Final

Developing Environmental Compliance and Enforcement Indicator Programs

Pilot Project: Logging in Costa Rica

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Abstract

Using environmental compliance and enforcement (ECE) indicators can increase the efficiency and effectiveness of environmental enforcement programs by measuring the success of specific efforts, revealing temporal trends, and identifying and focusing program improvements. To advance the use of ECE indicator programs, the Team developed guidelines for their design. This followed environmental and sustainability indicator literature research, communication with ECE practitioners, and data collection in order to design a pilot project. Recognizing the difficulties faced by developing countries in particular in enforcing environmental law, our research produced two primary deliverables: an ECE indicator pilot project for the logging industry in Costa Rica and a "best practices" document. The pilot project includes a set of specific indicators, recommendations for implementing the indicator program, and recommendations for analyzing the indicators. The "best practices" document provides general guidelines for selecting, implementing, and analyzing ECE indicators. These materials will be distributed to practitioners through the International Network of Environmental Compliance and Enforcement Network (INECE).

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List of Common Acronyms

CalEPA: California Environmental Protection Agency
CBP: Chesapeake Bay Program
CEI: Czech Environmental Inspectorate
CITES: Convention on International Trade in Endangered Species
CSD: Commission for Sustainable Development
CVR: Central Volcanic Region
ECE: Environmental Compliance and Enforcement
EPIC: Environmental Protection Indicators for California Program
EPI: Environmental Performance Indicators
ESI: Environmental Sustainability Index
FCPOEC: Florida Centre for Public Management's Office of Enforcement and Compliance
FUNDECOR: Fundación para el Desarrollo de la Cordillera Volcánica
GEF: Global Environment Fund
IITF: Indicators Implementation Task Force
INECE: International Network of Environmental Compliance and Enforcement
INR: Institute for Natural Resources
MINAE: Costa Rican Ministry of Energy and the Environment
NGO: Non-governmental Organization
NJDEP: New Jersey Department of Environmental Protection
OECD: Organisation for Economic Co-operation and Development
Paris Document: *INECE-OECD Workshop on Environmental Compliance and Enforcement: Measuring What Matters*
PSR: Pressure-State-Response
SINAC: National System of Conservation Areas
SIReFOR: Sistema Nacional de Evaluación de la Forestación y Reforestación
Team: The Bren Team of Students

UNCED: United Nations Conference on Environment and Development

UNEP: United Nations Environmental Programme

USEPA: United States Environmental Protection Agency

USEPA Guidance Document: Mike Stahl and Robbi Farrell, entitled "*Performance Measurement Guidance for Enforcement and Compliance Practitioners"*

1.0 Executive Summary

INTRODUCTION

At the forefront of the environmental compliance and enforcement (ECE) field, the International Network for Environmental Compliance and Enforcement (INECE) works to enhance and expand the use of ECE indicators on a global scale. To further these efforts, the Bren Team worked closely with INECE as its client to design an ECE indicator pilot project centered on the implementation and enforcement of logging laws in Costa Rica. The Team focused on advancing guidelines for developing ECE indicators.

ECE INDICATOR TERMINOLOGY AND PURPOSE

Unfortunately, ECE practitioners are faced with overly complicated official definitions of the term "indicator," such as that from the OECD: "A parameter, or a value derived from parameters, which points to, provides information about, or describes the state of a phenomenon, environment, or area with a significance extending beyond that directly associated with a parameter value (OECD, 2003, pg.5)." Instead, the Team used a definition from the INECE lexicon: "A quantitative or qualitative measure of performance that is used to demonstrate change, and which details the extent to which results are being or have been achieved" (Office for Results-based Management Strategic Planning and Coordination Division, 2001) ECE indicators of various kinds measure performance at different stages of an ECE Program.

ECE indicators provide information to parties interested in improving environmental standards through laws and rules; these parties can include, for example, compliance program managers, enforcement officials, government officials, and environmental advocates. In order to make indicators widely applicable for such stakeholders, INECE established a common ECE vocabulary via international consultation. These terms, adopted by the Team, clarify ECE concepts, and facilitate their use and application. (See Box 1)

Box 1.0: **Key ECE Indicator Terms** (INECE-OECD Workshop of Environmental Compliance and Enforcement Indicators: Measuring What Matters, 2003; Stahl and Ferrell, 2004)

- Compliance - The behavior response to regulatory requirements.
- Enforcement - The application of all available tools to achieve compliance.
- Inputs - Inputs include time, staff, funding, materials, equipment and the like that contribute to an activity.
- Outputs - Outputs are activities, events, services and products that reach a regulated body.
- Outcomes - Outcome indicators measure the results of an agency's outputs, and are generally divided into three categories: immediate, intermediate and final outcomes.
- Immediate outcome indicators - measure changes in knowledge, skills, attitude, motivation, or awareness.
- Intermediate outcome indicators - measure progress toward a final outcome, such as a change in behavior or other results that contribute to the end outcome.
- Final outcome indicators - measure the ultimate result the program is designed to achieve, such as ambient concentrations of an air pollutant.

Use of certain indicator combinations can show patterns and relationships between ECE activities and results, highlighting failures of and inconsistencies among enforcement and compliance actions. For example, in Costa Rica, a trained, paid logging inspector (an indicator of an input to an ECE program) monitors the roads only for a set number of hours in the day (an indicator of a program output). Naturally, illegal loggers avoid using the roads during these hours. Analyzing indicators and the data they yield helps to identify program strengths and weaknesses, such as incomplete monitoring efforts. In this way, indicator use can increase the efficiency and value of a program by assisting in supervising program operations, enhancing accountability, and assessing program results.

THE GROUP PROJECT

The Team's approach consisted of three phases: a literature review, an ECE indicators pilot project design, and a summary of best practices for designing ECE indicator programs.

The overall methodology selected by the Team for designing the pilot project stemmed from the most recent "guideline" document for ECE indicator selection, the USEPA's *Performance Measurement Guidance for Compliance and Enforcement Practitioners* (USEPA Guidance Document).

Literature Review

The literature review focused on understanding indicators in context. Minimal application of indicators to enforcement and compliance, outside of INECE, led the Team also to review environmental and sustainability indicator programs. Unlike ECE indicators, environmental indicators provide a broader picture of the state of the environment and do not always include ECE efforts. Sustainability indicator programs focus on the ecological footprint, or use of renewable and non-renewable resources. Examining the construction of these indicator programs and drawing on these efforts helped the Team supplement existing guidelines for ECE indicator development.

An extensive literature search revealed ECE indicators used around the world, providing useful insight into the structure of indicator programs. The literature also exposed best practices in the field, which the Team has compiled. The literature review also helped the Team refine and apply a conceptual framework known as a logic model, and indicator criteria – both identified in the literature as critical steps in designing a pilot project. The Canadian Results-based Management and Accountability Framework defines the logic model as "a theoretical 'road map' of the policy, program or initiative upon which the strategic plan, ongoing performance measurement and evaluation strategies are based (2003)." The overall literature, however, includes little guidance on the actual application of logic models. Assembling material from published articles, working documents and conference presentations, the Team devised a framework for indicator application allowing identification of common themes amongst the various indicator programs. The themes presented sub-categories, which aided the group in developing an indicator set.

