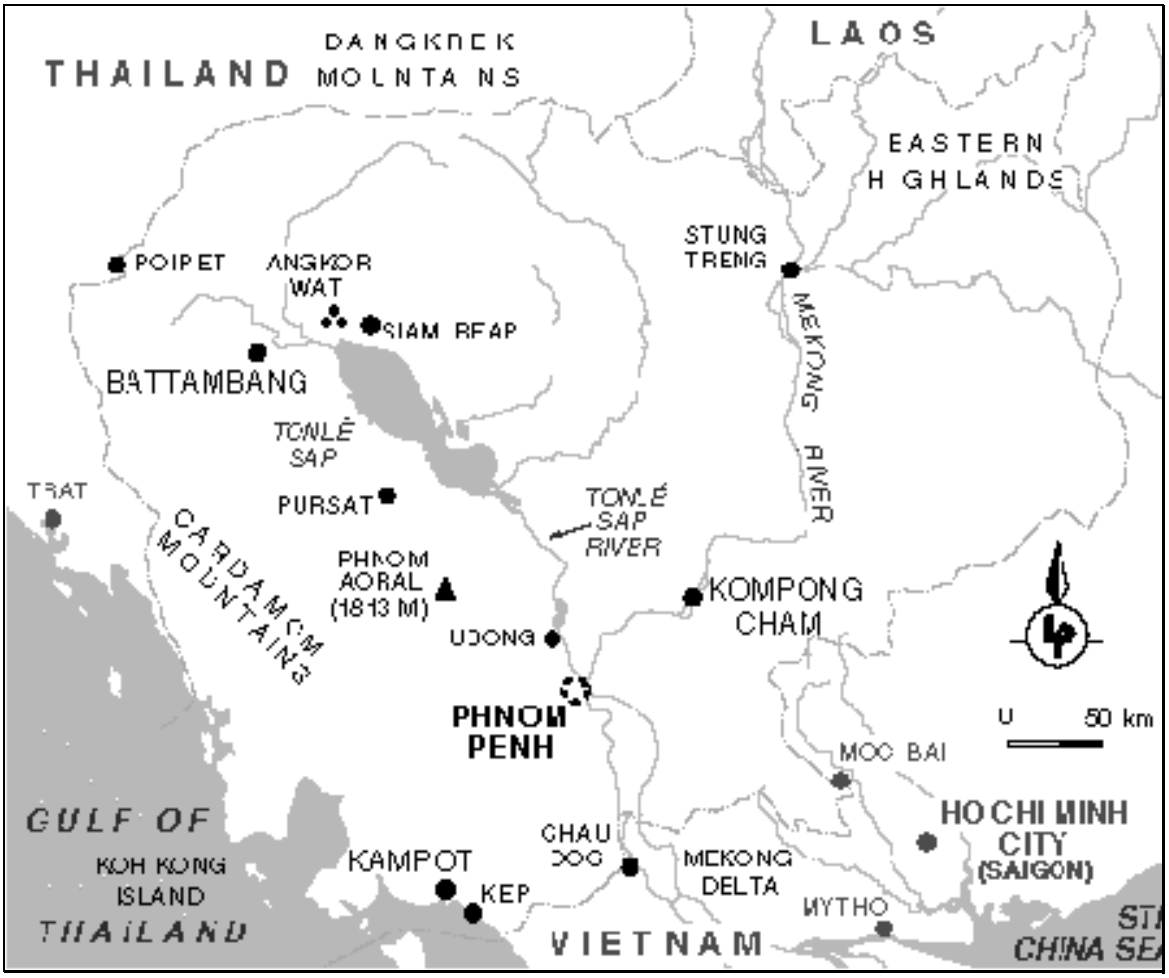
4.1 Situational analysis: Cambodia

The Kingdom of Cambodia is situated in the heart of mainland Southeast Asia and bordered by Vietnam, Thailand, and Laos (13^{o} North and 105^{o} East). The total land area of Cambodia is 181,126 km^2. Mountain ranges and hilly plateaus border the country to the north and east, while southern coastal zones and central plains are the primary areas of agricultural production (see Figure 2). In the middle of the country is the largest permanent freshwater lake in Southeast Asia – the *Tonle Sap* or Great Lake which supports fishing and transportation within the Kingdom.

The official 1998 census reported a population of 11.4 million, 90% of which are ethnic Cambodian or *Khmer*, pronounced *Kah-mair* (Ministry of Planning 1999). Small pockets of Vietnamese, Chinese and others comprise the remainder of the population. Most people speak the local language, *Khmer*, with some French and English. Over 97% of the population practice Theravada Buddhism (Ministry of Planning 1999). The majority of Cambodians live in rural

areas, an alarming 40% live below the poverty line. Hence, it is not surprising that over 78% of the population rely on natural resources – agriculture, fish, wildlife, and forests – for their survival (Ministry of Planning 1999).

Figure 2 Map of Cambodia



Cambodia is emerging from over three decades of war, political conflict and authoritarian regimes, particularly the communist regime of the Khmer Rouge *(red Khmer)* from 1974 – 79. It is estimated that up to 2 million Cambodians died over the four-year Khmer Rouge period – a result of war, starvation, torture, exhaustion, malnutrition, lack of medical care and political

executions (Chandler 1991). The challenge remains to rebuild the Kingdom's human and natural resources.

4.2 Case study area: Angkor

4.2.1 Historical overview of Angkor

Cambodia was the first country in Southeast Asia to establish a national park in 1925, when the 10,800 ha of forest and temples in Angkor were designated as the Angkor Archaeological Park. Angkor contains over 800 temples built between the 6th and 14th century, including one of the Seven Wonders of the World – the majestic Angkor Wat. The temple complex is just outside Siem Reap town in the central plains of Siem Reap Province. The *Tonle Sap* lies to the south, and the vast Phnom Kulen Mountain Range lies to the north.

Angkor's temples are surrounded by lush, semi-evergreen tropical forest of quality and quantity that is now rare in Cambodia. The tropical rainforests of Angkor consist primarily of species from the families *Dipterocarpaceae, Leguminosae, Lythracaeae* and *Fagacae.* Consequently, the Biodiversity Decree of 1993 designated Angkor as a Protected Landscape Area. As well, due to its cultural and archaeological significance, Angkor was internationally recognized as a World Heritage Site in 1994 (Ministry of Environment 1998). According to archaeological records, Angkor has been settled for centuries, with small villages formed around multiple *kroms* or family 'groups' (Choulean *et al*. 1998). Today's villagers continue conventional patterns of settlement, with groups of roughly 200 families per village. Once covered by open forests, much of Angkor has been converted to agriculture over the centuries.

The people of Angkor typically rely on one rain-fed crop of rice per year for subsistence, but the forests are perhaps equally important to rural communities. Ninety-seven percent of rural

families rely on fuel-wood and charcoal for cooking and heating (Ministry of Planning 1999). Forests also provide materials for housing, tools, equipment and boats, and they supply a wide variety of foods and medicines. Resins, gums, oils, fruits and fuel-wood are also collected as marketable products to supplement incomes.

4.2.2 Conflicts: People and forests in Angkor

Prior to the 1970's, the majority of forest resources were under state control and managed by the Provincial Department of Forestry. However, *de facto* understandings at the village level considered all non-private land to be open-access for collection of fuel-wood and non-timber forest products. Neighbouring villages respected each other's conventional 'communal' areas, and there was no impingement on private lands. Villagers could obtain permission from the Provincial Department of Forestry to clear communal land for agriculture or to fell trees for construction (Ly Beang, National Department of Forestry, personal communication 2001, Hubbard 2001).

This relatively stable lifestyle was drastically altered in the 1970's by the political upheavals, chaos and poverty from which the country is only now beginning to recover. The Khmer Rouge cleared a large part of the Angkor primary forest for permanent agriculture, and unregulated commercial logging from the 1980's onwards has altered the vegetation drastically (Choulean *et al.* 1998). In addition, the current desperate economic conditions coupled with rapidly growing local communities, has resulted in strong exploitation pressure on all available resources. Open access to the forests of Angkor has encouraged unsustainable practices by both local communities and external users (Choulean *et al*. 1998).

Local families continue to engage in conventional activities, but now at an unsustainable rate (Choulean *et al*. 1998, UNV/UNDP 1995). Some examples of these activities are large-

scale slash and burn agriculture, charcoal production, over-harvesting of non-timber forest products (vines, resin from *Dipterocarpus alatus* or *yeang*) and unsustainable rates of fuel-wood extraction. Forest quality, quantity and diversity have decreased in recent decades, and there are fears that the forests of Angkor, if they continue to be exploited at current rates, will no longer have the capacity to regenerate (Choulean *et al.* 1998, UNESCO 1994).

4.2.3 Managing the forests of Angkor

Prior to 1993, Angkor was under the jurisdiction of the Ministry of Tourism and Culture, and forest management was supervised by the Provincial Department of Forestry. After designation as a Protected Area in 1993, Angkor was initially placed under the jurisdiction of the newly-formed Ministry of Environment. The result was on-going conflict with the Department of Forestry, whose management role had been undermined. The conflict was perhaps moot: the Ministry of Environment had been given 23 Protected Areas to manage, but had neither the budget nor the technical capacity to do so (Ministry of Environment 1998).

Fortunately, designation of Angkor as a World Heritage Site in 1994 brought technical and financial support from UNESCO (United Nations Environmental, Scientific, Cultural Organization). This support was key in establishing APSARA (the Authority for the Protection and Management of Angkor and the Region of Siem Reap), an umbrella agency and was the first step towards realizing objectives for Angkor and Siem Reap (i) to establish durable economic dynamism (locally, nationally, internationally), and; (ii) to protect and promote the cultural and natural heritage (UNESCO 1994).

To protect the forests, a Royal Sub-decree (law) was passed that effectively prohibited all harvesting or collection of trees and/or forest products (Royal Government of Cambodia 1994). The impact of the Sub-decree was disastrous for the villagers in Angkor: up to 90% of their

incomes came from selling fuel-wood, resins and vines collected from the nearby Angkorian forests (UNV/UNDP 1997, 1995). Fuel-wood and timber were still available in neighbouring districts, but the cost, time and effort to collect these products were prohibitive. Conflict with local government authorities and APSARA's enforcement arm, the Heritage Police, increased and many families resorted to illegal harvesting – at unsustainable rates – to meet their basic needs (UNV/UNDP 1997, 1995). Clearly, an alternative was urgently needed to strike a balance between the temples, trees and people. The alternative proposed was community-based forest management, to be implemented under the auspices of a United Nations participatory rural development project that targeted the needs of villagers living in Angkor.

4.3 Case study project: the Angkor Community Forest Project

4.3.1 United Nations Community Participation in Protected Areas (CPPA) Project

The CPPA project (CMB/93/007) worked with 7 of the 20 villages within Angkor from April 1995 – March 2000, supporting a wide range of poverty-alleviation activities in the target villages. It was the only national or international development project that worked directly with the villages in Angkor. The primary objectives were to support the natural and cultural environment of Angkor Park and to build the capacity of the local communities to engage in environmentally sustainable economic activities. The project used a Participatory Action Research approach (PAR) to encourage local community members to identify and address their own development needs in a sustainable manner. The CPPA project was supported by the UNV (United Nations Volunteers) and UNDP (United Nations Development Program), employing a staff of 10 Khmer National UNV's and 3 International Specialists. The CPPA project ended in May 2000. At this point, the Project was localized to the non-governmental Angkor

Participatory Development Organization (APDO). APDO continues to function in 11 Angkor villages, using a participatory approach and former project staff, albeit with a reduced budget.

4.3.2 The Angkor Community Forest Pilot Project

Between 1995 and 1997, CPPA project staff researched and documented the impacts of the 1994 Royal Decree on the livelihoods of the local villagers. The project used a two-pronged approach to resolve forest resource conflicts. First, the community was engaged and trained to implement a community-based management project to protect and sustain forest resources. At the same time, CPPA project staff presented the plight of the local communities to concerned government agencies and received approval to conduct community-based management pilots in the Park and lobbied for community forestry legislation. It was hoped that raising the awareness of both stakeholder groups (communities and government) would lead to better discussions and participation in the management of Angkor, moving from a 'centralized control strategy' to a 'sustainable community-based management' strategy that would strengthen the role of local communities as decision-makers (UNV/UNDP 1997, FAO 1994). After a series of workshops, exposure visits and training, two villages were identified in 1998 as the most suitable and eager to pilot community forestry.

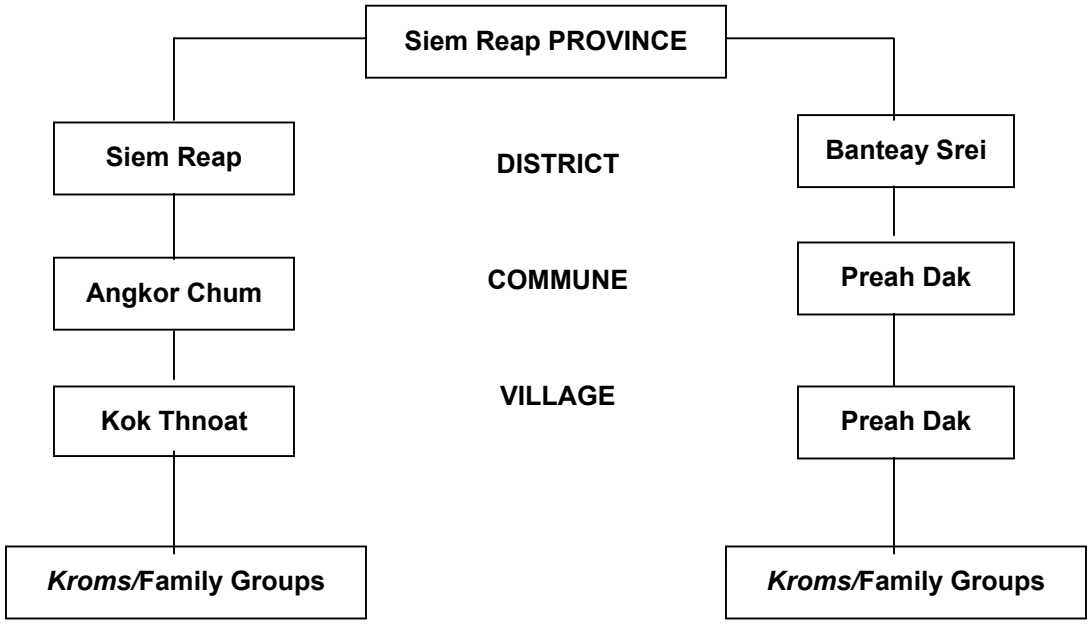
4.3.3 Case study villages

The two pilot villages are Preah Dak (*Pray- dahk*) and Kok Thnoat (*Coke-Thnout*). Preah Dak village lies 10 km north of Siem Reap town and on the banks of the Eastern Baray, an ancient irrigation reservoir. The Baray became unusable due to sedimentation in the early 10th century. However, today the channel is ideal for rice cultivation, and the long banks of the reservoir serve as conventional fuel-wood collection areas. The households of Preah Dak

straddle the paved Road #67 that leads north to the remote temple of Banteay Srei (*the citadel of women)* and the sacred Phnom Kulen (*lychee mountain)*. It is the largest village and administrative capital of its commune (Figure 3), with a primary school, a large market and a Buddhist Pagoda (*Wat).*

Kok Thnoat, on the other hand, is a more remote village with little infrastructure and fewer administrative institutions than Preah Dak. The village lies on the northern bank of the Western Baray, approximately 20 km north-west of Siem Reap town. The village is nestled between Kok Beng village to the east and Peam village to the west. Nearby there is also a military camp and the western gate of Angkor Thom that leads to the Bayon temple. The village has a six-room primary school but little else apart from households. Access to the village is severely limited due to poor roads that can flood for up to four months of the year (see Appendix B: Map of Case Study villages). For both villages, governance is defined through a hierarchical system of chiefs and deputy chiefs at various administrative levels from village to commune to district (Figure 3).

Figure 3 **Administrative context of case study villages in Angkor Community Forest Project.**



The demographic statistics for the villages from 1995 to 2001 indicate that Preah Dak has experienced an average annual population growth rate of 1.4% over the last seven years, while Kok Thnoat is rapidly increasing at the rate of 2.9% per year (Table 3).

Table 3 Demographic statistics for Preah Dak and Kok Thnoat villages.

Preah Dak Village/Statistic	**1995**	**1998**	**2001**
Total number of families	240	250	273
Population	1274	1341	1407
Males	576	618	679
Females	698	723	728
Average family size	5-7 persons	5-7 persons	5-6 persons
Average annual population growth rate:	1.4%		

Kok Thnoat Village/Statistic	**1995**	**1998**	**2001**
Total number of families	314	350	402
Population	1815	1993	2272
Males	911	1082	1246
Females	904	911	1026
Average family size	5-7 persons	5-6 persons	5-6 persons
Average annual population growth rate:	2.9%		

Sources: Hubbard (2001), CARERE/SEILA Commune Inventory (1999), UNV/UNDP (1999), (1995)

Almost all families in Preah Dak and Kok Thnoat identify themselves as farmers – primarily for rice production, but also raising livestock, cultivating fish farms and tending to home gardens and fruit trees. However, most families need supplementary income to compensate periods of rice deficit or to pay for weddings, funerals, religious ceremonies, school fees, sundries, transport, and health services. The conventional 'second' occupation is collecting forest products for household use and sale.