Indicator literature reveals the necessity of criteria for the selection of indicators. The Team found it necessary to refine and consolidate criteria terms due to the large number of synonymous criteria and significant variations in methods for selection. Several organizations recommend a consistent set of criteria, while others recommend tailoring criteria to specific

projects. More importantly, the lack of application recommendations devalues the literature on the use of criteria and impedes the application of criteria in the field.

Pilot Project

In order to better understand the applications of ECE indicators in developing countries, the Team's effort focused on developing a pilot project in Costa Rica; a developing nation with a stable economy in which INECE possessed key stakeholder contacts. Thus, in a two-day, project scoping Conference in San Jose, Costa Rica, and in subsequent stakeholder meetings in Costa Rica, the Team further developed stakeholder contacts and began designing the Pilot Project. A diverse group of Costa Rican Stakeholders attended the Conference, including officials from the Costa Rican Ministry of Energy and the Environment (MINAE), the chief environmental prosecutor, and various non-governmental organization (NGO) and private sector representatives. The Conference outlined the scope of the Team's group project, deciding to concentrate on the Costa Rican forestry sector. Although Costa Rica's forests represent some important environmental achievements, illegal logging continues to occur throughout the country, causing major environmental problems. The Team's goal emerged as the design of a Pilot Project to provide valuable information on enforcement and compliance efforts within the forestry sector, specifically addressing illegal logging. The Team and the Stakeholders identified three steps for the Pilot Project: 1. evaluation of the legal framework and enforcement process; 2. selection of indicators; and 3. recommendations for practical steps for project implementation and use.

The first step included an in-depth analysis of Costa Rican law, an evaluation of available, relevant data, and a review of the enforcement efforts of the key forestry actors: the National System of Conservation Areas (SINAC, a system of regional offices under the "umbrella" of MINAE responsible for forestry management), the Federal Prosecutor's Office, and the Forest Regents (non-government officials who design and execute federally required forestry management plans). The Team worked with participants in a UCLA law clinic to ensure thorough and expert analysis of the law.

The second step triggered the Team's evaluation of criteria for indicator selection and application, which led to its work on a logic model. The model clarified the roles of the key actors in forestry law enforcement. The Team then inventoried existing data, using them to identify an indicator set for each of the three main Costa Rican Stakeholders (SINAC, the Forest Regents, and the Prosecutor's Office).

Best Practices

To accomplish the third step of the pilot project design, the Team compiled best practices from indicator programs in the literature, and from the lessons learned in designing the Costa Rican pilot project. In addition, the Team utilized communications with practitioners via an E-dialogue conducted by INECE and the USEPA. These best practices serve as ideas or concepts that have proven useful to practitioners and can guide others in similar situations.

An example includes a practice recommended originally in the USEPA Guidance Document:

> Best practice: Use "internal teams" for implementation design and analysis (Ferrell and Stahl, 2004).

> Costa Rica Application: A consistent team within SINAC will fill this role in Costa Rica. The team should include managers from the regional offices to maximize local expertise, and the team should be also diverse, for example, the team will need technical experts as well as managers who posses decision-making and problem solving abilities.

The Best Practices Document allows regulatory agencies and individual practitioners to supplement the available literature, and adopt the elements of ECE indicator programs most relevant to their own ECE circumstances; a step provided for Costa Rica by the Team as the final part of the ECE indicator Pilot Project design on compliance and enforcement of logging laws.

CONCLUSION

Lack of literature guidance and a transparent set of methodology, hindered the Team's ability to develop and apply ECE indicator principles. Yet, through expanding the literature search and through a trial and error process the Team did develop applicable indicator sets for Costa Rica. The Team also gleaned 'best practices' for future indicator practitioners. Overall, the Team hopes that this document provides a foundation for implementation of an ECE indicator Pilot Project in Costa Rica, and hopefully it furthers the development of ECE indicator programs in general.

2.0 Introduction

2.1 PROBLEM STATEMENT

Over the last thirty years, environmental laws and treaties have been developed throughout the world at an accelerated rate. However, environmental quality continues to decline around the world at an alarming pace. Therefore, there is a great need for effective environmental enforcement to increase the standing of these laws and treaties, and to ultimately protect natural resources. If the requirements do not trigger action from the regulated community, they only serve as "paper tigers."

In 1992, countries participating in the Rio Earth Summit recognized the need for improved environmental compliance and enforcement mechanisms. Emerging from these deliberations, "Agenda 21" outlined a comprehensive plan for sustainable development and clearly identified enforcement and compliance capacity building as a shared objective. In addition, participants recognized the need for "more and different" types of environmental indicators, in order to provide a standardized means for local, state, and global policymakers to assess environmental performance (UNCED, 1992). From the latter development, environmental enforcement and compliance indicators began to evolve.

Using ECE indicators can increase the efficacy and efficiency of enforcement programs by measuring the success of specific enforcement and compliance efforts, revealing temporal trends, and focusing improvements. At the forefront of this field, the International Network for Environmental Compliance and Enforcement (INECE) works to advance the use of ECE indicators on a global scale. To further these efforts, the Bren Team worked closely with INECE as its client to advance the existing guidelines for ECE indicator program development.

2.2 APPROACH

The following steps detail the plan for accomplishing the project objectives.

Step 1: Background Research

In order to understand the context of ECE indicators, the Team completed a comprehensive literature review on the development and use of indicators. Examining past indicator program construction aided efforts in designing a pilot project and compiling a comprehensive list of "best practices." The literature review focused on a variety of types of indicators, including environmental and sustainability indicators.

A more focused effort targeting ECE indicator literature supplemented the broad overview. The Team used available literature to create a comprehensive catalogue of ECE indicators currently in practice. The Team gathered summary reports developed by the INECE network, the Organisation for Economic Co-operation and Development (OECD), the European Environmental Agency, and the Convention on International Trade in Endangered Species (CITES) for essential background information on ECE indicators. In addition, throughout the project the Team conducted a judicious international literature review of ECE Indicator

programs, focusing on any undiscovered literature, conference presentations, and working documents.

Another component of data-gathering included specific contact with ECE indicator experts. The Team initiated communications with ECE practitioners from the United States Environmental Protection Agency (USEPA) and other countries. In addition, an E-dialogue was conducted via the INECE web-site in August 2004 and in February 2005, in order to stimulate ECE indicator discussion amongst nations regarding the best practices for indicator selection, implementation, and use. Environmental compliance and enforcement practitioners from around the world participated in both E-dialogues. The discussion followed queries and commentary posed by the moderator. The Pilot Project process and best practices recommendations incorporate recommendations obtained during both E-dialogues.[1]

Step 2: Designing a Pilot Project

The second objective was to design an ECE indicator pilot project in Costa Rica in conjunction with MINAE, in order to gain practical program design experience. Throughout the Pilot Project, the Team used the procedures outlined in the most recent framework for designing ECE indicator programs as a planning and organizational tool. The document, written by the USEPA's Mike Stahl and Robbi Farrell, is entitled "*Performance Measurement Guidance for Enforcement and Compliance Practitioners"* (USEPA Guidance Document). The document is currently undergoing revisions and is a collaborative effort of the INECE ECE Indicator Expert Working Group.

The Pilot Project was initiated in a two-day, project-scoping Conference in San Jose, Costa Rica. A diverse array of participants attended the Conference, including MINAE officials, the chief environmental prosecutor, and various NGO and private sector representatives. Following the Conference, the Team scheduled private interviews with various stakeholders. Overall, the main goals of the Conference were to select a focal area and scope for the pilot project and communicate the usefulness of ECE indicator programs to the attendees. Private interviews were initiated to gain an overall understanding of the forestry sector, and to begin cataloguing existing enforcement and compliance data.

The development of the Pilot Project can be divided into three essential steps:

1. **Understanding and evaluating the legal framework.** During the Conference and subsequent meetings, the participants offered information on the Costa Rican environmental law framework – including the most recent forestry legislation. Close contact with the Lead Costa Rican Environmental Prosecutor, José Pablo González Montero was invaluable in understanding the key legislation used to prosecute illegal logging violations. The evaluation phase was completed through additional research, with the help of two University of California, Los Angeles (UCLA) Law students participating in the UCLA Environmental Law Clinic. As a product of this research, the Team developed a table including the "points of compliance" in the laws and regulations governing forestry (language that mandates compliance under

[1] See Appendix A for the summary of the first E-dialogue.

criminal and administrative penalty) and the activities being undertaken by the government to attain compliance. The ultimate goals of this step were to identify the specific regulations that the indicator program will provide information for, and analyze the strengths and weaknesses of these regulations.

2. **Cataloguing/Analyzing current practices in Costa Rica (e.g. what they are measuring).** One main goal of the stakeholder meetings was to determine the nature of the data currently being collected that pertains to environmental compliance and enforcement in Costa Rica's forestry sector. After meeting with a variety of data collection agencies, the Team gained a general understanding of the data that are currently being collected. Several agencies provided electronic copies of their information, and others forwarded additional data in the mail. The relevant data were sorted, compiled and analyzed to identify potential ECE indicators. The Team attempted to exhaust all measurements currently in use prior to recommending additional data collection activity.
3. **Recommending Indicators, implementation methods, and use.** The Team produced recommendations for additional indicators, in order to form a comprehensive ECE indicator program and supplement current data collection practices. Additional indicators were selected based on the criteria, goals, and priorities that were established by the Costa Rican participants and MINAE during the two-day Conference and subsequent communications. To provide a comprehensive indicator program, implementation and analysis recommendations are also provided. The implementation and analysis recommendations were based on an analysis of current "best practices" and the constraints identified at the Conference.

The Team recorded each step that was followed during Pilot Project design, in order to create transparency and collect best practices. The "Process Document" follows the general framework of the USEPA Guidance Document and discusses indicator construction methodology. This document can aid future ECE indicator project efforts by providing a detailed narrative and identifying problem areas and potential solutions.

Step 3: Constructing a Best Practices Document

The "Best Practices Document" incorporates the lessons learned from the Pilot Project, best practices outlined in the USEPA Guidance Document, and relevant practices identified from additional indicator literature. The Best Practices Document is not a definitive set of rules; rather, it is a compilation of practical advice for designing and implementing ECE indicator programs. This document will be a menu of sorts; allowing interested regulatory agencies to review the elements most appropriate for their circumstances and follow a general framework for implementation and use.

3.0 Indicator Background

3.1 INDICATOR HISTORY AND USE

The term indicator has its Latin root in the verb *indico*, which means to "point out, indicate, inform, show, declare, disclose, make known, reveal, or betray" (Tufts University, 2004). In terms of ECE indicator programs, an indicator is a simple metric that measures observable behavior and progress towards program goals.

Essentially, indicators provide information about a larger, typically more difficult to quantify, or qualify, situation. If properly selected, indicators reduce the number of measurements or parameters required to give an accurate presentation of the situation (OECD, 2003). In turn, this information can be communicated more efficiently to the user. Perhaps the most widely used example of an indicator is the classic "canary in the coalmine." Miners would bring a caged canary with them into the coalmine; if the canary perished, this was a clear indication that potentially toxic gases were reaching a dangerous threshold for the miners. Indicators are applied to a myriad of situations today, including human health, weather, and economics. Generally, these situations share the need for both the identification of current trends and the accurate prediction of future events.

In the environmental context, indicators chart progress towards domestic objectives and international commitments (OECD, 2003), in combination with economic and social indicators (United Nations, 2001). The OECD developed a considerable body of literature on the development and use of environmental indicators in policy analysis that has been influential in the development of ECE indicators (INECE-OECD, 2003). The USEPA built upon the early work of the OECD and INECE to create a framework for ECE indicators. The USEPA Guidance Document provides the most recent procedural framework for designing ECE indicator programs. The specific environmental and sustainability indices described hereafter represent a cross-section of indicator construction efforts in the identification, development, and use of indicators, while also describing the strengths and weaknesses associated with each stage.

3.1.1 Environmental Indicators: History and Use

The first efforts to develop comprehensive, national environmental indicator programs are grounded in a 1979 OECD Council Recommendation on *Reporting on the State of the Environment*, which recommended that member nations:

> Intensify efforts to improve scientific knowledge, information, statistics and indicators on the state of the environment, in order to contribute to the evaluation of the state of the environment, of activities that have an impact on the environment, and of environmental policies themselves (OECD, 2003, pg.9).

This recommendation ultimately led to the 1985, "Environment: Resource for the Future" declaration, adopted by the OECD member nations and Yugoslavia. In 1991, the OECD member nations tasked the organization with creating a program of environmental performance reviews, with the primary goal of helping member countries improve their environmental management performances (INECE-OECD, 2003). Gradually, a framework for the development and use of environmental indicators evolved from the Working Group on Environmental Information and Outlooks. This framework has culminated, most recently, in the OECD

Reference Paper, "OECD Environmental Indicators: Development, Measurement, and Use"; the OECD framework is based on the pressure-state-response (PSR) model, which employs criteria to help select and qualify indicators. (OECD, 2003) The framework recognizes that no complete set of universal indicators exists; rather, multiple sets exist serving various purposes and audiences.

The use of environmental indicators has spread internationally and has contributed to a heightened capacity for environmental monitoring. In terms of practical application, environmental indicators: allow for international, state, or local comparison; contribute to the harmonization of environmental policies through comparison and information exchange; measure environmental progress towards stated goals and overall performance; and efficiently and concisely communicate information to policymakers. The following programs illustrate local-level efforts of several organizations in the United States that provide examples of how indicators are applied in practice and why they are employed.