4.3.4 Project summary: Objectives and outcomes

The primary objectives of the Angkor Community Forestry Project were:

- to protect and conserve forest resources in Angkor;
- to improve the livelihood opportunities of local communities living within Angkor, and;
- to promote the use of a participatory approach in developing local community capacity to manage local forest resources.

Project staff and external UN advisors set the project objectives with limited consultation with local beneficiaries (UNV/UNDP 1997). The Community Forestry Project received the majority of its funding and technical support from the implementing agencies UNV and UNDP. Additional funding also came from the Canada Fund for Small Projects, administered by the Canadian Embassy. The project worked very closely with the FAO (United Nations Food and Agricultural Organization) Project *Participatory Natural Resource Management in the Tonle Sap* and the Provincial Department of Forestry, who generously provided training and technical advice. Strong partnerships were also developed with AgriSud (a French NGO specializing in agro-forestry), APSARA, and government officials at the provincial, district, commune, and village levels. Preah Dak and Kok Thnoat villagers donated their time, labour, land, and materials (UNV/UNDP 1999, 1998).

Each village demarcated the actual land base for its pilot in a slightly different manner. In Preah Dak, the villagers requested and received permission from the Commune Chief to appropriate 40 hectares of degraded land on the banks of the Eastern Baray reservoir. The land had historical precedent as an open-access site for fuel-wood and vegetable collection by Preah Dak villagers. The monks at Wat Preah Dak also donated 12 ha of protected forest adjacent to the Pagoda, for a combined total of 52 ha of community forest. In contrast, Kok Thnoat did not have a large parcel of communal land available. However, there were approximately 50 ha of severely degraded private forest between the road and the southern portions of some homesteads. The forest owners agreed to donate the land to the Community Forest Project in exchange for a

share in the long-term returns. Similarly, the village chief and homestead owners agreed to donate 15 communal hectares of previously protected *yeang* forest located near the primary school, for a total of 65 ha (UNV/UNDP 1998,1997). With secured funding, land and participation from a wide variety of stakeholders (especially the local beneficiaries), project activities commenced in February 1998 (Table 4).

Table 4 Project summary for case study villages Kok Thnoat and Preah Dak.

	Kok Thnoat	Preah Dak
Protected areas	15 ha	12 ha
Planted areas	52 ha[1]	36 ha
Total trees planted	33,751	31,937
Nursery size	300 m^2	300 m^2
Number of fuel-efficient cook stoves	178	204
Number of fuel-efficient palm sugar stoves	0	45
Number of fruit trees – private land	1,560	1,743
Income from harvesting trees	0	0
Income from nurseries (seedling sales at village and inter-village)	5,000 riels[2]	70,000 riels[2]
CF Members (families)	271	250
Number of forest guards	1	4
Number of forestry management-related trainings	36	39

[1] 2 ha have been added to the original 50-ha plot of community forest.

[2] The conversion rates for August 2001 were 4000 riels = $US1 = $CDN0.60

As of August 2001, there were 117 ha of community forest in Kok Thnoat and Preah Dak. Roughly 65,700 timber and fuel-wood trees have been planted in these areas. Over 600 people have been actively involved in the local management of their forests, and of these over 250 have participated in forest-management-related training. After almost five years, the community forestry institutions are still active, involving over 70% of families in Kok Thnoat and 92% of families in Preah Dak. The major outcomes of the project are summarized in Table 4 (UNV/UNDP 2000, 1999, 1998, 1997).

4.3 Developing Project Indicators (PI) using a conventional approach

4.4.1 Introduction

For Stage 1 of my comparative analysis, I needed to develop a set of indicators specific to the project, using a conventional approach. The following sections discuss how the PI were developed, present the complete PI set, and discuss some of the characteristics of the PI.

4.4.2 Methods

To develop the PI, I went to great lengths to ensure that the evaluation was impartial, consistent, accurate, and not distorted (Table 5). I decided to develop the indicator set based on my previous project evaluation experience in Cambodia with UNV/UNDP and Concern Worldwide, an International NGO. For instance, I previously had designed and implemented over 10 project monitoring systems (using objectives and indicators) related to natural resource activities. I evaluated the outcomes of community-based forest projects throughout Cambodia, designed and conducted a strategic review of Concern's national program objectives, and evaluated the effectiveness of community-based irrigation schemes. As well, I participated in numerous external program evaluations between 1997 through 2000, and developed a range of skills related to project evaluations.

For this research, I assumed the role of an external consultant hired to conduct a conventional *ex post* project evaluation of the Angkor Community Forest Project, specifically to develop a set of indicators. I drafted a fictitious Terms of Reference (TOR) to set standards for how the PI would be developed (Appendix C) and gave myself three weeks to complete the assignment.

Table 5 **Research protocol to reduce bias in conventional approach to develop Project Indicators (PI) for the Angkor Community Forest Project.**

Potential bias	What is it?	Steps taken to minimize bias
Raised or false expectations	The research results may be linked with financial/funding opportunities and the results may be prejudiced.	• The research was conducted for strictly academic purposes. • The researcher did not receive monies for the evaluation results.
Consistency	Research activities facilitated by different people, using different approaches and techniques, different places could result in variances in results.	• There was 1 researcher who collected information, and analysed results. • Structured PI to achieve 'equivalence' with established indicator frameworks. • Consulted the literature on indicator sets. • Consulted the literature on project evaluations. • Researcher relied on past experience in project evaluations, tools, techniques.
Researcher bias	The researcher is overly familiar with the project, and may be unable to objectively collect data.	• The researcher relied on project documents, field visits, and indicator literature to develop the PI. • The researcher had distanced herself from direct involvement with the project. She had not worked on the project since 1999, and had not been in contact with project beneficiaries since August 2000. • Maintained separate identity from project. • Maintained distance from project beneficiaries during development of PI. • Guidelines were established (draft Terms of Reference) to set clear objectives for how to develop the PI.
Verification of results	The results may not be accurate or reliable if they can not be verified.	• All indicators were subjected to a 'triangulation' test – such that only indicators that could be verified from a minimum of three sources could be included in the final set of PI. • Consultation with project documents, government departments, semi-structured interviews, field surveys, and indicator literature.

I used a conventional approach to develop a set of PI based on the original project objectives (Section 4.3.4). I reviewed project documents, such as project proposals, quarterly and annual reports, to get an idea of how well the project objectives had been met. I visited the two villages to develop site-specific indicators to measure the project impacts. I interviewed relevant government officials involved in forest resources and the management of Angkor. I also

relied on existing performance indicators sets that were relevant to the project, such as UNESCO (1994) and CIFOR (2000, 1999). To ensure the PI were equivalent with the Sustainability Indicator Standard (SIS), I used an objective-indicator matrix and limited the number of indicators to a maximum of 30, as per Section 3.4 and Bossel (2001).

By setting these parameters, I was able to reduce the potential bias in the results by developing the PI using a highly structured approach with techniques to verify the results (Table 5). Unlike a conventional evaluation, I purposely did not consult the local beneficiaries, or project staff, to prevent prejudicing the outcome of the local evaluation (see Section 5.1.5 for techniques used to minimize bias in the participatory research).

4.4.3 Results: The Project Indicator (PI) Set

The PI consists of 22 indicators arranged according to 3 project objectives within an objective-indicator matrix (Table 6). There were two main factors that influenced the development and quality of the PI: the scope of the project objectives, who develops the objectives, and how the indicators were selected.

In keeping with a conventional approach to project evaluation, the PI relied primarily on project objectives set at the outset of the project. For the Angkor project, the objectives seemed to be too general and ill-defined (Section 4.3.4). For example, Objective 1 seeks "to protect and conserve the forest resources in Angkor" but fails to define how, when, what the boundaries are, or what type of forest resources should be included. The project objectives are weakened because of a lack of temporal or well-defined spatial goals, and because the objectives were developed externally without full consultation with the local communities. The quality of the indicators depends on the quality of the project objectives. If the objectives are weak or inappropriate, there is the risk that the resulting indicators will fail to measure crucial

Table 6 **Project Indicators (PI) for the Angkor Community Forest Project derived using a conventional approach.**

	OBJECTIVES/INDICATORS	SOURCE
	Objective 1: To protect and conserve the forest resources in Angkor	
1.1	Amount of protected area as a percentage of total forest area	UN (2001)
1.2	Ratio of managed to non-managed forest area	UN (2001)
1.3	Quantity of land reforested	UNESCO (1994)
1.4	Change in quality of managed and protected forest areas (e.g., density, canopy cover, soil conditions, species diversity)	CIFOR (2000)
1.5	Change in quantity of fuel-wood available in local communal areas	Hubbard (2001)
1.6	Moderate to high levels of forest biodiversity maintained	UNESCO (1994)
1.7	Change in soil erosion and soil loss	UNESCO (1994)
1.8	Change in fuel-wood consumption (e.g., fuel-efficient cook stoves, alternative fuels)	Hubbard (2001)
	Objective 2: To improve the income-generation opportunities of local communities living within Angkor	
2.1	Quantity of income-generation opportunities arising from the project	UNESCO (1994)
2.2	Market access for income-generation activities	UNESCO (1994)
2.3	Access to subsidies, credit, trainings for income-generation activities	UNESCO (1994)
2.4	A comprehensive forest management plans exists, detailing access and distribution of benefits derived from project	CIFOR (2000, 1999), UNESCO (1994)
2.5	Project benefits exceed costs (e.g., Benefit-Cost Analysis)	UNESCO (1994)
	Objective 3: To promote the use of a participatory approach to develop the capacity of communities to manage their local forest resources	
3.1	Level of participation of stakeholders in forest management activities	CIFOR (2000), UNESCO (1994)
3.2	Inclusive representation of all stakeholders (especially disadvantaged groups)	CIFOR (2000, 1999)
3.3	Local stakeholders meet with satisfactory frequency and high quality interaction	CIFOR (1999)
3.4	Training needs assessed and integrated into management plans	Hubbard (2001), CIFOR (2000)
3.5	Monitoring and evaluation used for regular revisions to management plans	CIFOR (1999)
3.6	Degree of participation in decision-making at village and provincial level	UNESCO (1994)
3.7	All community forest members have satisfactory knowledge of forest resource use and forest management plans	CIFOR (2000, 1999)
3.8	Compliance with management plans (e.g., access rules and regulations)	CIFOR (2000, 1999),
3.9	Change in dependence on external support (e.g., financial, technical assistance)	UNESCO (1994)

information about how the project is performing. As such, the PI suffered from the poor quality of the original project objectives and may be limited in their ability to measure for sustainability.

To fully assess for sustainability, conventional project evaluations should adopt double-vision, whereby both the project objectives as well as other objectives, are included in the evaluation. The original project objectives should be clear, and additional objectives should be used in order to supplement and/or improve the quality and content of conventional PI sets.

An obvious limitation for the project objectives was the lack of community consultation. The project relied only on externally derived objectives (and indicators). The result is two-fold: (a) the PI may not reflect local priorities, particularly, how or why project objectives might have changed over time; and (b) the conventional approach blocks ways to include meaningful participation of beneficiaries at all stages of the project. It is too late for this case study, but future projects should develop the project objectives in consultation with the local beneficiaries.

Finally, conventional approaches rely on external evaluators to objectively audit the performance of projects – yet the selection of indicators is often a subjective preference for evaluators. The selection of indicators is highly subjective and everyone has ones that they consider important (Hart 2000). Certain people will focus more on 'economic' indicators while others will lean towards social or environmental ones. In this evaluation, like others using a conventional approach, the development of the PI is at the discretion of the evaluators. Thus, the quality of the indicator sets varies with the skills and subjective preferences of these evaluators.

Chapter 5: DEVELOPING THE LOCAL INDICATORS (LI)

5.0 Introduction

As part of Stage 1 of the comparative analysis, this chapter describes a second set of indicators, the Local Indicators (LI), derived using a participatory approach. First, I describe the study team and explain the objectives of the participatory approach. Next, I describe the methods used to derive the LI. In particular, I address how the study team sought to maximize the accuracy of the results through the reduction of potential areas of bias. Finally, I present the resulting LI set, and briefly discuss the outcomes of the participatory research.

5.1 Methods

5.1.1 The study team

To facilitate the research, I selected a team of experienced participatory research extension workers from the local NGO, Angkor Participatory Development Organization (APDO). The team was comprised of two facilitators/translators, Mr. Chim Chao, the Environment and Natural Resource Co-ordinator, and Mr. Tek Savuth, the Executive Director of APDO. Both were responsible for the facilitation of all participatory activities and the translation of all results between English and Khmer, as well as scheduling meetings with the relevant community members. Two other staff, Mr. Chat Phath and Ms. Kim Sotheavy also assisted in the village as experts in participatory research. I acted as the lead researcher and part-time facilitator. In addition, three foresters from the Provincial Department of Forestry were seconded from the United Nations Food and Agriculture Organisation (FAO) to assist with

participatory forest mapping for two weeks. Finally, the research was not possible without the contributions of the local communities who agreed to participate in the study.

5.1.2 Defining the objectives and parameters of the participatory approach

Like the Project Indicators (PI) of Chapter 4, the scope of the local evaluation was limited to an *ex post* assessment of the case study community forest project after five years (1998-2001). The main objective of the research was to use a participatory approach to develop a set of local indicators to evaluate the case study project. Although not a specific objective of the research, I also hoped that the exercise would build the evaluative capacity of the local beneficiaries and provide a set of indicators for the community to monitor project performance.

In preparation for the local evaluation, the study team met in Cambodia in May 2001 to review, revise, and clarify the objectives and duration of the research. We discussed participatory approaches and the tools we might use to elicit information (see Section 5.1.3), and how the research should be conducted to minimize bias (Section 5.1.5). Shortly after these initial discussions, preliminary meetings were held with the leaders of the community forest groups in each village to (a) explain the objectives of the research, and (b) request that villagers participate in the research.

5.1.3 Tools and techniques of participatory approach

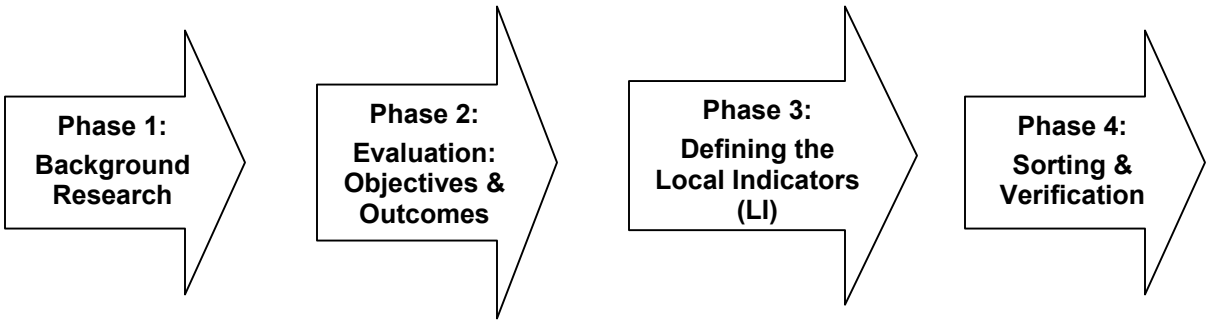
To achieve the high level of participation required, the study team decided to use a variety of techniques and approaches referred to as Participatory Rural Appraisal or Rapid Rural Appraisal (PRA or RRA). In simplified terms, the major difference between PRA and RRA is who does the research (Freudenberger 1994). For RRA's, outsiders conduct the research, analyze the results and decide what happens to the information. In PRA, it is the local

communities, normally with training from outsiders, who define the objectives of the study, collect and analyze the results and decide what happens to the information. However, because RRA requires local participation, and PRA requires external facilitation, the line between the two techniques is often blurred, so that field research often combines aspects of both PRA and RRA. Overall, the key to successful rural appraisal is collecting pertinent information from a variety of participants in a timely manner. I selected the study team for their participatory research expertise, and for their familiarity with the case study project and the local beneficiaries of the project. For the field research component of the study, the team used both PRA and RRA approaches to better facilitate a participatory, self-evaluation process.

5.1.4 Data collection

The LI were compiled based on the information collected during participatory research conducted in the case study villages over three months from May-August 2001. Figure 4 illustrates the four distinct phases of the data collection.

Figure 4 **Four phases of data collection for the participatory project evaluation of the Angkor Community Forest Project.**



In the first phase of the evaluation, the study team asked the villagers to map the historical uses and users of forest resources in the case study villages. The historical maps were

used as a reference in subsequent meetings, to narrow and define trends in forest resources 'before' and 'after' the community forest project (FAO 1994).

In the second phase, the villagers were asked to evaluate their community forest project by (a) defining their own set of objectives of the project, the local objectives, (b) discussing the outcomes of the project in terms of the local objectives, and (c) considering the major strengths and weaknesses of the project over the first five years, including suggestions for improvement. Data for Phase 1 and 2 were collected over four weeks, using a variety of participatory tools. Information was collected using the following rural appraisal tools: village/community meetings, social mapping, historical matrices, wealth ranking, seasonal calendars, and SWOT (strength, weaknesses, opportunities, threats) analysis (FAO 1997, 1995, 1994).