The Chesapeake Bay Program is a regional environmental protection effort that uses environmental indicators to further its goals of determining the health of the Bay in order to make appropriate policy decisions (Chesapeake Bay Program, 2005). Although this program has a specific spatial focus, the partners involved in this program encompass a variety of entities: the states of Maryland, Pennsylvania and Virginia; the District of Columbia, the Chesapeake Bay Commission, the USEPA, and various advisory groups.

The International Joint Commission (IJC) was formed to monitor the success of the Great Lakes Water Quality Agreement between the United States and Canada. In 1993, the IJC established the Indicators Evaluation Task Force to evaluate the progress of the Agreement and to subsequently advise the IJC on policy decisions. (Indicators Implementation Task Force, 2005).

The Environmental Protection Indicators for California Program (EPIC) uses environmental indicators to aid in a strategic planning process. Established in 2000, EPIC maintains an environmental indicator system to help California's environmental programs perform self-evaluations. Viewed as a joint effort among the California Environmental Protection Agency (CalEPA), the Resources Agency, and the Department of Health Services, the program developed indicators to address environmental issue areas; including air quality, water quality, land, waste and materials management, transboundary problems, pesticide use, human health, and ecological health. In general, the EPIC program seeks to refine state environmental goals, efficiently allocate financial resources, promote greater accountability in state agencies, and provide more comprehensive information to the public (Office of Environmental Health Hazard, 2005).

There are several other noteworthy environmental indicator programs at the state level in the United States. The New Jersey Department of Environmental Protection (NJDEP) has been a pioneer in the movement to transition to an environmental results-based management system (RBM). The RBM system, together with the New Jersey Sustainable State Initiative, has produced a set of set of forty-one indicators that link society, the environment, and the economy. In addition, NJDEP has developed 100 environmental indicators to focus on natural resources such as air, water and open space (Kaplan and McGeorge, n.d.).

A more focused regional effort was initiated in Oregon in 1997; the state of Oregon developed the Oregon Plan for Salmon and Watersheds (Oregon Plan) to address watershed restoration

and fish recovery. In order to make sense of a large amount of environmental data, environmental indicators were developed to track issue areas identified in the Oregon Plan. (Institute for Natural Resources, 2004).

Similar examples are not restricted to the United States, nor to state agencies. At the project level, the World Bank has developed a set of Environmental Performance Indicators (EPIs) to analyze a wide variety of direct and indirect environmental impacts. The primary goal of the EPI Program is to, "assess and evaluate the performance of World Bank projects in relation to environmental issues." (Segnestam, 1999, pg. vii)

3.1.2 Sustainability Indicators: History and Use

The development of indicators in tracking progress towards sustainability merits an overview; these efforts are especially relevant in light of the pilot project's location in a developing nation. Efforts to improve environmental enforcement in these nations, which ultimately aim to prevent environmental degradation, cannot be decoupled from efforts to achieve economic, social, and institutional progress. Together, these form the "pillars" of sustainable development.

It is important to note that specific indices discussed in the *Sustainabilit*y and *Environmenta*l subsections in this report are only a small cross-section of current indicator development efforts; however they provide the best basis for comparison with ECE indicators. The discussion of sustainability indicators begins with a summary of the work produced as a result of the Rio Earth Summit.

The adoption of Agenda 21 by over 100 heads of state who met in Rio de Janeiro, Brazil, in 1992 led to the formation of the Commission for Sustainable Development (CSD), which is a functioning 53 member commission. This group was created to, "ensure effective follow up of the UNCED and monitor and report on the implementation of Earth Summit agreements on the local, national, regional, and international levels" (U.N. Department of Economic and Social Affairs, 2004). The CSD indicator program consists of four general indicator categories: environmental, economic, social, institutional. Currently 58 core indicators are in use. The overall goal of this program is to make indicators of sustainable development widely accessible to decision-makers.

In addition to the CSD framework, researchers at the World Economic Forum (the Global Leaders for Tomorrow Task Force), the Yale Center for Environmental Law and Policy, and the Columbia University Center for Earth Science Information have also developed a sustainability index. The Environmental Sustainability Index (ESI) represents an effort to provide a single benchmark for gauging progress towards environmental sustainability, and indicators have been developed for one hundred and forty two nations (World Economic Forum, 2002). The ESI program uses a "data driven" approach, resulting in quantitative measures that are easily tracked and comparable. An index score is composed of a set of twenty core indicators, each of which is composed of 2 – 8 individual variables (World Economic Forum, 2002). Twenty core indicators are organized within the following five components: environmental systems, reducing stresses, reducing human vulnerability, social and institutional capacity, and global stewardship (World Economic Forum, 2002). The aim of this index is to provide an analytic means for cross-national sustainability comparison – a measurement similar to the Gross Domestic Product (GDP) for traditional economic comparison.

3.2 ECE INDICATORS: TERMINOLOGY AND PURPOSE

3.2.1 ECE Indicator Terminology

The following definitions are found in the USEPA Guidance Document (Stahl and Ferrell, 2004):

> **Compliance** - The OECD defines compliance as the behavioral response to regulatory requirements. Similarly, Environment Canada defines compliance as a state of conformity with the law. Hence, compliance indicators include measurable pieces of information that inform about regulates' behavior response to regulatory requirements.
>
> **Enforcement -** The OECD defines enforcement as the application of all available tools to achieve compliance. In a broad sense, the OECD definition of enforcement includes: compliance promotion, compliance monitoring, and non-compliance response. Enforcement indicators include measurable pieces of information that inform about compliance promotion, compliance monitoring and non-compliance response.

ECE indicators are expressed as inputs, outputs and outcomes.

> **Inputs -** Inputs are investments, including time, staff, funding, materials, and equipment that contribute to an enforcement activity. While of limited usefulness in and of themselves, they speak to the government's commitment and are important components for determining efficiency and return on investment. When considered together with outcomes, inputs can be used to determine the level of effort required to achieve an outcome. Managers can use this information to analyze efficiency in their programs.
>
> **Outputs -** Outputs are activities, events, services and products that reach a regulated body. Examples include the number of inspections performed, the number of compliance assistance workshops provided, and the number of enforcement cases issued. These indicators demonstrate a level of effort toward an outcome, but they do not indicate the degree to which the outcome is achieved.
>
> **Outcomes -** Outcome indicators measure the results of an agency's outputs, or the response of the regulated community, and are generally divided into two categories: intermediate and final outcomes.
>
> * *Intermediate outcome indicators* measure progress toward a final outcome, such as a change in behavior or other results that contribute to the end outcome. An example of an intermediate outcome of an inspection would be a change in facility management practices.
> * *Final outcome indicators* measure the ultimate result the program is designed to achieve, such as an improvement in ambient air quality or a reduction in the number of people living in areas in which pollutant standards were exceeded. When final outcome indicators are designed with the program's goals and objectives in mind, they should enable managers and others to determine whether the program's activities, or outputs, are achieving those goals.

The indicator categories defined above stem from the adaptation of a logic model, which is applied to the development of ECE indicators. The logic model, a project specific indicator

framework, will be discussed in detail in Section 5.0. Conventionally, the category of "immediate outcome indicators" is included in this framework:

- *Immediate outcome indicators* measure changes in knowledge, skills, attitude, motivation, or awareness (McCawley, n.d). Thus, immediate outcome indicators do not measure actual behavioral changes; rather they measure the educational value of program outputs. Thus, in the context of compliance promotion strategies, immediate outcome indicators may be critical measures of program success. Moreover, immediate outcome indicators may be more easily linked with enforcement activities (i.e. compliance promotion) than are actual behavioral changes (intermediate outcomes).

3.1.2 ECE Indicators in History and Practice

Although the field of ECE indicator development and use has only recently emerged, there have been multiple efforts to develop and implement ECE indicators on international, national and regional scales in recent years. The primary objective of the 2003 INECE-OCED workshop in Paris was to provide a forum for government officials and enforcement and compliance experts to exchange information and experience regarding the use and development of ECE indicators. As a result, nations with both established and emerging ECE indicator programs drafted reports on the status of their respective programs. Fifteen nations participated, including Argentina, Belarus, Belgium, Canada, China, Czech Republic, Georgia, India, Kazakhstan, Mexico, Netherlands, Russia, Scotland, Thailand, and the United States. Though several of the ECE indicator programs are much more developed than others, this set of summary reports provided the foundation for the Bren Team's catalogue of ECE indicators (INECE-OECD, 2003). In addition, the reports offer insights into the current state of the ECE indicator field.

Most ECE indicator programs are in the early stages of development and focus on input and output indicators. Typically, such programs focus on demonstrating the relationships between the investments and activities of the regulatory agency (or relevant organization). It is much more difficult to develop and implement ECE indicator programs with outcome indicators, as demonstrating definitive relationships between enforcement activities, behavioral responses of the regulated community, and environmental impacts is quite difficult. Despite their limitations, basic ECE indicator programs can be useful. For example, ECE indicator efforts in the Czech Republic are providing critical information on investment efficiency to compliance assurance program managers. The Czech Environmental Inspectorate (CEI) has focused on analyzing the linkages between investments (inputs) and environmental inspection activities (outputs). A number of indicators to assess these activities have been designed and implemented. The initial Czech Republic ECE indicator program, though relatively simple and comprised mainly of output indicators, has demonstrated the usefulness of ECE indicators to practitioners (Fencl, Svobodova, Svemer, 2003). Like many countries working with ECE indicator programs, the CEI recognizes the importance of outcome indicators and plans to incorporate them into the next phase of their program.

Several governments are leading the change to more complex, outcome-oriented ECE indicator programs. Simplistic programs centered on input and output indicators do not fully characterize the state of compliance and leave many unanswered questions; results-based management, in contrast, prioritizes establishing linkages between agency activities, compliance, and environmental impact (Stahl, 2003, pg 9). The United States government has pushed for

outcome-focused programs. The Government Performance and Results Act (GPRA) of 1993 has led many US Federal agencies, including the USEPA's Office of Enforcement and Compliance Assurance (OECA), to focus more on the results of actions and less on the actions themselves. Following the GPRA framework, the USEPA has done extensive work on the development and use of outcome ECE indicators. In 1997, OECA began a large-scale effort to revamp the program and develop an improved set of indicators. Currently, OECA uses these indicators to report results and analyze and improve their enforcement program (Stahl, 2003).

Similarly, Environment Canada has developed an acclaimed ECE indicator program that has moved beyond the simple input and output indicator programs predominately employed by other compliance assurance programs. Until recently, Environment Canada focused predominately on output ECE indicators. However, several Canadian government mandates, such as the Results-based Management and Accountability Frameworks (FMAF), have instigated a shift towards results-based management. Environment Canada's recent projects focus on linking agency activities with actual outcomes. As reported by program managers within Environment Canada, "Environment Canada is committed to developing environmental compliance and enforcement indicators both as a means of addressing . . . reporting requirements and for providing management with the information it needs to steer its compliance promotion and enforcement programs" (Barret and Pascoe, 2003, pg 7). Specifically, Environment Canada has developed ECE indicator pilot programs in the agricultural and mining sectors (Barret and Pascoe, 2003).

Complex ECE indicator programs are also being employed on the regional level. For example, in the United States, states such as Massachusetts and Florida have used ECE indicators in several program areas of their respective environmental agencies. The Massachusetts Department of Environmental Protection is tracking the number of missing discharge monitoring reports and the number of facilities in noncompliance with groundwater regulations. Analyzing these "outcome" indicators before and after the agency's Groundwater Comprehensive Compliance Strategy was enacted revealed a post-policy trend towards compliance (Lumb, 2003). The Florida Centre for Public Management's Office of Enforcement and Compliance (FCPOEC) uses ECE indicators to measure compliance with regulatory programs and to determine the effectiveness of the agency's efforts (Lumb, 2003, pg.8).

In addition, results-based ECE Indicator programs are being used at the international level in the protection of endangered species. The Secretariat of The Convention on International Trade in Endangered Species (CITES) uses ECE indicators to assess the effectiveness of the treaty's enforcement. CITES aims to monitor trade in endangered species and ensure that the survival of certain listed species is not threatened. ECE indicators are used in five of CITES key programs. Overall, the use of ECE indicators has allowed the Secretariat to improve CITES implementation (Yeater, 2003, pg. 1).

3.2.2 Purpose

As compliance assurance programs are emerging to enforce environmental regulations (including both traditional regulatory and voluntary compliance strategies) ECE indicator programs can provide a measure of their success. The USEPA Guidance Document identifies three primary functions of how ECE indicator programs achieve this goal:

- **Monitoring program operations**: To ensure that personnel and resources are used appropriately to accomplish an agency's goals. This type of analysis could compare inputs and outputs; for example, how many activities of various kinds are conducted within a given period of time with a given amount of resources.. Examples include the number of inspections conducted annually and the number of enforcement warnings and charges issued per year.
- **Enhancing accountability**: To enhance accountability to central budget authorities, legislative bodies, environmental constituency groups, and the general public. Since there are multiple audiences, it is often necessary to use multiple indicators to provide a full account of program performance, and to provide. When taken together, inputs, outputs and outcomes relate a given amount of resource allocation to a number of enforcement cases settled and the corresponding reduction in pollution (e.g. kilograms of pollution reduced). These indicators can also be valuable as an internal tool to motivation for program staff and managers and to recognize and celebrate accomplishments.
- **Assessing program performance**: To determine what needs to be continued and what needs to be done differently to achieve desired outcomes. For many, this is the primary purpose and most important reason to invest in development and use of performance indicators. For example, managers can compare outputs (number of inspections) with outcomes (compliance rates) to learn whether more inspections lead to greater compliance. Similarly, comparing the number of inspections by sector with corresponding changes in compliance rates can help management identify sectors in which inspections have the greatest impact. Managers can look for patterns and relationships between activities and results, and make improvements where necessary (Stahl and Ferrell, 2004).