In the third phase of the data collection, the two villages were invited to attend a two-day evaluation workshop at the offices of APDO. The study team facilitated the workshop and the participants were asked to create a list of indicators to measure the performance of a 'successful' community forestry project. To ensure that the list was comprehensive, the participants were encouraged to consider all types of influences that might affect a project, such as social, cultural, economic, legal/political, economic and environmental. Although the research was geared towards assessing sustainability, I decided not to limit the selection of indicators to those ones that might measure sustainability. Instead, I let the villagers develop a range of indicators that best suited their goals and objectives. Similarly, the number of indicators was not limited, unlike the PI and Sustainability Indicators Standard (SIS).

Phase 4 was sorting and verification of the data – whereby the study team returned to the villages to clarify information, fill in any gaps and conduct additional research to verify the accuracy of the results. For example, forest data was corroborated using physical information collected during participatory forest mapping and surveys. Another example is the use of focus

groups to target those persons who may have been under-represented in earlier activities (such as women) or those groups with a specific expertise or knowledge (e.g., the elders focus group to discuss the historic use of forest products).

To ensure the consistency of the findings, I compiled the final list according to the principles of triangulation (Patton 2002) whereby information must be confirmed using a minimum of three sources, tools, or approaches. The data were triangulated by (a) using different data-collection methods (mix of quantitative and qualitative), (b) cross-checking the results using the same methods (tools) but different participants to gain different perspectives, and (c) some findings were cross-checked using different investigators (e.g., the Provincial Department of Forestry conducted participatory forest mapping surveys). Information was collected using a range of participatory tools such as focus groups, semi-structured interviews (SSI), open interviews, informal discussion, participatory forest mapping and surveys, and personal observation (FAO 1997, 1995, 1994). The list of indicators was reviewed and revised according to this additional (triangulated) information.

5.1.5 Minimizing bias

One weakness of participatory approaches is how to ensure that the information collected is accurate and representative of a wide majority of viewpoints and not biased so as to distort the results. Table 7 illustrates how potential areas of bias were minimized or eliminated to ensure the accuracy and objectivity of data collected during the participatory project evaluation.

Table 7 **Field research protocol to reduce bias in participatory research results to develop Local Indicators (LI) for the Angkor Community Forest Project.**

Potential bias	What is it?	Steps taken to minimize bias
Raised or false expectations	Participants link research results with financial/funding opportunities and results may be prejudiced. Research team links research results with financial/funding opportunities and results may be prejudiced.	• The academic purpose of the research was explained to the participants and the research team. It was explained to both groups that no additional funding would be forthcoming as a result of the research/evaluation. • The participants received only food/drink refreshments in exchange for participation. The research team had project salaries and did not receive additional monies for the research.[1]
Consistency	Research activities facilitated by different people, using different approaches and techniques, different places could result in variances in results.	• There were 2 facilitators and 2 research assistants who helped schedule meetings and assist in the villages. The structure of the research team remained constant over the 3-month research period. • The 2 facilitators were solely responsible for translating the results to ensure consistency. All information was translated weekly to prevent loss of meaning/context. I sorted, compiled and analyzed the translated results. • With one exception[2], all activities were held in the villages – in the nurseries, community forest areas, or in the homes of community forest members. • Both villages had the same research activities[3], used the same tools, and the data was summarized and analyzed in the same way.
Researcher Bias	The researcher is overly familiar with the project, and may be unable to objectively collect data.	• The research was conducted by a research team rather than an individual researcher to ensure a wider perspective. • As such, the research team met regularly to collectively review and revise the research objectives. • Often, the researcher took a 'backseat' during the research to distance herself from influencing the process.
Verification of results	The results may not be accurate or reliable if they can not be verified.	• All indicators were subjected to a 'triangulation' test – such that only indicators that could be verified from a minimum of three participatory tools could be included in the final set of LI.
Participation fatigue	Participants stop participating in activities and/or give 'quick' answers because they are too busy or tired to participate.	• The scheduling for research activities was revised weekly to ensure participant availability and to select mutually convenient times for villagers and the research team.

Table 7 (cont'd) Field research protocol to reduce bias in participatory research results to develop Local Indicators (LI) for the Angkor Community Forest Project.

Potential bias	What is it?	Steps taken to minimize bias
Representative participation	The results do not reflect the viewpoints of all beneficiaries. Key stakeholders participate in all activities and potentially dominate the findings with inaccurate results. Conversely, certain participants do not join in activities and the results will be biased.	• The research team employed a variety of research tools to include a diverse group of participants to tap a range of sources of conventional knowledge. • Diverse groups were encouraged to participate, to prevent the reliance on only a few persons for all information • The research team would 'brain-storm' to come up with new ideas to improve the quality and quantity of participation – e.g. focus groups for women to talk about economic impacts of the project and focus groups for elders to talk about historic trends in forest management and the environment.
Language barriers	Language differences are a barrier to effective data collection and/or interpretation of results.	• All the research was conducted in the local Cambodian language, with the results recorded (written and taped) for later translation to English. • The objectives or goals for each research activity were discussed by the research team in advance of activities to ensure understanding. The objectives would then be translated into Khmer and checked with other members of the research team for accuracy. • Using my working knowledge of Khmer, I could follow discussions in the field and ask for clarification where necessary.

Notes:

[1] At the end of the research, I donated $US100 to APDO in appreciation for their assistance, to be used for a staff party. I also arranged an end-of-research payment of $100 for the lead facilitation/translator as compensation for working overtime and weekends.

[2]The 2-day evaluation workshop was at the APDO office, because it had more space, whiteboards, and training materials. By holding the workshop at the office, we did not create more work or expense for any individual 'host' in the village who may have felt obligated to cook and supply food for all the participants.

[3] Preah Dak had two focus group meetings (elders and women) while Kok Thnoat decided to combine the elders and women into one focus group.

5.2 Results: The Local Indicator (LI) Set

The study team and villagers from Kok Thnoat and Preah Dak used a participatory approach to jointly develop a set of LI that can be used to evaluate the case study project. The LI consist of 4 local objectives and 29 LI shown in an objective-indicator matrix (Table 8). To ensure accuracy and unbiased results, only indicators that could be triangulated were considered

Table 8 **Local Indicators (LI) for the Angkor Community Forest Project derived using a participatory approach.**

	OBJECTIVES/INDICATORS
	Objective 1: To improve the environment by protecting, planting and growing trees
1.1	Increased vegetation in degraded areas by planting of local timber and fuel-wood trees
1.2	Natural regeneration of local timber trees in protected areas
1.3	A functioning nursery producing a good diversity of local species (e.g., timber, fuel-wood, fruit, medicinal)
1.4	Adequate amount of land is available for community forest (including expansion)
1.5	Improved soil quality
1.6	Increased habitat for wildlife
1.7	Regulation of climate and weather
	Objective 2: To have good participation from all members and equally share the responsibilities and benefits of the community forest
2.1	Community forest agreements and management plans (including work schedules, benefit distribution, monitoring & evaluation systems) exist and are enforced
2.2	All members participate voluntarily and contribute time and labour equally
2.3	Funds and labour are available for the operation, maintenance and repair of nursery
2.4	There is understanding and enforcement of rules/penalties governing forest resource users both within and between villages
2.5	Primary benefits are income from harvesting timber trees (long-term)
2.6	Short-term benefits from increased technical skills
2.7	Cultural and aesthetic benefits received from protecting the environment
2.8	Community solidarity and improved morale as a benefit of working together
	Objective 3: To enable the people to effectively manage their forest, through training, education and awareness, and capacity building
3.1	Establishment of Community Forestry Committee (CFC) with strong leaders
3.2	Training should be need-specific (e.g., technical training for nursery workers, managerial skills for leaders)
3.3	Technical advice, training, financial and material resources from external experts (e.g., Non-government Organisations (NGOs))
3.4	All members have equal opportunity to access training
3.5	All members encouraged to participate (especially low income families and women)
3.6	Capacity built through both training and hands-on experience
3.7	All members educated and knowledgeable about the objectives of community forestry
3.8	Knowledge and skill transfer to younger generation
3.9	All members had opportunity to share in decision-making within the project
3.10	All members are committed (resolve of participants)
	Objective 4: To reduce conflict with government authorities
4.1	Conflict is reduced between multiple users and government authorities (e.g., APSARA, the Heritage Police, other villages)
4.2	Recognition and support of community forest from local government authorities at the village/commune

Table 8 (cont'd) Local Indicators (LI) for the Angkor Community Forest Project derived using a participatory approach.

4.3	Signed and approved Community Forest Agreements (CFA) between community and APSARA
4.4	Good working relationships with relevant government departments (e.g., Provincial Department of Forestry)

for inclusion in the final indicator set. A complete list of all indicators, including frequency and how they were identified, i.e. what research tool was used, is provided in Appendix D.

Unlike the conventional approach (Chapter 4) this indicator set relied on local objectives and was conducted primarily by local beneficiaries, with some external facilitation. A full discussion of the strengths and weaknesses of participatory approaches can be found in Chapter 7, however there are a few points specific to the case study that I highlight below.

First, it is interesting to note that the local objectives differ from the project objectives, and in fact include a fourth objective to assess the role of legal-political institutions as a factor for project success. The local objectives (Table 8) favour protection of the environment (versus project objectives that specify only protection of forest resources. The local objectives also include more information on how to achieve the objectives (e.g., improvement of the environment by protecting, planting and growing trees) while the project objectives are more generally defined. The local objectives place greater emphasis on group cohesion and participation of local people, while again, the project objectives are too vague to give a sense of how local communities participate in the project. Intuitively, it is clear that the local objectives are relevant, current, and specific to the local beneficiaries and political climate within the study site of Angkor. However this does not indicate whether the local objectives are appropriate. I am also left wondering about the original project objectives, which are absent from the local set. Defining which indicators to use is a challenging issue for participatory evaluations.

Second, the participatory approach is definitely inclusive of local viewpoints, but the question remains whether the results are actually representative of all community members, and whether external considerations (such as donors and global benefits) are included. Without both local and external perspectives, there is the chance that the results could be biased or inaccurate. Finally, the participatory evaluation was labour and time-intensive as compared to the conventional approach. Time and expense is definitely a drawback for using a participatory approach and the costs and benefits should be accounted for when designing participatory approaches to evaluation.

Chapter 6: COMPARISON OF INDICATOR SETS

6.0 Introduction

The primary objective of my research was to compare two approaches to developing indicators, and assess which indicator set performed better against the standard of sustainability. The research was divided into three stages, as described in Figure 3.1. In Stage 1, the indicator sets and the standard of sustainability are developed. In Stage 2, the indicator sets are compared to evaluate their performance against the standard. In Stage 3, trade-offs are made between certain attributes of the indicator sets to decide which indicator set is preferred.

In the previous chapters, I conducted Stage 1 of my analysis and developed the standard and indicator sets to be used in Stage 2. In Chapter 3, I developed the Sustainability Indicators Standard (SIS), a composite of sustainability indicators used to measure the performance of community forestry projects. The SIS is the benchmark against which indicator sets will be assessed. In Chapter 4, I developed a set of Project Indicators (PI) using a conventional 'top-down' approach (Table 6). In Chapter 5, the local beneficiaries developed a set of Local Indicators (LI) using a participatory approach (Table 8).

In this chapter, I first describe the methods used to complete Stage 2 and Stage 3 of the research. In Stage 2, I compare the LI and PI using the SIS. The PI, LI and SIS are mapped onto three separate sustainability matrices, according to environmental, economic, and social objectives, and I discuss the performance of the PI and LI sets. In Stage 3, the decision analysis isolates important attributes of the indicator sets to develop a Multi-Attribute Trade-off Analysis (MATA) to gauge the performance of the PI and LI.

6.1 Comparison of Local and Project Indicators

6.1.1. Methods to evaluate performance

The main part of the comparative analysis (Stage 2) involves mapping the LI, PI and SIS within three sustainability matrices (Tables 10, 12, 14). I separated the indicator sets according to the environmental, economic and social objectives used for the SIS. Horizontally, the matrix contains indicators from the SIS, while the LI and PI fill the columns of each matrix. Thus I was able to map and assess the performance of the LI and PI in terms of environmental sustainability, economic sustainability and social sustainability, in addition to measuring the overall performance of the LI and PI against the SIS.

To measure indicator performance, I used an ordinal scoring system – good, medium, poor – to assess how well the LI and PI 'match' a corresponding indicator from the SIS. A 'match' must use the same phrases, or, meet the exact intent of the SIS. A 'probable match' is similar, and captures some but not all of the intent of the SIS. For a 'gap' there are no similarities with the SIS. I calculated the performance score by moving horizontally across the rows of the matrices (Tables 10, 12, 14) and counting whether there is a match (M), probable match (P), or gap (G). For example, if a local indicator has at least one match with a sustainability indicator, it receives a 'good' rating. If there are only probable matches or gaps, the sustainability indicator receives a 'medium' performance rating. If the sustainability indicator has no matches, it is assigned a 'poor' performance value (Table 9).

Section 6.1.2 through 6.1.4 presents each sustainability matrix and describes the performance results of the LI and PI in terms of environmental, economic, and social sustainability.

Table 9 How to measure performance scores for Sustainability Indicators.

Performance Index	Description
Good	There is at least one match (M) for the specific Sustainability Indicator
Medium	There are no matches (M) only probable matches (P).
Poor	There are no matches (M) or probable Matches (P) only Gaps (G).

6.1.2 Results: Assessment of environmental sustainability

In the environmental matrix, I compare the local and project indicators to indicators from the SIS that measure environmental sustainability. The environmental sustainability matrix shows how well 8 PI and 7 LI assess 7 environmental indicators drawn from the SIS (Table 10).

An analysis of this matrix shows that the indicator sets have similar performance. Both indicator sets achieve a 'good' score for the majority of the sustainability indicators. If the performance values for both good and medium are summed, the score for PI is 86% (6 out of 7 are matches or probable matches) and 100% for the LI (7 out of 7). This means that although both indicator sets are able to assess environmental sustainability, the LI have the advantage (Table 11).

Good performance: indicators that match

For both the LI and PI the best matches for environmental sustainability are for measuring the quality and quantity of the forest ranging from planting of trees and natural regeneration, to the ratio of protected and managed forest areas, and finally to changes in forest density, canopy cover, and species diversity (SIS 1.1). Protecting soil quality and minimizing erosion also rate highly for both indicator sets (SIS 1.6).

The LI score points for identifying positive links with neighbouring ecosystems, such as increasing wildlife habitat (SIS 1.3). The LI also scores well in maintenance of local genetic diversity, mostly through growing and planting a variety of local species (SIS 1.7). The PI also

Table 10 Environmental sustainability matrix to compare the environmental performance of the Local and Project Indicators.

Objective: The project has met of exceeded a minimum set of goals associated with the health of the ecosystem.

	SIS 1.1 Quality and quantity of traditional forest ecosystem type maintained and/or restored	SIS 1.2 Forest biodiversity maintained or enhanced to an agreed minimum standard (e.g. regional conservation plans, community plans, international convention)	SIS 1.3 Positive linkages with neighbouring ecosystems and consideration of other land uses (e.g. wildlife habitat, agriculture)	SIS 1.4 Erosion and other forms of soil degradation are minimized	SIS 1.5 Ecologically sensitive areas are protected	SIS. 1.6 Rare or endangered species are protected	SIS 1.7 Levels of genetic diversity maintained or enhanced, particularly indigenous species
PI 1.1 Amount of protected area as a per cent of total forest	**P**	**G**	**G**	**G**	**P**	**G**	**G**
PI 1.2 Ratio of managed to non-managed forest area	**P**	**G**	**G**	**P**	**G**	**G**	**G**
PI 1.3 Quantity of land reforested	**M**	**G**	**G**	**P**	**G**	**G**	**G**
PI 1.4 Change in quality of managed and protected forest areas (e.g., density, canopy cover, soil conditions, species diversity)	**M**	**P**	**G**	**P**	**G**	**G**	**G**
PI 1.5 Change in quantity of fuel-wood available locally	**G**	**G**	**G**	**G**	**G**	**G**	**G**
PI 1.6 Moderate to high levels of forest biodiversity maintained	**P**	**M**	**G**	**G**	**G**	**P**	**M**
PI 1.7 Changes to soil erosion and soil loss	**P**	**G**	**G**	**M**	**G**	**G**	**G**
PI 1.8 Change to fuel-wood consumption	**G**	**G**	**G**	**G**	**G**	**G**	**G**
PERFORMANCE INDEX for PROJECT INDICATORS (PI)	**[**	**[**	**X**	**[**	⇔	⇔	**[**
Li 1.1 Increased vegetation in degraded areas by planting of local timber and fuel-wood trees	**M**	**G**	**G**	**P**	**G**	**G**	**P**
LI 1.2 Natural regeneration of local timber trees in protected areas	**M**	**G**	**G**	**P**	**P**	**P**	**M**
LI 1.3 A functioning nursery producing a good diversity of local species (e.g., timber, fuel-wood, fruit, medicinal)	**P**	**M**	**G**	**G**	**G**	**G**	**M**
LI 1.4 Adequate amount of land available for community forest (including expansion)	**G**	**G**	**G**	**G**	**G**	**G**	**G**
LI 1.5 Improved soil quality	**P**	**G**	**G**	**M**	**G**	**G**	**G**
LI 1.6 Increased habitat for wildlife	**P**	**G**	**M**	**G**	**G**	**P**	**G**
LI 1.7 Regulation of climate and weather	**G**	**G**	**P**	**G**	**G**	**G**	**G**
PERFORMANCE INDEX for LOCAL INDICATORS (LI)	**[**	**[**	**[**	**[**	⇔	⇔	**[**

Legend: Performance Index for Project and Local Indicators (PI and LI)

[Good. There is at least one Match (M) for the specific Sustainability Indicator.