For INECE, the mandate to advance the field of ECE indicators stems from the Sixth INECE Conference held in San Jose, Costa Rica in April of 2002. The conference participants called upon INECE to develop uniform minimum criteria for indicator selection and to conduct pilot projects (INECE-OECD, 2003). To meet these challenges, INECE formed an expert working group that identified four primary goals:

- To strengthen demand and capacity for performance assessment of environmental compliance and enforcement activities in individual countries.
- To create indicators that provide regular feedback to managers, political leaders and legislatures.
- To stimulate cooperative projects between the INECE participants to develop and implement enforcement and compliance indicators.
- To promote international harmonization of environmental compliance and enforcement indicators, thus aiding reporting on national, regional and global progress towards sustainable development (INECE-OECD, 2003).

The following section outlines current practices in designing, implementing, and using ECE indicators.

3.3 DESIGNING ECE INDICATOR PROGRAMS

Designing a methodology for developing ECE indicator programs has been an iterative process, led by INECE, the OECD, Environment Canada, and the USEPA. Currently, there are two documents that attempt to outline a process for the selection, implementation, and use of ECE Indicators. The first effort emerged from the INECE-OECD conference in Paris, and is found within the document *INECE-OECD Workshop on Environmental Compliance and Enforcement: Measuring What Matters* (Paris Document). This document presents a multi-step process for designing ECE indicator programs, recommends a framework for indicator selection and outlines considerations for the selection and implementation of indicators. The other document is the USEPA Guidance Document that outlines a three step process for designing an indicator program, including best practices for identifying, designing, implementing, and using indicators.[2]

This section provides an overview of the current "state of play" in ECE indicator program design, the limitations of the existing methodologies, and the "best practices" in related indicator selection literature that may be adapted for future ECE efforts. , this discussion will be organized according to the three step process outlined in the USEPA Guidance Document: identifying, implementing, and using indicators (see Figure 3.1 below for the complete framework).

Figure 3.1: Model for Developing and Using ECE Indicators (Stahl and Ferrell, 2004)

Identifying Indicators →	**Designing and Implementing Indicators** →	**Using Indicators**
Best Practices	Best Practices	Best Practices
Determine scope	Use internal teams to determine how to implement	Monitor performance with regular reports
Apply logic model	Conduct pilot projects	Analyze performance of organizational units
Develop guiding principles	Implement in phases	Review effectiveness of specific programs
Select criteria for evaluating indicators	Consult with experts	Report to external audiences
Develop common definitions for key terms	Monitor the implementation	Analyze behind the numbers
Inventory existing data sources	Develop and distribute an implementation plan	
Look beyond existing data	Ensure timely and accurate reporting	
Select appropriate combination of indicators		

[2] See Appendix B for the full text of Michael M. Stahl and Robbi Farrell's draft document.

3.3.1 Identifying Indicators: Conceptual Aspects

Indicator literature identifies two critical conceptual considerations during the ECE indicator identification stage of the process: a conceptual framework and criteria for the evaluation of potential indicators (although the process may vary widely depending upon project specific circumstances). This section will primarily focus on these two aspects - the other practical steps that must be taken in any project prior to indicator selection will be discussed extensively in Section 5.0.

3.3.1.1 Conceptual Frameworks for Indicator Identification and Analysis

ECE Indicator projects are multi-faceted; measuring the interrelationship between enforcement and compliance program investment, effort, behavioral changes in the regulated community, and environmental effects. A conceptual framework can provide a means for organizing indicators in regards to these various components, while ensuring that indicator programs are designed comprehensively. They also facilitate the interpretation of indicators (Segnestam, 2002, pg.16). Currently, the logic model is the accepted framework for the development and analysis of ECE indicators. However it is prudent to consider the additional frameworks available to ECE practitioners since the "fit" of these frameworks depends on the "detail of analysis, structure, and purpose" of monitoring programs (Segnestam, 2002, pg.16).

The Pressure-State-Response (PSR) model has been employed by the OECD in the past to design environmental indicators. The model organizes indicators into the following categories:

- The *pressure* variables describe human activities or other factors creating an environmental problem.
- The *state* variables describe a measurable environmental parameter that reflects the effects of the pressure on the environment.
- The *response* variables measure the degree to which society has reacted to the environmental problem (e.g. state). (OECD, 2003).

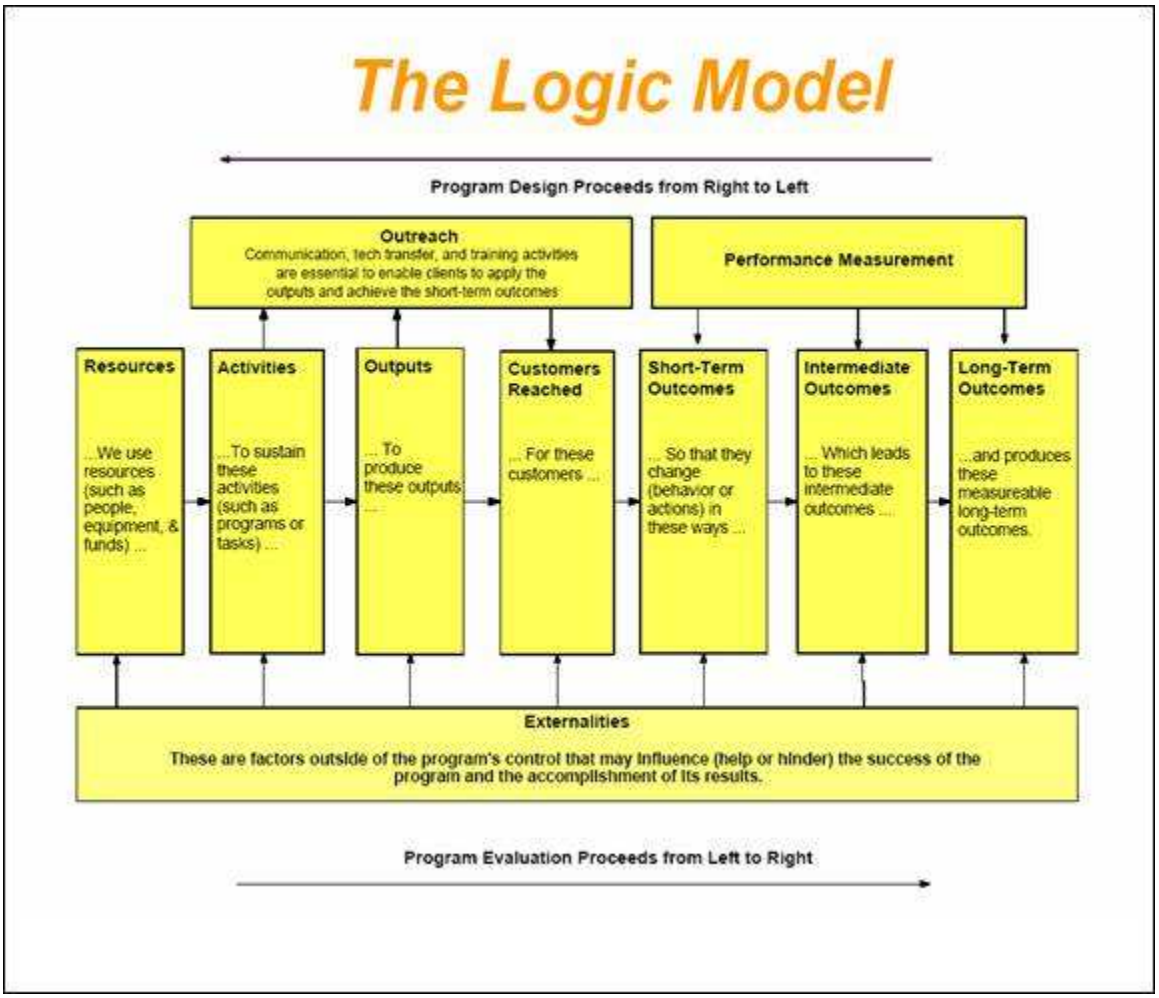
The PSR framework is linear, and grounded in a causal view of environmental problems. For example, human activities can cause negative or positive change in the environmental state; in response, society takes action to modify those activities. This linear approach has inherent limitations such as deflecting user attention away from more complex ecological and socio-economic influences at work in the state of the environment (OECD, 1994). For example, the framework does not provide for indicators that explain how "state" may modify the environmental impacts of "pressure."

Alterations to the PSR framework have emerged in the last decade, and these adaptations reflect various concerns and needs of PSR model users. A fourth indicator category has been suggested – impact indicators (Segnestam, 2002, pg.8). This category allows the state indicators to expand, encompassing existing policies or management practices that may modify the environmental change created by "pressure." In the construction of the United Nations Sustainability Index, the CSD originally advocated the use of the PSR model for developing national indicator programs (Segnestam, 2002). Upon realizing that the majority of the "test"

nations were not using this framework, the CSD abandoned the PSR model in favor of categorizing indicators according to themes and sub-themes.

Currently, OECD, USEPA, and INECE literature classify ECE indicators as societal response indicators, a modified PSR model (Stahl and Ferrell, 2004). However,interms of identifying potential ECE indicators, project-specific frameworks have been found to function more effectively than the PSR model. Project specific frameworks follow the typical flow of a project cycle: inputs, outputs, outcomes and impacts (Segnestam, 2002).. These indicator categories correspond with the definitions provided in the ECE indicator terminology section (although some ECE indicator practitioners group outcome and impact indicators under the single heading of "outcomes," while users of the project-specific framework have suggested the grouping of outcome and impact indicators under the single heading of "impacts") (Segnestam, 2002). Figure 3.2, below, is a sample logic model used by the National Center for Environmental Assessment in environmental monitoring.

Figure 3.2: Logic Model Example (Messer, 2004)



A logic model is a type of project-specific framework that acts as a graphic depiction of the relationship between resources invested, activities undertaken, and the results. The

classification of indicator categories is largely a project-specific choice - various users may, interchangeably, find the respective indicator categories helpful or confusing, and adapt their use of the logic model accordingly.

Figure 3.3: Sample Logic Model (Stahl and Ferrell, 2004)

Inputs ***Resources***	**Outputs** ***Activities***	**Intermediate Outcome** ***behavior change***	**Final Outcome** ***environmental impact***
Personnel Funds for salaries, contracts, IT, etc.	Inspections conducted Enforcement actions taken Fines assessed	Greater understanding of how to comply Improved facility management practices Increased compliance	Reduced pollution emissions Improved ambient water quality Reduced contaminant burden in wildlife species

Both the PSR model and project specific frameworks have inherent strengths and weaknesses. To begin with, titles of categories have always caused confusion since there is a wide range of definitions; however this difficulty has largely been ignored by ECE indicator literature. Overall, the specific titles of indicator categories may change within the context of a project and is of little consequence if the user clearly defines their titles and maintains a comprehensive model. The common purpose of these models is to ensure that all aspects (whether pressures, activities, impacts, or investment) of the project or program of concern are being monitored through the assignment of indicators.

Given the important status of a logic model in an ECE indicator program, it is surprising that there is little specific instruction on how to apply a logic model for the selection of indicators. The Paris Document, for example, is clear in identifying the need to organize an enforcement and compliance program within a logic model but does not provide advice to the ECE practitioner on how to accomplish this task.

3.3.1.2 Selecting Criteria for the Evaluation of Potential Indicators

One of the central themes in indicator literature is the need for programs to be as streamlined as possible (Segnestam, 2002). Criteria are employed for this purpose. Within indicator selection literature there are many synonymous terms used for criteria; Appendix C is a compilation of definitions of various criteria collected from the literature review.

The USEPA Guidance Document suggests that stakeholder discussions may elicit differing criteria on a project-specific basis, noting that the USEPA has determined the following criteria to be useful in evaluating potential indicators:

- **Relevant** to the goals, objectives, and priorities of the agency and to the needs of external stakeholders.
- **Transparent** so they promote understanding and enlighten users about program performance.
- **Credible** and based on data that is complete and accurate.
- **Functional** in that they encourage programs and personnel to engage in effective and constructive behavior and activities.
- **Feasible**, that is, the cost of implementing and maintaining a measure should not outweigh its value to the program.
- **Comprehensive** as possible with respect to the important operational aspects of program performance (Stahl and Ferrell, 2004).

The Paris Document, however, suggests that the use of three general criteria will result in more meaningful ECE indicators. Stakeholder consultation is also recommended in this document, though the degree to which this should inform choice of criteria is unclear. The following three criteria are recommended by INECE-OECD in the Paris Document:

- **Usefulness:** Policy relevant: usefulness in priority setting, resource allocation and accountability; Program relevant: to goals, objectives, and priorities; Functional: encourages constructive behavior; Timely: measure can be gathered in time to remain relevant; Comprehensive: covers important operational aspects; Informative: provides information that various users want and need.
- **Believability:** Transparent: promotes understanding of program; Credible: based on data that is complete and accurate; Simple: easy to measure and interpret.
- **Reliability:** Technologically sophisticated: incorporating the latest information technology; Feasible: value to program outweighs cost; Measurable: the process of collecting analyzing and publishing the data should be feasible and cost-effective; robust: measure produces similar indications in similar circumstances (INECE-OECD, 2003).

As evident from these examples, the terms used throughout indicator selection literature tend to be closely-related and are often employed in the same project or program.