⇔ Medium. There are no Matches (M) only Probable Matches (P) and Gaps (G).

X Poor. There are no Matches (M) or Probable Matches (P) only Gaps (G).

Table 11 **Comparative analysis of performance measure scores for Project Indicators and Local Indicators against the environmental objectives of the Sustainability Indicator Standard (SIS = 7).**

Performance Index	Project Indicators (PI)	Local Indicators (LI)
Good	4	5
Medium	2	2
Poor	1	0

measure diversity but score lower for failing to specify the planting of local species. For biodiversity the situation is reversed with PI scoring higher than the LI (SIS 1.2). Other than mentioning a "good diversity of local species" the LI do not include standards or thresholds to maintain the biodiversity of the forest ecosystem whereas the PI demand "moderate to high levels of biodiversity".

Medium to poor performance: probable matches and gaps

The PI have three major areas of weakness that appear as probable matches or gaps: protecting ecologically sensitive areas, protecting rare or endangered species and developing positive links with neighbouring ecosystems and other land uses (SIS 1.4, 1.5, 1.3). Like the PI, the LI also fails to include indicators to protect rare or endangered species and this represents a critical weakness for a project set within a Protected Area (SIS 1.5). Similarly, neither set states what level or minimum standard of biodiversity should be met, and again, this is a glaring omission considering the World Heritage Status of the study site (SIS 1.2).

Additional outcomes

Finally, there are a few cases where the PI and LI have developed indicators that are uniquely representative of the study site. The PI include additional indicators that focus on fuel-wood availability, as this one of the key project objectives (PI 15, 1.8). However, fuel-wood

indicators are curiously absent from the LI. The LI have additional indicators to value the ecosystem services provided by the forest, such as climate regulation (LI 1.7). The LI also measure the land resources available for community forest, as both a requirement and a constraint to be considered when evaluating project performance. Neither of these indicators are part of the PI set.

6.1.3. Results: Assessment of economic sustainability

In the economic matrix, I compare the local and project indicators to indicators from the SIS that measure economic sustainability. The economic sustainability matrix shows how well 6 PI and 13 LI assess 11 economic indicators drawn from the SIS (Table 12).

An analysis of this matrix shows that the indicator sets have similar performance. Both indicator sets were able to match roughly ½ of the sustainability indicators for a 'good' performance score. If the performance values for both good and medium performance are summed, the score for the PI is 82% (9 out of 11 matches or probable matches) compared to 91% for the LI (10 out of 11). Based on the number of matches and probable matches, the LI perform slightly better than the PI when assessing economic sustainability (Table 13).

Good performance: indicators that match

PI and LI share comparable number of matches with the SIS, however the matches are not necessarily for the same economic indicators. The indicator sets have three issues in common: forest management plans, compliance rules, and investing in the forest. Both PI and LI include a need for a comprehensive forest management plan, although these plans are not necessarily sustainable (SIS 2.1). Both sets also include indicators that measure compliance, enforcement and understanding of the rules governing forest access and use (SIS 2.4). The LI go

Table 12 Economic sustainability matrix to compare economic performance of the Local and Project Indicators.

Objective: The project ensured the equitable distribution of benefits from forest resources for both current and future generations.

	SIS 2.1 A comprehensive forest management plan exists for sustainable use of timber and non-timber forest products	SIS 2.2 Local people have secured rights and access to forest resources	SIS 2.3 Evidence of compliance or successful enforcement of rules governing access and use of community forest	SIS 2.4 Evidence of compliance or successful enforcement of rules governing access and use of community forest	SIS 2.5 Local people understand both financial and intangible benefits of the forest (e.g., timber, fuel-wood, subsistence, medicines, socio-cultural, recreational, aesthetic, legacy)	SIS 2.6 Opportunities exist for local people to receive a mix of short and long-term financial benefits from community forest activities	SIS 2.7 Benefits are perceived to be reasonable and secure	SIS 2.8 Benefits are distributed equally over time among all groups (especially among disadvantaged groups, e.g., women, disabled, very poor, elderly)	SIS 2.9 People invest in their forest (e.g., time, labour, money) and the destruction of forest resources is rare	SIS 2.10 Regular economic auditing to ensure the benefits derived from project exceed the costs (BCA)	SIS 2.11 Recognition of resource scarcity and increased concerns for resource availability for current and future generations
PI 2.1 Quantity of income-generation opportunities arising from the project	G	G	G	G	P	M	G	G	G	G	G
PI 2.2 Market access for income-generation activities	G	G	G	G	G	G	G	G	G	G	G
PI 2.3 Access to subsidies, credit, trainings for income-generation activities	G	G	G	G	G	M	G	G	G	G	G
PI 2.4 A comprehensive forest management plan exists, detailing access and distribution of benefits from the project	M	P	G	G	G	G	G	G	G	G	G
PI 2.5 Project benefits exceed costs (BCA)	G	G	G	G	G	G	G	G	G	M	G
PI 3.8 Compliance with management plans (e.g., access rules and regulations)	G	G	P	M	P	G	P	G	M	G	G
PERFORMANCE INDEX for PROJECT INDICATORS (PI)	[	⇔	⇔	[	⇔	[	⇔	**X**	[	[	**X**
LI 2.1 Community forest agreements and management plans (including work schedules, benefit distribution, monitoring and evaluation systems) exist and are enforced	M	G	G	G	G	G	G	P	M	G	G
LI 2.2 All members participate voluntarily and contribute time and labour equally in exchange for shared benefits	G	G	G	G	G	G	P	P	M	G	G
LI 2.3 Funds and labour are available for the operation, maintenance and repair of nursery	G	G	G	G	G	G	G	G	M	G	G
LI 2.4 There is understanding and enforcement of rules/penalties governing forest resource users both within and between villages	G	G	P	M	P	G	G	G	M	G	G
LI 2.5 Primary benefits are income from harvesting timber (long-term)	G	G	G	G	M	P	G	G	G	G	G
LI 2.6 Short-term benefits from increased technical skills	G	G	G	G	M	G	G	G	G	G	G
LI 2.7 Cultural and aesthetic benefits received from protecting the environment	G	G	G	G	M	G	G	G	G	G	G
LI 2.8 Community solidarity and improved morale as a benefit of working together	G	G	G	G	M	G	G	G	G	G	G

Table 12 (cont'd) Economic sustainability matrix to compare economic performance of the Local and Project Indicators.

	SIS 2.1 A comprehensive forest management plan exists for sustainable use of timber and non-timber forest products	SIS 2.2 Local people have secured rights and access to forest resources	SIS 2.3 Evidence of compliance or successful enforcement of rules governing access and use of community forest	SIS 2.4 Evidence of compliance or successful enforcement of rules governing access and use of community forest	SIS 2.5 Local people understand both financial and intangible benefits of the forest (e.g., timber, fuel-wood, subsistence, medicines, socio-cultural, recreational, aesthetic, legacy)	SIS 2.6 Opportunities exist for local people to receive a mix of short and long-term financial benefits from community forest activities	SIS 2.7 Benefits are perceived to be reasonable and secure	SIS 2.8 Benefits are distributed equally over time among all groups (especially among disadvantaged groups, e.g., women, disabled, very poor, elderly)	SIS 2.9 People invest in their forest (e.g., time, labour, money) and the destruction of forest resources is rare	SIS 2.10 Regular economic auditing to ensure the	SIS 2.11 Recognition of resource scarcity and increased concerns for resource availability for current and future generations
LI 1.4 Adequate amount of land available for community forest (including expansion)	G	G	G	G	G	G	G	G	G	G	P
LI 3.9 All members are committed to the project	G	G	G	G	G	G	G	G	M	G	G
LI 4.1 Recognition and support of community forest from local government authorities at the village and commune level	G	M	M	G	G	G	G	G	G	G	G
LI 4.2 Signed and approved Community Forest Agreements (CFA) between community and APSARA	G	M	M	G	G	G	G	G	G	G	G
LI 4.3 Conflict is reduced between multiple users and government authorities (e.g., APSARA, the Heritage Police, other villages)	G	G	P	P	G	G	G	G	G	G	G
PERFORMANCE INDEX for LOCAL INDICATORS (LI)	[	[	[	[	[	⇔	⇔	⇔	[	X	⇔

Legend: Performance Index for Project and Local Indicators (PI and LI)

[Good. There is at least one Match (M) for the specific Sustainability Indicator.

⇔ Medium. There are no Matches (M) only Probable Matches (P) and Gaps (G).

X Poor. There are no Matches (M) or Probable Matches (P) only Gaps (G).

Table 13 Results of Performance Index for Project Indicators and Local Indicators against the economic objectives of the Sustainability Indicator Standard (SIS = 11).

Performance Index	Project Indicators (PI)	Local Indicators (LI)
Good	5	6
Medium	4	4
Poor	2	1

one step further to define the stakeholders who should be educated about the rules – the case study villages as well as neighbouring villages. Last, both indicator sets measure people's

investment in their forest (SIS 2.9). The LI describe this investment in terms of non-financial contributions, such as donated time, labour, participation in training and workshops, as well as a demonstrated commitment to the project. The PI describe this investment solely through the use of 'compliance' indicators that led me to assume that if people respect the rules then they are willing investors who protect their forest resources. Oddly, cash investment by the local beneficiaries is absent in both sets. Perhaps this is a reflection of the conventional dependence on donor funds or simply a confirmation that money is a serious constraint in the rural villages.

There were two areas where the LI seem to perform better than PI: access to resources and the identification and distribution of benefits. The LI specify access to resources as a requirement to measure the economic sustainability of a community-forest project (SIS 2.2). The LI further state that political will and legal frameworks, such as signed Community Forestry Agreements, are also necessary to secure access to forest resources (LI 4.2). If participation can be expected to lead to better access rights, than the LI would have an additional advantage because the access rights are likely perceived as fair and secure (SIS 2.3). Thus LI seem better able to capture performance related to resource access.

The LI also define a wide range of benefits from the forest and, by specifying these benefits, it is reasonable to assume that the local community understands the benefits (SIS 2.5). The community individually lists the important benefits (rather than aggregating) and this partially explains why the economic LI outnumber the PI 13 to 6 (Table 12). Many of these benefits are long-term, intangible goals, such as "aesthetic" and "community solidarity" and not easily valued in monetary or numeric terms. The LI may be relevant to the project, but they could prove difficult to measure, and thus less useful. The LI state that all contributions and benefits will be shared equally among all members of the community forest project (SIS 2.8). Having agreement on benefit distribution is an important consideration for economic

sustainability, but this indicator could be greatly improved if more detail was given on how the benefits will be distributed.

Conversely, there were two main issues where the PI outperform the LI: measuring a range of short and long-term benefits and capturing the economic viability of the project (SIS 2.6, 2.10). The PI aggregate the project benefits as opposed to the disaggregated approach used by the LI. The PI have a distinct advantage in measuring both the short and long-term financial benefits resulting from the project (SIS 2.6). The PI also include specific mechanisms and activities to support short and long-term stability, by targeting whether a suitable market exists for the community forest products (PI 2.2).

The most important distinction is the ability of the PI to measure the economic performance of the project through the use of Benefit-Cost Analysis (BCA). This economic indicator allows the PI to measure whether the project (and activities) are economically viable. It provides a much needed accountability measure for use by project donors by calculating whether the project benefits outweigh the costs (SIS 2.10). It is necessary to know the opportunity cost of each project, so that decision-makers can evaluate whether scarce capital has been spent efficiently.

Medium to poor performance: probable matches and gaps

It would seem there is a complementary relationship between the indicator sets. If one set has a gap, the other set will have a match. For example, the PI fail to address issues of rights, access and security, and do not recognize whether the benefits are distributed fairly over time to all groups in the community (SIS 2.2, 2.3, 2.8). The LI fail to adequately describe any short-term financial benefits (SIS 2.6). However, recognition of the benefits seems moot if the project is not economically viable. The LI completely ignored this basic premise of economic

accountability for a sustainable project – specifically, whether the benefits outweigh the costs of the project (SIS2.10). The LI do not mention BCA as an economic indicator and key measure of economic sustainability.

A joint area of weakness for LI and PI is how to measure whether the benefits are perceived as reasonable and secure (SI2.7). There are not specific indicators to measure 'perception' and it is risky to assume that participation is evidence that local people agree with the benefits. Finally, neither PI nor LI measure whether concerns associated with 'resource scarcity' are the motivation behind participating in the project (SIS2.11). As such, I am uncertain as to what circumstances, influences, or incentives persuade people to join in community forest activities and commit to sustainable activities.

Additional outcomes

The LI were the only indicator set to specify indicators to measure the costs, both labour and financial, associated with operating the nursery. I could interpret this in three ways:

(a) the LI were not developed properly and should have aggregated all costs into one indicator;
(b) specific costs warrant mention as indicators due to their importance to project performance or;
(c) the LI include the basic concepts of a conventional economic indicator, BCA.

Regardless, the disaggregated costs should signal to the evaluator that certain costs and components of the project require careful consideration.

Last, the LI are the only set that seems to focus on the main physical input necessary for a community forest: whether land is available. The LI seek to ensure that an adequate amount of land is available for both current and future community forest needs. If land availability is a constraint, it should also be included in the PI set. Interestingly, the local indicator for land

availability (LI 1.4) serves as both an environmental and economic indicator. This linkage between environmental and economic sustainability is a key characteristic of sustainability indicators Bossel 2001, Meadows 1999, Berkes and Folkes 1998).

6.1.4 Results: Assessment of social sustainability

In this social matrix, I compare the local and project indicators to indicators from the SIS that measure social sustainability. The social sustainability matrix shows how well 9 PI and 14 LI assess 11 social indicators drawn from the SIS (Table 14).

Table 14 Social sustainability matrix to compare social performance of the Local and Project Indicators.

Objective: The project developed or maintained new and existing socio-cultural institutions to support community-based management activities.

	SIS 3.1 Community-based groups exist and have mechanisms to promote group cohesion and build	SIS 3.2 Key stakeholders participate in all stages of the project	SIS 3.3 Inclusive representation of diverse group of stakeholders at all stages of the project	SIS 3.4 Contributions made by all stakeholders are mutually valued and respected	SIS 3.5 Local communities have a degree of participation in decision-making at local and regional levels	SIS 3.6 Members have satisfactory knowledge of forest use and management plans	SIS 3.7 Stakeholders (including children) are educated formally and informally about community-managed forest	SIS 3.8 Forest management plan includes training needs assessment of stakeholders and training schedule	SIS 3.9 Increased human capital (e.g., technical skills, abilities, level of education)	SIS 3.10 Monitoring results regularly incorporated into the implementation of management plans (and revision)	SIS 3.11 Reduced dependence on external support to encourage self-sufficiency (financial, technical assistance, moral support)
PI 3.1 Level of participation of stakeholders in forest management activities	G	P	G	G	G	G	G	G	G	G	G
PI 3.2 Inclusive representation of all stakeholders (especially disadvantage people)	G	P	P	G	G	G	G	G	G	G	G
PI 3.3 Local stakeholders meet with satisfactory frequency and high quality interaction	P	P	G	G	G	G	G	G	G	G	G
PI 3.4 Training needs assessed and integrated into management plans	G	G	G	G	G	G	G	P	G	G	G
PI 3.5 Monitoring and evaluation results used for regulation revision of management plans	G	G	G	G	G	G	G	G	G	M	G
PI 3.6 Degree of participation in decision-making at village and provincial level	G	P	G	P	M	G	G	G	G	G	G
PI 3.7 All community forest members have satisfactory knowledge of forest resource use and forest management plans	G	G	G	G	G	M	G	G	G	G	G
PI 3.8 Compliance with management plans (e.g., access rules and regulations)	G	G	G	G	G	P	G	G	G	G	G
PI 3.9 Changes in dependence on external support for project activities (e.g., financial, technical, moral assistance)	G	G	G	G	G	G	G	G	G	G	M

Table 14 (cont'd) Social sustainability matrix to compare social performance of the Local and Project Indicators.

	SIS 3.1 Community-based groups exist and have mechanisms to promote group cohesion and build	SIS 3.2 Key stakeholders participate in all stages of the project	SIS 3.3 Inclusive representation of diverse group of stakeholders at all stages of the project	SIS 3.4 Contributions made by all stakeholders are mutually valued and respected	SIS 3.5 Local communities have a degree of participation in decision-making at local and regional levels	SIS 3.6 Members have satisfactory knowledge of forest use and management plans	SIS 3.7 Stakeholders (including children) are educated formally and informally about community-managed forest	SIS 3.8 Forest management plan includes training needs assessment of stakeholders and training schedule	SIS 3.9 Increased human capital (e.g., technical skills, abilities, level of education)	SIS 3.10 Monitoring results regularly incorporated into the implementation of management plans (and revision)	SIS 3.11 Reduced dependence on external support to encourage self-sufficiency (financial, technical assistance, moral support)
PERFORMANCE INDEX for PROJECT INDICATORS (PI)	⇔	⇔	⇔	⇔	[	[	X	⇔	X	[	[
LI 3.1 Establishment of Community Forest Committee (CFC) with strong leaders	M	G	G	G	G	G	G	G	G	G	G
LI 3.2 Training should be need-specific (e.g., technical training for nursery workers, managerial skills for leaders)	G	G	G	G	G	G	P	P	G	G	G
LI 3.3 Technical advice, training, financial and material resources from external experts (e.g., Non-governmental organizations (NGO's))	G	G	P	G	G	G	P	G	G	G	G
LI 3.4 All members have equal opportunity to access training	G	G	G	P	G	G	M	G	G	G	G
LI 3.5 All members encouraged to participate (especially low-income families and women)	G	P	P	G	G	G	G	G	G	G	G
LI 3.6 Capacity build through both training and hands-on experience	G	G	G	G	G	G	M	G	M	G	G
LI 3.7 All members educated and knowledgeable about the objectives of community forestry	G	G	G	G	G	P	M	G	P	G	G
LI 3.8 Knowledge and skill transfer to younger generation	G	G	P	P	G	P	M	G	M	G	G
LI 3.9 All members had opportunity to share in decision-making within the project	G	P	G	P	P	G	G	G	G	G	G
LI 3.10 All members are committed to the project	G	G	G	G	G	G	G	G	G	G	G
LI 2.1 Community forest agreements and management plans (including work schedules, benefit distribution, monitoring and evaluation systems) exist and are enforced	G	P	G	G	P	G	G	G	G	P	G
LI 2.2 All members participate voluntarily and contribute time and labour equally in exchange for shared benefits	G	P	G	M	G	G	G	G	M	G	G
LI 2.4 There is understanding and enforcement of rules/regulations governing forest resource users both within and between villages	G	G	G	G	G	P	P	G	G	G	G
LI 4.4 Good working relationships with relevant government departments	G	P	P	G	G	G	G	G	G	G	G
PERFORMANCE INDEX for LOCAL INDICATORS (LI)	[	⇔	⇔	[	⇔	⇔	[	⇔	[	⇔	X

Legend: Performance Index for Project and Local Indicators (PI and LI)

[Good. There is at least one Match (M) for the specific Sustainability Indicator.

⇔ Medium. There are no Matches (M) only Probable Matches (P) and Gaps (G).

X Poor. There are no Matches (M) or Probable Matches (P) only Gaps (G).

An analysis of this matrix shows that again, the LI perform more strongly than the PI. However, unlike the environmental and economic matrices, the majority of the social indicators did not receive a good score: only 36% of the PI and LI were considered good matches. When the values for both good and medium performance were summed, the score for the PI is a respectable 82% (9 out of 11 matches or probable matches) versus the score of 91% for the LI (10 out of 11). Thus, while both indicator sets are able to assess social sustainability, the LI still retains an advantage (Table 15).

Table 15 **Comparative analysis of performance measure scores for Project Indicators and Local Indicators against the social objectives of the Sustainability Indicator Standard (SIS = 11).**

Performance Index	Project Indicators (PI)	Local Indicators (LI)
Good	4	4
Medium	5	6
Poor	2	1

Good performance: indicators that match

The LI perform well mostly in the areas of participation, education, and, human resource development. The majority of the matches focus on establishing community-based groups and measuring the quality and quantity of participation of group stakeholders, such as who participates, how they participate, and to a lesser extent, when (SIS 3.1 and 3.4). In particular, the LI define a range of stakeholders who should be involved, such as all members within a community (men, women, young, old, wealthy, poor), and include involving neighbouring villages and developing partnerships with government stakeholders. This leads to community groups that are inclusive, respectful of all contributions, and share decision-making powers to broaden the understanding of the forest management plans (SIS 3.1 – 3.6). However, the LI are weak for not specifying that participation should occur "at all stages of the project" and for confining the decision-making to the "village level" rather than extending it to broader regional

boundaries of the SIS and PI. The second focus of the LI is on human resource development (SIS 3.7 and 3.9). The LI define who should have access to training (equal access, including children), what the training should be (needs assessment), and how the training should be conducted (formal and non-formal). The only weakness here is the LI failure to specify when the training should occur.

Four important matches occur within the PI set: the amount of decision-making at multiple levels, stakeholder knowledge of community forest management plans, regular monitoring and evaluation systems, and a plan to reduce dependence on external support (SIS 3.6, 3.6, 3.10, and 3.11). In each of these cases, the PI represent a social indicator that is not fully addressed in the LI set.

Medium to poor performance: probable matches and gaps

The key weakness of the PI is a failure to fully measure the qualitative aspects of participation (see SIS 3.1, 3.3, and 3.4). For example, the PI do not include or measure "inclusive representation", "mutually valued contributions", "education of stakeholders", or building the "human and social capital" of the participants and the community forest group. Similarly, the PI focus on quantity by only measuring the number of trainings – although the PI do tie the training to a time-schedule within the forest management plans (SIS 3.8). The gaps in the PI are related to how to educate and build the capacity of the community (SIS 3.7 and 3.9).

The weaknesses in the LI centre around a lack of mechanisms to increase the effectiveness and self-sufficiency of social institutions over time. For example, there is no mention in the LI of the time-frame or training schedule (SIS 3.8) or how the project will ensure that villagers participate at all stages of the project (SIS 3.2). Second, the LI specify participation but fail to measure what level of understanding (and use) of forest management

plans is required to sustain community forestry (SIS 3.6). Third, regular monitoring and evaluation, along with integrating the results in revised management plans (SIS3.10) are only briefly mentioned in the LI set. Last, there is a significant gap in measuring the community's movement towards self-sufficiency – free from dependence on external sources for technical, financial or moral support (SIS 3.11). As opposed to the SIS (and PI), the LI do not measure a reduction in dependence, and until this happens, the social institutions will not be truly sustainable.

Additional outcomes

An additional complaint against both the PI and LI stems from the generalized terminology that they use. For example, 'the level of participation of stakeholders' does not give enough information to measure the outcome (PI 3.1). Similarly, "all members are committed" may be too vague of an indicator to be useful (LI 3.10). Many of the LI and PI are poorly worded, and "compliance" or "participation" indicators might lead the evaluator to make inferences that are incorrect. The indicators should be worded more clearly so that the evaluator is not forced to rely on assumptions or inferences. Finally, the LI again includes indicators with socio-economic linkages, a key trait of effective sustainability indicators (Bossel 2001).

6.2 Which indicator set performs better?

6.2.1 Overall performance within the sustainability matrices

Based on the assessment from the previous section, the Local Indicators tend to perform better overall than the Project Indicators. However, each set has strong and weak components, and neither set is a perfect match for sustainability. There may also be confounding factors

beyond the approach (such as weak project objectives) that affect the quality and content of the indicator sets. In the next three sections, I discuss some specific areas where the PI and LI excel – and where the indicator sets complement each other to build a more comprehensive set of sustainability indicators.

6.2.2 Where the Project Indicators (PI) perform better

The conventional approach is an effective way to mix site-specific project objectives with higher-level indicators to protect the public good and ensure economic accountability. Project objectives are often a mixture of local and external needs and desires. For example, in the environmental matrix, the PI consider both site-specific indicators (fuel-wood shortages) but also include indicators to measure conservation and impacts of global biodiversity. Indicators to conserve the public good are especially important, considering the project operates within the boundaries of a World Heritage Site. Within the economic matrix, the PI identifies both financial and economic incentives – and in particular, includes economically viability (through the use of BCA). This is a core economic performance measure used by development agencies and must supplement any project evaluation.

6.2.3 Where the Local Indicators (LI) perform better

The LI perform best in measures related to the local context – site-specific indicators that relate to their social interactions, their environment, and the immediate benefits of the project. The LI is strong in developing indicators to measure social sustainability. This makes sense given the short-life of the project, and the need to develop strong human resources to collectively manage the local forests. The local evaluators recognized the importance of these capacity building indicators – mostly because of their direct experience with the project – and these

valuable lessons must somehow be included in project evaluations. Similarly, the LI tend to reflect localized environmental concerns, often the resources that families need for their livelihood. There is recognition of the immediate problems, but a lack of awareness of the wider international conventions that could (or should) be adhered to when protecting the environment. Finally, the LI are able to list a number of long-term financial and intangible benefits arising from the project. It is useful to understand the wide range of financial and non-financial incentives that motivate people to participate – and using a participatory approach seems to draw out these incentives more clearly.

6.2.4 Are the indicator sets complementary?

One significant outcome of the research was that the indicator sets are complementary, and could be used in combination to develop a comprehensive set of sustainability indicators. In many circumstances, the gaps of one indicator set were addressed by the other set. This suggests there is a role for both approaches to evaluate community-based management projects.

For environmental sustainability, there are two cases where the PI set is complemented by the LI – identifying the linkages with neighbouring systems and the protection or rare or endangered species. The participatory approach provides a deeper understanding of the natural resources in the area, and people's dependence on the health of neighbouring ecosystems. The information (particularly on protection of rare, local species) is very site-specific and is best gained through assessments by the local participants.

For economic sustainability, there are five cases where a complementary relationship between the PI and LI exist. The first two involve how the LI measure site-specific conditions related to security of forest access. The LI measure whether the access to forest resources is secure and fair – perhaps unsurprising considering the tenuous nature of land ownership in

Angkor. The conventional approach failed to measure these indicators, yet it is important to understand the context in which the project is operating. A participatory approach would give more information on the site-specific conditions, and what is important to the local people. The third case involves equitable distribution of benefits, which is a major part of economic sustainability. The PI measure the benefits but do may not include distribution while the LI specify how the benefits will be distributed and to whom. Using both approaches will help us to understand not only the quantity of the benefits but also the quality of how they are distributed.

There are two important cases where the PI complement a short-coming in the LI in economic sustainability. First, the PI include measures of the short and long-term financial benefits of a project. However, the LI do not mention any short-term financial benefits (but rather focuses on the 'intangibles' or long-term financial gain). It is well documented that without a mix of short-term and long-term benefits or 'incentives' projects will fail (Wells 1994). In fact, the Angkor project is already suffering from a lack of short-term benefits, and has no finances to operate and maintain the nursery. Clearly, this indicator is crucial to evaluate the performance of a project and was missed using a participatory approach.

Second, the PI define economic accountability as a measure of project performance and this is a key performance measure for donors (Bryon 1991). The LI do not refer to BCA or whether the project is economic viable. I'm curious to know whether the community did not include accountability because they do not know about BCA or because economic accountability is not relevant for projects that depend on donor funding. Clearly, accountability of the project is not considered as necessary by local communities: either the funds are there or not. Development agencies have much greater restrictions and must provide some measure of accountability to donors and governments. Thus, the participatory approach must be complemented by economic performance measures derived using a conventional approach.

In the Social Sustainability Matrix, there are 8 instances where the LI and PI could complement each other. Half of the cases involve using a participatory approach to improve the quality and quantity of participation within the social institutions associated with community forestry. The LI are far more specific on how to build the capacity of their communities to effectively manage their forest resources. As well, the actual process of developing indicators, to build the evaluative capacity of the local beneficiaries, is an additional benefit of the participatory approach.

The PI have an advantage in the remaining cases, specifically because they include a temporal component in their indicators that is lacking in the LI set. For example, the PI designate a training schedule while the LI describe who should be trained. The PI describe regular reviews and monitoring, while the LI say only that monitoring and evaluation systems should be in place. If the PI and LI were combined, the indicators would be descriptive, site-specific, as well as bounded within a time-line. Finally, the PI mandate certain indicators to specifically reduce dependence and increase the responsibility and decision-making capacity of villagers to manage their local forest resources.

6.3 Decision analysis using Multi-Attribute Trade-off Analysis (MATA)

6.3.1 Methods for MATA

In this final stage of the analysis (Stage 3), I calculated how the performance measures from the sustainability matrices (matches and probable matches) could help a decision-maker trying to choose between the PI and LI. Multi-Attribute Trade-off Analysis (MATA) is a decision-making tool that weighs certain performance measures, or, attributes, and uses the resulting values as a test for comparing which alternative performs better. Ultimately, decision-makers should select

the alternative with the highest performance value. MATA is included in the analysis as an additional tool to help determine which indicator set – the LI or PI – performs better. The four steps of the MATA are described below (Wright 2001).

1. Identify which alternatives were being considered and what decision needed to be made. In this study, the alternatives were the PI and LI, and I wanted to decide which indicator set performs better against the SIS.
2. Define how the performance of the indicator sets would be assessed. I achieved this by selecting and scoring certain 'attributes' that were important to measure the performance of the PI and LI sets. I used the same performance measures (attributes) used in Stage 2 of the analysis: namely, the number of matches (M's) and the number of probable matches (P's). I selected M's and P's as the most important attributes to measure how well the indicator sets assess the standard of sustainability. For this analysis, all M's and P's within each matrix are counted and summed.
3. Assign weights to each attribute, according to the relative importance of the attribute for estimating performance. To do this, I assigned 3 different weights to the attributes, to test the sensitivity of the analysis and whether the weighting affects the choice of decision. In Option A, since there is no difference in the weighting between the number of matches (M) and number of probable matches (P), both are weighted the same. Therefore, to calculate the weighted performance of the indicator sets, M = 1 and P = 1. For Option B, I assumed that matches (M) were the only important attribute to measure performance and M = 1 but P = 0. For Option C, I decided that both M's and P's were important, but that M's should be given twice as much weight for determining the performance of the indicator sets. Thus for Option C, M = 2 and P = 1.

4. Sum the weighted scores to calculate the Total Weighted Value (V) for each alternative. The Total Weighted Value (V) was calculated for Options A, B, and C for both the LI and PI. In addition, I adjusted the results to account for differences in the number of indicators between LI and PI. The Total Weighted Value (V) for each option was multiplied by 100 and expressed as a percentage ratio. The equations used to calculate the weighted and normalized performance value for LI and PI are given below:

Option A: Where matches (M) and probable matches (P) have equal weight.

$$V = [(M + P)/(\#SIS \times \#PI)] \times 100 \quad (6.1)$$

$$V = [(M + P)/ (\#SIS \times \#LI)] \times 100 \quad (6.2)$$

Option B: Where only matches (M) are assigned a weight.

$$V = [(M)/(\#SIS \times \#PI)] \times 100 \quad (6.3)$$

$$V = [(M)/(\#SIS \times \#LI)] \times 100 \quad (6.4)$$

Option C: Where matches (M) are given twice the weight as probable matches (P).

$$V = [(M \times 2) + (P \times 1)/(\#SIS \times \# PI \times 2)] \times 100 \quad (6.5)$$

$$V = [(M \times 2) + (P \times 1)/(\#SIS \times \# LI \times 2)] \times 100 \quad (6.6)$$

Each option will be assessed and used to evaluate which alternative (LI or PI) has the highest performance and how the weighting impacts my decision. Section 6.3.2 presents the results of the MATA, followed by a discussion of the how the Total Weighted Value (V) was used to help decide which indicator set performed best.

6.3.2 Results of decision analysis

The MATA was a complementary tool used to help decide which indicator set performed better against the SIS, by calculating which indicator set had the highest Total Weighted Value (V) when assessing certain attributes. Table 16 summarizes the Total Weighted Value (V) for Options A, B, and C summed from the three sustainability components in Table 17. These sums give equal weight to each of the three components: environmental, economic and social. Refer to Appendix E for a complete description of the calculations that contribute to these sums.

Table 16 **Sensitivity analysis for MATA: Normalized and Total Weighted Value (V) of PI and LI to assess performance of Angkor Community Forest Project (Option A, B and C).**

Sensitivity Analysis	Total Weighted Value (V) of Project Indicators (PI)	Total Weighted Value (V) of Local Indicators (LI)
Option A	20.2	30.6
Option B	56.3	72.3
Option C	38.3	51.4

Wright (2000:119) states that for a MATA, the decision-maker must choose "…the alternative with highest weight score [value]". Based only on this decision-rule, I examined each option to select which alternative (LI or PI) had the highest score (V). Regardless of weighting, I found that the LI consistently had a higher performance value and this was the alternative I chose.

I also compared the performance of the indicator sets according to each of the three sustainability components (Table 17). I again selected the LI because they outperform the PI in two out of three matrices, environmental and social, regardless of the weighting. Within the economic matrix, the PI and LI are close in value and even equal, as in Option C.

Finally, I compared the weighted values of the attributes within the indicator sets, once more applying the MATA decision-rule. For the PI, I would select economic sustainability as the highest performer in Option A, while for Option B and C it is environmental sustainability that performs best. For the LI, the environment always has the highest score, regardless of weighting.

Table 17 **Comparing the normalized and weighted values for Project and Local Indicators by sustainability matrices to assess performance of Angkor Community Forest Project (Option A, B and C).**

Sensitivity analysis by matrix	Weighted values of Project Indicators (PI)	Weighted values of Local Indicators (LI)
ENVIRONMENTAL SUSTAINABILITY		
Option A	7.1	14.3
Option B	25.0	34.7
Option C	16.1	24.5
ECONOMIC SUSTAINABILITY		
Option A	9.1	10.5
Option B	18.2	16.8
Option C	13.6	13.6
SOCIAL SUSTAINABILITY		
Option A	4.0	5.8
Option B	13.1	20.8
Option C	8.6	13.3

6.4 Which indicator set should be selected?

The Multi-Attribute Trade-off Analysis (MATA) found that the LI are more effective than the PI compared against the SIS. However, the results do not guarantee that LI are a perfect match for sustainability, or that the PI do not have any measures of sustainability. The results simply tell me that the LI are stronger at measuring certain components of sustainability than the PI.

Chapter 7: DISCUSSION

7.0 Introduction

The purpose of my research was to examine ways to improve the quality of Community-based Natural Resource Management (CBNRM) projects. To do this, I studied how new approaches and tools could be used to better measure the overall performance of such projects. I started off by investigating the conventional approaches and tools of project evaluation. The limitations of the conventional tools made them inadequate to measure the complex objectives of current CBNRM projects, namely sustainable development. In addition, the conventional approaches did not foster the inclusive participation of local beneficiaries – even though it has been widely acknowledged that a participatory approach, at all stages of the project, is crucial to the success of CBNRM projects. Clearly, alternative tools and approaches were needed to measure the performance of CBNRM projects.

I decided to use Sustainability Indicators as an alternative tool to evaluate projects and selected two approaches to developing these indicators. My research compared the participatory approach with the conventional "top-down" approach to assess which indicator set better met the standards of sustainability. My analysis showed that there were advantages to using a participatory approach compared to a conventional approach when developing sustainability indicators. However, there may be important benefits to using both approaches together to craft a more comprehensive set of indicators to evaluate project sustainability.

7.1 Lessons learned: developing sustainability indicators

7.1.1 Overview

The results show that the Local Indicators (LI) had the highest performance score against the Sustainability Indicators Standard (SIS). Although the LI may have been stronger than the Project Indicators (PI), neither set was a perfect match for assessing sustainability. My analysis revealed that neither set is comprehensive, and that the two indicator sets could be used to complement each other. Therefore, there is no perfect way to develop sustainability indicators and it may be more effective to use a combination of approaches to ensure the quality of indicator sets.

7.1.2 Whose objectives count?

The first lesson learned was that whomever sets the objectives predetermines the content, quality and utility of the indicators. The selection (and quality) of objectives shapes the outcome of the evaluation and ultimately, whether the results of the evaluation are useful. For example, the original project objectives were poorly defined and negatively affected the development of the PI. The local objectives were distinctly different than the project objectives, raising questions about which objectives should be used. The local objectives were closer to sustainability objectives but were still far from perfect. Some have argued that local objectives will always differ from externally-set objectives (like sustainability). Local objectives cannot be relied upon to capture sustainability, because sustainable development is a "…western concept…" (Bell and Morse 1999:31). Based on my results and experience, I disagree. The LI show that families living in rural Cambodia have aspirations and hope for the future of their children similar to those wrapped in the concept of sustainability. They are keenly aware of the

need for a healthy ecosystem and seek economic opportunities to guarantee and support their livelihood and that of their children, and this local version of sustainability is evident in their choice of objectives and associated indicators.

Having said that, there are no guarantees that local objectives, while relevant, will also be sustainable and applicable to more global concerns. There may also be certain circumstances where international standards for sustainability must override local needs. In the case of the World Heritage Site of Angkor, for example, development agencies and government may be committed to protection and may be unwilling to simply leave biodiversity to chance – especially because the local communities do not specifically include conservation of biodiversity in the LI. There may also be indicators that are so critical that they must be included in any indicator set. For example, any indicator set that tolerated 'human right violations' would have to be rejected outright – regardless if the local communities condoned these practices. These 'critical indicators' are non-negotiable, and often linked to the vision of the international organization. Somehow, they must be translated and included within the locally-developed indicators. Whose objectives should take precedence? There is no easy answer. But before embarking on an evaluation, the objectives must be clearly defined, including who will develop the indicators to evaluate the project, and how the results will be used.

7.1.3 Issues of equity and distribution

Sustainability rests on the foundation of equity and how benefits are distributed within and between generations (WCED 1987). In this study, the LI address equity while the PI do not. The LI define equity as the exchange between present contributions (labour, time) in return for a share of future benefits (harvesting of mature timber in 25-30 years). There are a number of difficulties with this definition. First, the community does not specify how these benefits will be

distributed nor how disputes will be resolved – and there will be disputes – although it simply may be too early in the project to do so. Regardless of approach used, it is crucial to develop indicators that account for the distribution of benefits and costs over a specified time frame. Second, the potential exists for the current generation to be unfairly burdened at the expense of future generations, a reverse of the conventional sustainability scenario. It seems that the current generations are paying more (labour, time, restricted access) and have only minimal short-term benefits, such as developing technical skills. Conventional wisdom (Wells 1994, Thomson 1992) says you need a mix of short and long-term benefits or 'incentives' to motivate people to participate. The danger is whether people's participation today is valued enough to exchange for timber in the future. There is no easy solution, except to include clear indicators that measure whether the benefits are fair and equitable: we cannot simply rely on people's participation as an indicator of equity and fairness.

7.1.4 Accounting for the full costs and benefits

The LI do not take into account the full costs and benefits of the project, weakening the chances to measure whether the project is economically sustainable. Although the LI specifies a range of project benefits and costs, it ignores the opportunity cost of alternative uses of resources. The LI need to be supplemented with economic indicators (such as Benefit-Cost Analysis) to effectively assess the long-term sustainability of a project and to help decide whether the project is economically viable.

Second, the LI detail a broad number of benefits and costs, and in doing so, include a number of intangibles that are useful for a truer assessment of project performance. For example, many of the benefits are associated with education and training, and building community solidarity. Not only do we gain insight into the desirability of training components,

but the range of financial and non-financial incentives that should be included. Similarly, the LI include the intangible costs of things such as participation and commitment. These costs, what Ostrom (1990) calls transaction costs, are a necessary part of community-based projects, especially during the early phases, and must be fully accounted for.

Third, the LI reveal that the villagers are still reliant on donors for funding and technical support. Perhaps this is not surprising, considering the villages have received funding since 1993. Indicators that measure self-sufficiency are necessary for economic sustainability. One final problem confounding sustainability is that the original project design failed to adequately supply short-term income: primarily to defray the costs of operating and maintaining the nursery. A combination of poverty and poor planning defeated measures to achieve self-sufficiency. Two things are apparent: either do not build expensive infrastructure that requires operation and maintenance funding, or, develop a secure source of locally-generated funds to cover the operating costs of the project (World Bank Participation Source Book 1997).

7.1.5 Getting specific: Setting what, when and how much

Good sustainability indicators should specify targets, time-limits, thresholds and even values (Hart 2000), and both the LI and PI have lots of room for improvement of these aspects. A common weakness for both sets was vague or poorly worded indicators. Indicators should be clear and specific to allow evaluators to measure progress towards sustainability. The indicators should also specify boundaries, size, whether an increase or decrease is preferred, and when the project should accomplish these goals. This clarity is especially important when setting indicators to measure the more qualitative outputs of the project.

There will always be site-specific indicators and evaluators should not rely too heavily on a generic or standard template, otherwise valuable information and insight could be missed.

Conversely, because the LI and PI are very site-specific, it is important to ensure that the indicators are relevant and comparable to other projects. This is known as Horizontal Comparability (between projects in the same region) and Vertical Comparability (between projects internationally) (IUCN/IDRC 1999). Without some standardized comparability, the LI and PI could lose relevance and utility and project evaluations would suffer.

In best practice, indicator sets should be regularly revised and used to inform our progress towards sustainability. Unfortunately, neither the LI nor the PI were subjected to a final review process. This lack of review process meant that neither indicator set benefited from final verifications and revisions from the local community or other experts. The quality of indicators sets is reflective of the time spent to revise, consult and update on a regular basis. Indicators are not meant to be static and where possible, evaluations should use an iterative approach to review and revise indicator set, and should use this up-to-date information.

Finally, the indicators must somehow measure whether the project continues to be necessary or relevant – or whether past a certain threshold, the project would no longer be meaningful. For example, if there is no land available for community forestry, should there be a project designated for that area? Or, is it too late for community forestry to address the damage caused by unsustainable harvesting practices? Do the indicators assess whether community forestry is the only alternative to resolve the issue of forest scarcity? Is there another solution? Identifying these thresholds within the indicators add the important duo of relevance and utility to project evaluations.

7.2 Participatory approaches to project evaluations: strengths and weaknesses

7.2.1 Strengths

My research showed that participatory evaluations have advantages over conventional approaches to project evaluations. First, participatory approaches tend to capture a wealth of information, from a wide variety of participants and perspectives. The results are holistic, descriptive, current, relevant and an accurate depiction of how the villagers perceive their project. Generally, the pace of the evaluation is slower (to accommodate the needs of the participants), with time for iteration. Because local participation is voluntary, the financial costs are kept low. The information is both 'hard' and 'soft' and local evaluations not only include, but equally value, both types of information. This mixed-method approach to data collection, both quantitative and qualitative, seems betted suited to capture the multiple criteria of sustainability.

Second, participatory evaluations encourage meaningful participation at all stages of the project. Meadows (1998) found that the process of evaluation can be as important as the outcome, and there were second order benefits associated with using a participatory approach. Firstly, the beneficiaries develop new skills as they build their evaluative capacity, such as collaboration, decision-making, facilitation, presentation skills, and forest surveys/mapping techniques. Secondly, the villagers also have a set of local indicators against which to measure their progress and guide future management and planning. Thirdly, participatory evaluations are an excellent way to ensure that the local viewpoint is integrated throughout the evaluation and also broaden the perspective from one external evaluator, to a mix of local and external.

Fourthly, participatory evaluations give us additional insights into the project that might be missed in conventional evaluations. For example, the local evaluation developed a 'top 10' checklist list (see Appendix F). Not only was the format different, but the checklist was also ranked to show the preferences of each village, and how they differed. Perhaps ranking is more important to villagers than expected, and that information from checklists could also supplement the conventional measurement of performance indicators.

Dixon *et al.* (1994) noted that the need to find ways to value benefits but before this we need to use an approach that accurately identifies the benefits. This might result in overlapping indicators, or intangibles that are difficult to measure. Complexity shouldn't be a deterrent however, because "…the things that are easiest to measure sometimes shouldn't be measured at all" (Bryon 1991:179).

7.2.3 Weaknesses

The outcome of any project evaluation depends largely on the competence, integrity, and credibility of the evaluators. First, a weakness of participatory evaluations is that local evaluators may not have the expertise or capacity to evaluate their own project. The communities often require extensive training and external experts to facilitate the process. It can be a time-consuming and costly, in terms of lost opportunity costs for locals. Because participatory evaluations are still relatively untested, it could be difficult to persuade both donors and local communities to participate in such a process.

Second, there is the threat that participatory evaluations are not representative of the entire community. Local evaluations are definitely relevant to those who participate, but I am not sure whether the results are representative of the entire village. Local evaluations may also neglect a diversity of perspectives outside of the direct beneficiaries: for example, neighbouring

villages who share the forest resources or who are affected by the project, community members who chose not to participate, government representatives, tourism or other private interests, even project staff. As noted from the research, participatory approaches also suffer from a lack of external 'broader' perspectives and the quality of the indicator sets may become too narrow or site specific for any meaningful use by donors. Both local and external viewpoints are crucial for a full project evaluation, but some could get marginalized if a localized participatory approach is used.

Third, participatory evaluations may lack utility if the results cannot be compared both locally (Horizontal) and internationally (Vertical). If the results are not comparable, they lack utility and may be of less relevance to international development agencies that rely on project evaluations to craft new projects and decide which project should be funded.

Fourth, participatory evaluations are susceptible to bias, particularly when scarce funding dollars are attached to the outcome. All types of evaluations should consider bias as a potential weakness and take steps to address to ensure accurate results. It is included as a reminder that evaluation teams must be knowledgeable and vigilant about using best practice to ensure an unbiased, critical, but fair evaluation of the project.

Finally, participatory project evaluations, in many ways, are not truly local because of external influence. The project evaluation is typically at the bequest of the donor, and external facilitators often manage the process, without respecting local objectives. The benefits of the participatory approach may outweigh these weaknesses, but it bears noting that participatory evaluations are not yet truly in the hands of local beneficiaries.

7.3 Facing the realities of international aid and development

Participation is an acknowledged necessity for strong and successful development projects. There are tools that do incorporate participation at various stages – tools such as participatory project evaluations – but they are not being used. Although there may be many reasons for this lack of use, I have narrowed them to three.

The first reason deals with the political will of international development agencies. Projects are still driven by the objectives and philosophies of these donor agencies (often in conjunction with governments) and thus evaluations are at the discretion of each organization. How the evaluations are conducted – if at all – and how the results are used depends entirely on the will of the organization. Local evaluations are only possible if the development organization support and nurture a learning atmosphere. As such, it is important to realize that participatory project evaluations are not only about local situation, but also about detecting a strong connection across the local/external interface. Communities do not operate in isolation, and must therefore be sensitive to the positive and negative impacts of external influences, such as government policies, market forces, and the evolving goals of international development projects (Klooster 2000).

The second reason is that the local communities may also be resistant to participatory approaches for project evaluation. I offer two possible explanations for this. First and foremost, local evaluations are time-consuming, and the burden of participation is borne primarily by the local participants. Generally, communities are not directly compensated for this time, so as to ensure the results are transparent and unbiased. Ironically, external consultants (paid very handsomely) are not subjected to the same stringent code of transparency. Although some projects are moving towards a *per diem* compensation for participation, for the most part local

people bear the cost of local evaluations. There are no guarantees that the benefits of a participatory approach outweigh the costs for local evaluators. In addition, with the onus of evaluation placed on the shoulders of the direct beneficiaries, there is the chance that local participants may be unwilling to 'negatively' assess their project for fear that funding will be stopped.

The third reason is that there is reluctance to try a new approach. Participatory evaluations are talked about in development circles and generally praised, but not implemented. The methods and approaches have been discussed at length (Bell and Morse 2001, UNDP 1996) but who is testing this new approach? The limited acceptance of participatory evaluations may in part be due to the lack of critical mass of information – not many have been tried, and certainly even less to assess for sustainability. Project evaluations must have utility. As such, development agencies are not yet equipped to deal with evaluations that have both hard and soft measures, with evaluations that rely on local rather than project objectives, and especially when these objectives are subject to change over time. In the world of hard numbers and reliance on mainly economic performance measures, it is difficult to know how to use some of the so-called 'softer' data that arises from participatory evaluations.

There is also misunderstanding of what indicators can and cannot do. Indicators are only measurements of progress and can only affect policy when properly utilized. Bell and Morse (2001) referred to this as the "glass ceiling" of utility. Sadly, the local viewpoint is not considered important enough to warrant meaningful input in project evaluations – or for that matter, the rest of the project. Poor quality participation is the primary weakness of Community-Based Natural Resource Management (CBNRM) projects. It is surprising and disappointing that when given the chance to test a new approach to combat this weakness, the development agencies have quietly ignored it.

7.4 Applications for participatory project evaluations

My study has shown that participatory project evaluations can be a useful tool to define local sustainability indicators, particularly when used in conjunction with conventional evaluation approaches. However, I also learned that one size does not fit all and this applies to when and how participatory project evaluations are used. Certain circumstances will demand a conventional evaluation while others might be more appropriate for the techniques used in a participatory evaluation (Cummings 1997). To ensure that the lessons learned in this study are applied, I compiled a set of recommendations on when and how participatory project evaluations should be used:

> Participatory evaluations can and should be used to supplement information collected in conventional evaluations, and vice versa.

> Participatory evaluations are suitable for community-based natural resource management projects with multiple, long-term goals, rather than production or economic-driven projects of short duration.

> Participatory evaluations should be used in collaboration with other approaches when substantial external funding is involved, or where the project requires rigorous economic accountability (e.g., substantial commercial activities over the life of the project).

> Participatory evaluations should be used in collaboration with other approaches when the project includes objectives related to the "public good" that would be outside the scope of the local community.

> Participatory evaluations are a natural extension for projects that have used a participatory approach at various stages (or throughout) the life of project.

- Only projects with time and flexibility should use participatory approaches. The project must be able to support the use of local objectives, be prepared to deal with unexpected events or delays, and be committed to capacity building. If a project has set objectives and little flexibility with time, it should not use a participatory approach.
- Participatory evaluations should be used only if project managers and local beneficiaries are comfortable trying new approaches and facilitate a learning atmosphere.
- Participatory evaluations should be used only if project managers and local beneficiaries are open and receptive to learning new and different things about the project.
- Participatory evaluations work best when donors must have openness to a variety of approaches and possible outcomes.
- Participatory approaches work best when evaluators have insider knowledge of the project and geographic locale in which the project evaluation is being conducted.
- The evaluation team should be a mix of experienced and non-experienced evaluators with knowledge of best practice methods for participatory research. The team should be open to a wide range of participatory approaches and outcomes when engaging in evaluation.
- The evaluation team should be seek the advice of external experts in the field of project evaluation and particularly those who are experienced with participatory evaluations.

Chapter 8: CONCLUSION

The vision behind community forestry is to ensure sustainability of local forests, by engaging local communities who depend on these resources. In practice, conventional tools and approaches used by international development agencies have failed to adequately integrate either sustainability or participation when evaluating the performance of community-based projects.

My research demonstrates that alternative forms of project evaluation exist, and that use of a participatory approach is a meaningful starting point to measure project sustainability and increase the participation by local beneficiaries. My study shows that there is more than one approach to evaluate a project, and we need to apply different tools to effectively measure performance. By using a mix of approaches and tools, it is possible to produce a more comprehensive set of indicators to measure sustainability. It is hoped that the lessons learned from this analysis contributes to a growing body of literature on locally-defined sustainability indicators.

Ultimately, we need to convince development agencies that participatory approaches to project evaluation are viable, valuable, and necessary to ensure better quality projects and outcomes. There are challenges to using a participatory approach, and definitely the approach is not suitable for all types of projects. But we need to reflect on the commitment of development agencies to empower local beneficiaries in developing countries and to reconsider the effectiveness of the conventional tools and approaches we use to measure whether projects are successful or not.

Davis-Case (2001) asks "…how can we avoid making the same mistakes we made in the past and what can we learn from those mistakes to help us make better decisions in the future?"

The people of Kok Thnoat and Preah Dak have resoundingly stated the benefits of learning and education and we should follow their example.

Project evaluation is a necessary part of the learning process for development agencies. It's time to encourage development agencies to invigorate the process with new approaches and tools that guarantee that project evaluation returns to it's rightful position in the project cycle and is used to craft successful and sustainable projects.

APPENDICES

Appendix A: Sustainability Indicator frameworks

Table A.1 Generic Template of Criteria and Indicators for Sustainable Forest Management (CIFOR 2000).

P: Principle	C: Criterion	I: Indicator
2.1 – POLICY		
P.1 Policy, planning and institutional framework and conducive to sustainable forest management[1]		
C.1.1. There is sustained and adequate funding for the management of forests		
I.1.1.1 Policy and planning are based on recent and accurate information		
I.1.1.2 Effective instruments for inter-sectoral co-ordination on land-use and land management exist		
I.1.1.3 A *Permanent Forest Estate* (PFE), which includes both protection and production forests and is the basis for sustainable management, exists and is protected by law		
I.1.1.4 There is a regional land use plan (or PFE) which reflects the different forested land uses, and gives attention to such factors as population, agriculture, conservation, environmental, economic and cultural values		
I.1.15 Institutions responsible for forest management and research are adequately funded and staffed		
C.1.2 Precautionary economic policies exist		
I.1.2.1 Reserve funds for potential damages are available (performance bond)		
I.1.2.2 Anti-corruption provisions have been implemented		
C.1.3 Non forestry policies do not distort forest management		
I.1.3.1 Absence of agricultural sector incentives for production expansion		
I.1.3.2 Absence of price controls on domestic food production		
I.1.3.3 Absence of price controls on fuel oils		
I.1.3.4 Absence of distorting resettlement policies		
I.1.3.5 Absence of distorting exchange rate over or under-valuation		
2.2 – ECOLOGY		
P.2 Maintenance of Ecosystem Integrity		
C.2.1 The processes that maintain biodiversity in managed forests (FMUs) are conserved		
I.2.1.1 Landscape pattern is maintained[2]		
I.2.1.2 Change in diversity of habitat as a result of human interventions are maintained within critical limits are defined by natural variation and/or regional conservation objectives		
I.2.1.3 Community guild structures do not show significant changes in the representation of especially sensitive guilds, pollinator and disperser guilds		
I.2.1.4 The richness/diversity of selected groups show no significant change[3]		
I.2.1.5 Population sizes and demographic structures of selected species do not show significant change, and demographically and ecologically critical life-cycle stages continue to be represented		
I.2.1.6 The status of decomposition and nutrient cycling show no significant change		

I.2.1.7 There is no significant change in the quality and quantity of water from the catchment
C.2.2 Ecosystem function is maintained
I.2.2.1 No chemical contamination to food chains and ecosystem
I.2.2.2 Ecologically sensitive areas, especially buffer zones along watercourses, are protected
I.2.2.3 Representative areas, especially sites of ecological importance, are protected and appropriately managed
I.2.2.4 Rare or endangered species are protected
I.2.2.5 Erosion and other forms of soil degradation are minimized
C.2.3 Conservation of the processes that maintain genetic variation[4]
I.2.3.1 Levels of genetic diversity are maintained within critical limits
I.2.3.2 There is no directional change in genotypic frequencies
I.2.3.3 There are no changes in gene flow/migration
I.2.3.4There are no changes in the mating system
2.3 – SOCIAL
P.3 Forest management maintains or enhances fair intergenerational access to resources and economic benefits
C.3.1 Local management is effective in controlling maintenance of, and access to, the resource
I.3.1.1 Ownership and use rights to resources (inter and intra-generational) are clear and respect pre-existing claims
I.3.1.2 Rules and norms of resource use are monitored and successfully enforced
I.3.1.3 Means of conflict resolution function without violence
I.3.1.4 Access to forest resources is perceived locally to be fair
I.3.1.5 Local people feel secure about access to resources
C.3.2 Forest actors have a reasonable share in the economic benefits derived from forest use
I.3.2.1 Mechanisms for sharing benefits are seen as fair by local communities
I.3.2.2 Opportunities exist for local and forest-dependent people to receive employment and training from forest companies
I.3.2.3 Wages and other benefits conform to national and/or International Labour Organisation (ILO) standards
I.3.2.4 Damages are compensated in a fair manner
I.3.2.5 The various forest products are used in an optimal and equitable way
C.3.3 People link their and their children's future with management of forest resources
I.3.3.1 People invest in their surroundings (i.e., time, effort, and money)
I.3.3.2 Out-migration levels are low
I.3.3.3 People recognise the need to balance number of people with natural resource use
I.3.3.4 Children are educated (formally and informally) about natural resource management
I.3.3.5 Destruction of natural resources by local communities is rare
I.3.3.6 People maintain spiritual or emotional links to the land

P.4 Concerned stakeholders have acknowledged rights and means to manage forests cooperatively and equitably
C.4.1 Effective mechanisms exist for two-way communication related to forest management among stakeholders
I.4.1.1 Greater than 50% of timber company personnel and forestry officials speak one or more local languages, or, greater than 50% of local women speak the national language used by the timber company in local interactions
I.4.1.2 Local stakeholders meet with satisfactory frequency, representation of local diversity, and quality of interaction
I.4.1.3 Contributions made by all stakeholders are mutually respected and valued at a generally satisfactory level
C.4.2 Local stakeholders have detailed, reciprocal knowledge pertaining to forest resource use (including user groups and gender roles), as well as forest management plans prior to implementation
I.4.2.1 Plans/maps showing integration of uses by different stakeholders exist
I.4.2.2 Updated plans, baseline studies and maps are widely available, outlining logging details such as cutting areas and road construction, and include temporal aspects
I.4.2.3 Baseline studies of local human systems are available and consulted
I.4.2.4 Management staff recognises the legitimate interests and rights of other stakeholders
I.4.2.5 Management of NTFP reflects the interests and rights of local stakeholders
C.4.3 Agreement exists on rights and responsibilities of relevant stakeholders
I.4.3.1 Level of conflict is acceptable to stakeholders
P.5 The health of forest actors, cultures and the forest is acceptable to all stakeholders[5]
C.5.1 There is a recognisable balance between human activities and environmental conditions
I.5.1.1 Environmental conditions affected by human uses are stable or improving
I.5.1.2 In-migration and/or natural population increases are in harmony with maintaining the forest
C.5.2 The relationship between forest management and human health is recognised
I.5.2.1 Forest managers cooperate with public health authorities regarding illnesses related to forest management
I.5.2.2 Nutritional status is adequate among local populations
I.5.2.3 Forest employers follow ILO work and safety regulations and take responsibility for the forest – related health risks of workers
C.5.3 The relationship between forest maintenance and human culture is acknowledged as important
I.5.3.1 Forest managers can explain links between relevant human cultures and the local forest
I.5.3.2 Forest management plans reflect care in handling human cultural issues
I.5.3.3 There is not significant increase in signs of cultural disintegrations
2.4 – PRODUCTION OF GOODS AND SERVICES
P.6 Yield and quality of forest goods and services are sustainable
C.6.1 Forest management unit is implemented on the basis of legal title on the land, recognised customary rights, or clear lease agreements

I.6.1.1 Documentary evidence of the agreements with local communities under which management is entitled to manage the forest exists
I.6.1.2 Information on the identify, location and population of all indigenous and conventional peoples living in the vicinity of the management area of claiming customary rights to the management area exists
I.6.1.3 Evidence or statements from the representative organisations of local indigenous or conventional communities defining the extent of their territories exist, and include maps
C.6.2 Management objectives are clearly and precisely described and documented
I.6.2.1 Objectives are clearly stated in terms of the major functions of the forests, with due respect to their spatial distribution
C.6.3 Forest management plan is comprehensive
I.6.3.1 A comprehensive forest management plan exists
I.6.3.2 Management takes place with appropriate involvement of the stakeholders and takes into account all the components and functions of the forest, such as timber production, NTFP, ecology and well-being of local populations
I.6.3.3 Yield regulation by area and/or volume is prescribed
I.6.3.4 Silvicultural systems are prescribed and are appropriate to forest type and produce growth
I.6.3.5 Harvesting systems and equipment are prescribed to match forest conditions in order to reduce impact
I.6.3.6 Management plan is periodically submitted to revision
C.6.4 Implementation of the management plan is effective
I.6.4.1 The forest unit is zoned into areas to be managed for various objectives
I.6.4.2 Boundaries are marked in the field
I.6.4.3 Inventory of all forest uses and products are available
I.6.4.4 Workers and staff have adequate training to implement management
I.6.4.5 Infrastructure is laid out prior to harvesting and in accordance with prescriptions
I.6.4.6 Low residual stand damage
I.6.4.7 Rehabilitation of degraded and impacted forest is undertaken in accordance with a code of practice
I.6.4.8 Absence of significant off-site impacts such as on down stream water quality/quantity, infra-structure, etc.
I.6.4.9 Systems for production and transformation of forest products are efficient
C.6.5 An effective monitoring and control system audits management's conformity with planning
I.6.5.1 Continuous Forest Inventory (CFI) plots are established and measured regularly
I.6.5.2 Documentation and record of all forest management and forest activities are kept in forms that enable monitoring
I.6.5.3 Worked coupes are protected (e.g. from fire, encroachment and premature re-entry)
I.6.5.4 Tree marking of seed stock and potential crop trees is practised
I.6.5.5 Results derived from monitoring and research, as well as any additional scientific and technical information, are incorporated into the implementation and revision of the management plan

C.6.6 Equitable distribution and presence of economic rent
I.6.6.1 Estimated government rent capture
I.6.6.2 Estimated operator (manager) rent capture
I.6.6.3 Estimated forest local dwellers rent capture

Notes:

[1] The criteria and indicators listed under principle (P.1) deal with issues that are largely outside the control of the local forest managers, but nonetheless have an important influence on the outcomes of management at the FMU level.

[2] How each indicator will be verified depends upon the specific conditions of the FMU in question.

[3] Legitimate comparisons can be to undisturbed forest, regional conservation criteria or management objectives that do not conflict with regional conservation interest.

[4] This criterion, while important, will usually be considered for monitoring or assessment only on sites that are sensitive and/or high biological value.

[5] This principle and its associate subordinates are being subjected to a program of rigorous testing by CIFOR and its research collaborators. Updates on the results will be posted regularly on the CIFOR's web pages at the URL: http://www.cgiar.org/cifor

Table A.2 Generic Template of Criteria and Indicators for North American Sustainable Forest Management (CIFOR 1999).

Principle	Criterion	Indicator
1. Ecological integrity is maintained		
	1.1 Ecosystem function is maintained	
	1.1.1 Ecologically sensitive areas, especially buffer zones along water courses, are protected	
	1.1.2 Coarse woody debris and snags retained at functional levels	
	1.1.3 Area and severity of area burned	
	1.1.4 Area and severity of insect attack and disease infestation	
	1.2 Landscape patterns support native populations	
	1.2.1 Level of fragmentation and connectedness of forest ecosystem components	
	1.2.2 Road network density, type, use, and location	
	1.3 Native species diversity is maintained	
	1.3.1 Protected areas are maintained to protect rare, unique and representative species and features	
	1.3.2 Populations of indigenous species are likely to persist	
	1.3.3 Number of known forest-dependent species classified as extinct, extirpated, endangered, threatened, or vulnerable relative to the total number of known forest dependent species	
	1.3.4 Assessment of changes in the distribution and abundance of native aquatic fauna	
	1.4 Ecosystem diversity is maintained	
	1.4.1 Percentage and extent, in area, of vegetation types and structural classes relative to the historical condition and total forest area	
	1.4.2 Rate and total area of forest land converted to non-forest land cover, classed by major forest type	
	1.4.3 Representation of selected key and sensitive guilds occur in the community guild structure	
	1.5 Incidence of disturbance and stress	
	1.5.1 Pollutant levels in the ecosystem (implement screening procedure)	
	1.5.2 Area and severity of occurrence of exotic species detrimental to forest condition	
	1.6 Genetic diversity is maintained	
	1.6.1 Population sizes and reproductive success are adequate to maintain levels of genetic diversity	
	1.6.2 Use of scientifically-based seed transfer rules and seed orchard zones in planting native species	
	1.6.3 Management does not significantly change gene frequencies	
	1.7 Physical-environmental factors	

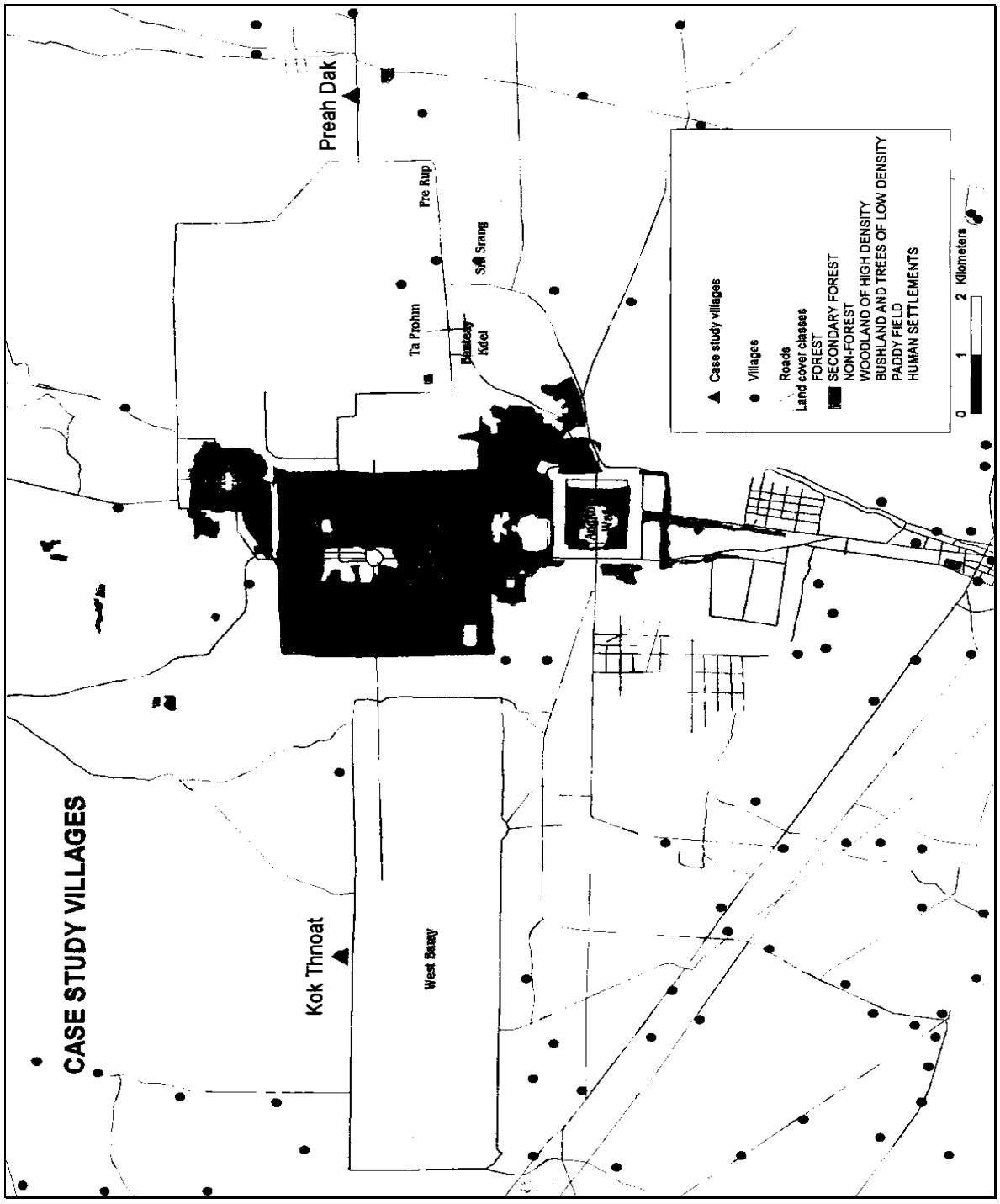
	1.7.1 Percentage of harvested area having greater than 25% of the area with degraded soil quality, including soil compaction, displacement, erosion, puddling, and loss of organic matter
	1.7.2 Trends and timing of events in stream flows from forest catchments
2. Yield and quality of forest goods are sustainable	
	2.1 Policy, planning and institutional framework are conducive to sustainable forest management
	2.1.1 Effective instruments for inter-institutional co-ordination on land use and forest management exist
	2.1.2 There is sustained and adequate funding and staff for the management of forests
	2.1.3 Institutions responsible for forest research are adequately funded and staffed
	2.2 Forest management provides for sustainability of good and services
	2.2.1 Policy and planning are based on recent and accurate information
	2.2.2 Objectives are clearly stated in terms of the major functional areas of the forest, with respect to their spatial distribution
	2.2.3 Silvicultural systems are prescribed and appropriate to forest type, production of desired products and condition, and assure forest establishment, composition, and growth
	2.2.4 Harvesting systems and equipment are prescribed to match forest conditions in order to reduce impact on wildlife, soil productivity, residual stand conditions and water quality and quantity
	2.2.5 Annual and periodic removals calculated by area and/or volume prescribed
	2.2.6 Mean annual increment for forest type and age class
	2.2.7 Distribution of, and changes in, the land base available for timber production are identified
	2.3 The management plan is implemented and effective in moving towards stated goals
	2.3.1 Actual vs. planned performance is measured and recorded
	2.3.2 An effective monitoring and control system audits management's conformity with planning
	2.3.3 Continuous inventories established and measured regularly
	2.3.4 Documentation and records of all forest management activities are kept in a form that makes monitoring possible
	2.4 Forest management is socially efficient
	2.4.1 Availability and use of recreational opportunities are maintained
	2.4.2 Total expenditures by individuals on activities related to non-timber use
	2.4.3 Existence of economic rents: Total harvesting revenues exceed harvesting costs
3. Society accepts responsibility for sustainability	
	3.1 Forest management provides ongoing access to the resource
	3.1.1 Access to forest resources is perceived to be fair and secure

	3.1.2 Ownership and use rights and responsibilities to resources (inter- and intra-generational) are clear and respect pre-existing claims
	3.2 Concerned stakeholders have a right to participate in open and meaningful public participation processes in order to influence management
	3.2.1 The process should be inclusive with all interests represented
	3.2.2 Stakeholders should have detailed and meaningful reciprocal background information necessary to provide quality input into the public participation process
	3.2.3 Management staff and stakeholders should recognize and respect the interests and rights of each other
	3.2.4 The decision-making processes must be transparent such that participants are confident that their opinions and values will be considered during the process and be reflected in the final product
	3.3 Forest-based human health issues
	3.3.1 Forest managers co-operate with public health authorities regarding illnesses related to forest management and potable water related concerns
	3.3.2 Forestry employees follow ILO working and safety conditions and take responsibility for the forest-related health risks of workers
	3.4 Recognition and respect for Aboriginal roles in sustainable forest management (Aboriginal rights, Treaty rights, and Aboriginal values)
	3.4.1 Extent to which forest planning and management processes consider and meet legal obligations with respect to duly established Aboriginal and treaty rights
	3.4.2 Assess the extent of Aboriginal participation in forest-based opportunities
	3.4.3 Extent to which forest management planning takes into account the protection of unique or significant Aboriginal social, cultural or spiritual sites
	3.4.4 Area of forest land available for subsistence purposes
	3.5 There is equitable access to and distribution of economic rents
	3.5.1 Mechanisms exist for sharing the economic benefits derived from forest management
	3.5.2 Wages and other benefits conform to national and/or ILO standards
	3.5.3 Employment of local population in forest management
	3.5.4 Estimated distribution of rent capture
	3.5.5 Number of communities with a significant forestry component in the economic base
4. Enabling Conditions – The following Criteria and Indicators are enabling conditions that support the overall framework of sustainable forest management	
	4.1 Policy, planning and institutional frameworks are conducive to sustainable forest management
	4.1.1 Effective instruments for inter-institutional co-ordination on land-use and forest management exists
	4.1.2 Institutions responsible for forest research are adequately funded and staffed

Table A.3 Zoning and Environmental Management Plan (ZEMP) Sustainability Indicators for Angkor, Cambodia (UNESCO 1994).

Environmental Sustainability	Social Conditions	Economic Conditions
Ecological Viability > moderate to high biodiversity > low soil loss > maintained or improved levels of hydrological function > positive linkages to neighbouring ecosystems	**Forest Perception (priorities of use and function)** > religious beliefs > environmental concerns > financial benefits > perceptions of changing resource availability (forest products, water, etc.)	**Security of Rights** > benefit security > territorial security
Vegetation Management > sustainable harvesting of timber and minor forest products (fuel-wood, vines) > support for associated agricultural conditions > regeneration of vegetation	**Social Organization** > degree of participation in decision-making > effective leadership > group/community cohesion > legal identity of management group > benefit distribution (subsistence and commercial) > compliance to access rules and regulations > dependence on external support (financial, technical assistance and moral support) > functioning and acceptance of forest product management , including inputs and distribution system	**Economic and Financial** > production benefits exceed costs > rapid initiation of (sustainable) benefit flow > continuous benefit flow benefits flow to low income families and women > market access for income generation activities > access to credit > access to subsidies required to promote conservative land use in ecologically sensitive areas > alternative income sources > labour availability

Appendix B: Map of case study villages



Source: C. Hubbard (2001).

Appendix C: Terms of Reference (TOR) for conventional evaluation

Title: Angkor Community Forest Pilot Project (under Community Participation in Protected Areas Project [CMB/93/007])

Evaluation Team: Cindy Hubbard

Time frame: 3 weeks

Objectives of the evaluation:

> To develop a set of project indicators (PI) to evaluate the Angkor Community Forest Pilot Project

Scope of the evaluation:

> The evaluation is limited to five-years (1998-2001)

> Two villages will be evaluated: Kok Thnoat and Preah Dak

Methodology: The evaluator will

> review project documents and visit the 2 community forest sites

> search the literature for existing performance indicator sets relevant to community forests in developing countries

> rely on experience and knowledge gained by working with the project/case study country from 1997-2000

Language of evaluation: English

Agency requesting evaluation: N/A

Salary: Nil

Appendix D: Master list of locally-derived indicators

Table D.1 Master set of Local Indicators from Kok Thnoat village.

No.	Description of Indicators	A	B	C	D	E
1	Establishment of community forestry committee (CFC); should have formal recognition from government partners (e.g., APSARA, Commune, District, Village, Forestry)	X	X	X	X	
2	Building capacity of community (human resources) to participate and manage community forest project (especially management and leadership skills for CFC, technical/training for members, education/awareness)		X	X	X	X
3	Participation and support of local villages; 'community solidarity'; working together in all activities; everyone encouraged to participate in activities and decision-making, voluntary support, motivated; committed	X	X	X	X	
4	Access to training for all (young, old, men, women, rich or poor); transfer of knowledge to younger generation; a range of formal/ non-formal training (hands-on)	X	X	X		X
5	Sharing of contributions and benefits from community forestry; benefits identified: long-term financial gain from timber harvesting is the primary benefit; others include increased technical skills; cultural and aesthetic benefits from protecting the environment; benefit of working together and developing community spirit, morale	X	X	X		X
6	Protection of environment and animal/wildlife habitat; improvement of environment and forest – lands developed, quality of soil/land and forest improved; variety of local seedlings planted (mostly timber but also fuel-wood); establishment of protected areas (mostly for local timber species *Dipterocarpus alatus*); trees as beneficial and needed regulators of climate and weather	X	X	X		X
7	Technical and financial support from external sources (preferably NGO's) but also government departments (seedlings & technical)	X	X	X		
8	Good maintenance of nursery infrastructure and nursery activities; resources for nursery (*thnal*); fertilizer, watering, maintenance and materials); high seedling production with a good mix of local species (e.g., timber, fuel-wood, fruit trees); funding and labour available for the nursery	X	X	X		
9	Promotion, understanding and enforcement of rules both within and between villages (penalties); understanding and awareness of CFC from all members; range of benefits understood by community members	X	X	X		
10	Recognition and support from government authorities (especially local) but particularly APSARA ; good relationships with government staff from Forestry department; reduction of conflict (and fines) between villagers and government	X		X		X
11	Need to establish a CFC (with strong leaders); need community forestry agreements (signed documents are important); need community forest management plan; need to have work schedules and enforcement of schedules; monitoring and evaluation; some felt that community forestry law might be necessary		X	X	X	
12	Need appropriate land size and land available to support community forestry; need more land to make community forestry bigger	X			X	X
13	Addressing/developing the specific needs of their village – particularly economic and training for economic opportunities (e.g., language skills for tourism-related jobs)	X				
14	Fundraising skills needed	X				
15	Selection of appropriate education and awareness-raising tools – such as exposure trips and village-to-village meetings – to teach people about community forestry			X		
16	Need to have private landowners agree to contribute land				X	

Legend:
A Community Forestry Committee and Village Development Committee meetings – PRA and RRA tools
B Evaluation Workshop (July 26-27, 2001)
C Focus Group (Women and Elders: Economics and Ecology)
D Semi-structured Interviews
E Participatory Forest Mapping (with Provincial Department of Forestry/FAO Siem Reap Project)

Table D.2 Master set of Local Indicators from Preah Dak village.

No.	Description of Indicators	A	B	C1	C2	D	E
1	Voluntary participation and support of local villages; 'community solidarity'; working together in all activities; good quality of participation and representative of all families (e.g., Community forestry Committee (CFC)); balanced time commitment from all members (e.g., CFC not overworked); commitment of all families;	X	X	X		X	X
2	Limited short-term benefits from Community Forestry – technical and training skills, increased community morale; other benefits include protection of culturally sensitive areas (e.g., near the Wat); secured access to local land; reduced conflict with government officials; Primarily benefit of the community forest is long-term financial gain from timber harvesting in 25-30 years	X	X		X	X	X
3	Building capacity of community to participate & manage community forestry project; identification of important training needs: management skills for CFC, technical/training skills for all members (including children); education/awareness for all members and neighbouring villages;	X	X		X	X	
4	Education and awareness of CF from all members; knowledge transfer to all members; motivation (incentives) to participate; access to training for all people, e.g., women, low-income	X		X	X	X	X
5	Recognition and support from government authorities (especially commune and village level) but particularly APSARA ; good relationships with government departments such as the Provincial Department of Forestry, and Provincial Department of Rural Development; wish to reduce conflict with government regarding access to forest resources	X	X			X	X
6	Promotion, understanding and enforcement of rules both within and between villages; reduction of conflict with government authorities (eg. APSARA and Heritage Police)	X	X		X	X	X
7	Technical and financial support from external sources (preferably NGO's) but also government departments (seedlings and technical)	X	X				X
8	Improving the community – better than before: knowledge, skills, 'morality'; community life has been improved; benefits of a 'strong' community			X	X	X	
9	Production: seedlings every year, replanting of trees, diversity of species (especially locally important trees used for timber, income-generation and fuel-wood); some funding needed for nursery activities	X		X	X		
10	Protection of environment and animal habitat; improvement of environment and forest – lands developed, quality of soil/land & forest; trees planted communal land and private land			X	X		X
11	Physical constraints identified as : insufficient land, and poor soil quality; population pressure and limited access to alternative (cheap) fuels; availability of fuel-wood has declined			X	X		X
12	Need to establish a CFC with strong leaders and have the Community Forestry Agreement or Law (signed papers); need Community Forestry Management Plan, Monitoring & Evaluation, Work Schedules		X				
13	Selection of appropriate education & awareness-raising tools – such as exposure trips and village-to-village meetings	X					
14	Good maintenance of nursery infrastructure		X				
15	Self-sustaining (without support from outsiders)	X					
16	Need to have appropriate numbers in community forestry groups				X		
17	Planning time frame should be long enough				X		

Legend:
A Community Forestry Committee and Village Development Committee meetings – PRA and RRA tools
B Evaluation Workshop (July 26-27, 2001)
C1/C2 Focus Groups: Women and Environment, Elders and Ecology
D Semi-structured Interviews
E Participatory Forest Mapping (with Provincial Department of Forestry/FAO Siem Reap Project)

Appendix E: Calculations for MATA

Option A: Normalized and weighted performance values for Project and Local Indicators (where M = 1, P = 1)

Project Indicators: Environmental Sustainability

$$V = [(M + P)/(\#SIS \times \#PI)] \times 100 \quad (6.1)$$

$$= [(4 + 10)/(7 \times 8)] \times 100$$

$$= 25.0$$

Local Indicators: Environmental Sustainability

$$V = [(M + P)/ (\#SIS \times \#LI)] \times 100 \quad (6.2)$$

$$= [(7 + 10)/(7 \times 7)] \times 100$$

$$= 34.7$$

Project Indicators: Economic Sustainability

$$V = [(M + P)/(\#SIS \times \#PI)] \times 100 \quad (6.1)$$

$$= [(6 + 6)/(11 \times 6)] \times 100$$

$$= 18.2$$

Local Indicators: Economic Sustainability

$$V = [(M + P)/ (\#SIS \times \#LI)] \times 100 \quad (6.2)$$

$$= [(15 + 9)/(11 \times 13)] \times 100$$

$$= 16.8$$

Project Indicators: Social Sustainability

$$V = [(M + P)/(\#SIS \times \#PI)] \times 100 \quad (6.1)$$

$$= [(4 + 9)/(11 \times 9)] \times 100$$

$$= 13.1$$

Local Indicators: Social Sustainability

$$V = [(M + P)/ (\#SIS \times \#LI)] \times 100 \quad (6.2)$$

$$= [(9 + 23)/(11 \times 14)] \times 100$$

$$= 20.8$$

Option B: Normalized and weighted performance values for Project and Local Indicators (where M = 1, P =0)

Project Indicators: Environmental Sustainability

$$V = [(M)/(\#SIS \times \#PI)] \times 100 \quad (6.3)$$

$$= [4/(7 \times 8)] \times 100$$

$$= 7.1$$

Local Indicators: Environmental Sustainability

$$V = [(M)/(\#SIS \times \#LI)] \times 100 \quad (6.4)$$

$$= [7/(7 \times 7)] \times 100$$

$$= 14.3$$

Project Indicators: Economic Sustainability

$$V = [(M)/(\#SIS \times \#PI)] \times 100 \quad (6.3)$$

$$= [6/(11 \times 6)] \times 100$$

$$= 9.1$$

Local Indicators: Economic Sustainability

$$V = [(M)/(\#SIS \times \#LI)] \times 100 \quad (6.4)$$

$$= [15/(11 \times 13)] \times 100$$

$$= 10.5$$

Project Indicators: Social Sustainability

$$V = [(M)/(\#SIS \times \#PI)] \times 100 \quad (6.3)$$

$$= [4/(11 \times 9)] \times 100$$

$$= 4.0$$

Local Indicators: Social Sustainability

$$V = [(M)/(\#SIS \times \#LI)] \times 100 \quad (6.4)$$

$$= [9/(11 \times 14)] \times 100$$

$$= 5.8$$

Option C: Normalized and weighted performance values for Project and Local Indicators (where M = 2, P = 1)

Project Indicators: Environmental Sustainability

$$V = [(M \times 2) + (P \times 1)/(\#SIS \times \# PI \times 2)] \times 100 \quad (6.5)$$

$$= [(4 \times 2) + (10 \times 1)/(7 \times 8 \times 2)] \times 100$$

$$= 16.1$$

Local Indicators: Environmental Sustainability

$$V = [(M \times 2) + (P \times 1)/(\#SIS \times \# LI \times 2)] \times 100 \quad (6.6)$$

$$= [(7 \times 2) + (10 \times 1)/7 \times 7 \times 2)] \times 100$$

$$= 24.5$$

Project Indicators: Economic Sustainability

$$V = [(M \times 2) + (P \times 1)/(\#SIS \times \# PI \times 2)] \times 100 \quad (6.5)$$

$$= [(6 \times 2) + (6 \times 1)/(11 \times 6 \times 2)] \times 100$$

$$= 13.6$$

Local Indicators: Economic Sustainability

$$V = [(M \times 2) + (P \times 1)/(\#SIS \times \# LI \times 2)] \times 100 \quad (6.6)$$

$$= [(15 \times 2) + (9 \times 1)/(11 \times 13 \times 2)] \times 100$$

$$= 13.6$$

Project Indicators: Social Sustainability

$$V = [(M \times 2) + (P \times 1)/(\#SIS \times \# PI \times 2)] \times 100 \quad (6.5)$$

$$= [(4 \times 2) + (9 \times 1)/(11 \times 9 \times 2)] \times 100$$

$$= 8.6$$

Local Indicators: Social Sustainability

$$V = [(M \times 2) + (P \times 1)/(\#SIS \times \# LI \times 2)] \times 100 \quad (6.6)$$

$$= [(9 \times 2) + (23 \times 1)/(11 \times 14 \times 2)] \times 100$$

$$= 13.3$$

Appendix F: Local checklist for successful projects by rank

Preah Dak	Checklist for success	Kok Thnoat
1	Degree of participation	2
2	Capacity building	1
3	Recognition and support from government	7
4	Technical and financial support	3
5	Understanding and enforcement	6
6	Education and awareness	N/A
7	Nursery production	5
8	Improvement to community	N/A
9	Improvement of the environment	8
10	Physical limits	N/A
N/A	Nursery maintenance	4
N/A	Established committee & management plans	9

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