While ECE indicator literature provides a multitude of criteria examples, there is limited discussion of how to select criteria. Thus, several questions remain unanswered. Is there a set of universal criteria that can be applied to any ECE indicator program or project? If so, how should these criteria be weighted by stakeholders to reflect the individual needs of differing ECE indicator programs or projects? Should project specific criteria be selected, through stakeholder consultation, at the onset of ECE indicator projects?

Once criteria are selected, the ECE indicator literature provides little guidance on applying the chosen criteria to potential indicators for the purpose of evaluation. The Guidance Document notes that “in applying these criteria to potential indicators it will often be necessary to compare the relevance and importance of the information produced by a potential indicator against the feasibility or cost of implementing that indicator” (Stahl and Ferrell, 2004, pg.11). It can be inferred from this observation that criteria should be applied to individual indicators in a

systematic fashion. However, this raises several questions. First, what methodology should be used to evaluate indicators? Should they be assessed qualitatively or quantitatively? Moreover, certain criteria seem to apply to the indicator program as whole rather than individual indicators. Comprehensiveness, for example, is a criterion listed in the Guidance Document that poses difficulty in application to any single indicator. ECE indicators function together to provide information; thus, assessing any single indicator for comprehensiveness outside of this context proves difficult.

The Paris Document, as noted, presents a set of three broad criteria for evaluating potential indicators, but does not provide specific methodological recommendations for applying the criteria. The sole methodological example for the application of criteria was found as an appendix in the OECD's most recent document for developing environmental indicators. This quantitative approach assigns a numerical ranking for each indicator's performance for each criterion and presumably examines the total score for each indicator. However, accompanying text or instruction would more clearly explain the methodology that is being recommended.

3.3.2 Implementing Indicators

The implementation phase should begin once a set of indicators has been identified. This phase is the appropriate time to define, test, and correct indicators "before reporting indicator data to the public or using it to assess and improve performance" (Stahl and Ferrell, 2004, pg.15). Steps in this stage should not be skipped in the race to start using the indicators (Stahl and Ferrell, 2004).

The USEPA Guidance Document provides a seven item "menu" for implementing indicators, and the Paris Documents offer similar suggestions. The menus consist of broad recommendations that may be applied to a variety of ECE indicator programs:

- **Internal teams** can organize the program, establish a timeline for implementation and recognize any potential hiccups.
- **Pilot projects** can evaluate and refine a program before it is fully implemented.
- **Phased implementation** can make a program more manageable.
- **Outside Experts** can provide consultation on difficult issues.
- **Managers** can monitor the program to make sure that appropriate implementation steps are occurring.
- **Implementation plans** can be developed and available for all program stakeholders.
- **Quality control programs** can ensure that data is reported and collected correctly (Stahl and Ferrell, 2004).

Many of the comments made in the second E-dialogue offered a few notable additions to the list above. First, the size of the implementation team emerged as an important consideration. Participants agreed that the team should be fairly small to ease overall team management. Others, such as high level policy makers, should be kept abreast of progress but involved to a lesser extent in daily management. In addition, it was noted that the implementation team should develop an appropriate data management system for tracking and evaluating indicators during and after implementation (INECE, *INECE E-dialogue Summary*, 2004).

Further best practices can be found in section 7. The practices have been culled from indicator literature in general, from ECE documents, and from the local-level programs discussed above: the Indicators Implementation Task Force (IITF) for the Great Lakes Water Quality Agreement, the New Jersey Department of Environmental Protection (NJDEP), the Institute for Natural Resources (INR) at Oregon State University, and the Chesapeake Bay Program (CBP).

3.3.3 Using Indicators

In order for the program to eventually achieve its objectives, the indicators must be used and analyzed appropriately. The USEPA notes that the benefits to compliance and enforcement may not be seen immediately; ECE practitioners must first gain experience in interpreting the indicators and applying them to specific enforcement programs (INECE, E-Dialogue and Using and Implementing Indicators, 2005). This phase of the program includes determining what aspects of environmental compliance and enforcement need to be analyzed (i.e. what relationships is the user interested in demonstrating); what technical guidelines and tools should be used to ensure a meaningful analysis; and how the information should be presented to the appropriate stakeholders. In the second INECE e-dialogue, Michael Stahl of the USEPA commented that, "…many nations have moved into the identification and implementation stages, and a few have moved into the stage of actually using indicators to manage and improve their programs (INECE, *INECE E-Dialogue*, 2005)." As a result, the discussion of the use and analysis of environmental-related indicators is limited in the literature; there are only a few organizations that outline this phase of indicator programs. The following section draws upon the experiences of these various organizations that have used and analyzed indicators in the past.

3.3.4 Summary: ECE Indicator Development, Implementation, and Use

Primarily, the users of ECE indicator programs attempt to demonstrate relationships between the various components of a compliance assurance program; these components include enforcement and compliance promotion investments and activities, the response of the regulated community, and the resulting environmental impact. In practice, linking enforcement activities with the behavior of the regulated community and environmental impacts has proven quite difficult. Many early ECE indicator programs focused on inputs and outputs – allowing the user to document how investments translate into activities, yet failing to indicate the impacts of activities on the behavior of the regulated community. Though subsequent efforts had success in designing results-based management indicator programs, further discussion is needed regarding the limitations of linking outcome indicators with enforcement activities. A comprehensive ECE indicator program contains quantitative measurements for each of these components, although qualitative measurements also reveal important trends.

The ECE indicator field has emerged only recently and, accordingly, the body of literature is limited in size. As a result, several aspects of indicator development, implementation, and use remain un-examined in the literature. However, the work of the USEPA, INECE and the OECD has provided a strong foundation for those who will follow. This section has highlighted topics where further work on ECE indicators can provide valuable insight for practitioners who would like to implement an ECE indicator program. Below follows the list of topics for later expansion:

- Standardization of titles for conceptual models.

- Recognition of the inherent limitations of linear frameworks.
- Adaptation of external factors to a logic model.
- Documentation of practices that have worked in the past so that practitioners do not re-invent the wheel for each program.
- Discussion of the role and practical implementation of criteria.

4.0 Pilot Project Background

Although the methodology to identify ECE indicators has been significantly advanced in recent years by INECE, the OECD, Environment Canada, the USEPA, and numerous others, this framework has largely developed within the context of developed countries. In developing countries, numerous economic and political challenges exist that may act as barriers to directly implementing programs patterned from programs in industrialized countries. Given the unique situations faced by these countries, significant work remains in adapting an ECE indicator framework to meet their needs and capacity. To this end, INECE chose to focus the Bren Pilot Project within a developing country; ultimately, the project is intended to serve as a model for future efforts in the developing world. Moreover, as stated, the lessons learned from the pilot project development process will contribute to the goal of advancing the guidelines for ECE indicator program development. As ECE indicator programs flow from well-crafted environmental law, (these programs ultimately aim to improve enforcement efforts, not legislation), Costa Rica was chosen for its' relatively advanced legal framework and reputation as a regional environmental "powerhouse" (Mauri, 2004, pg.2). Costa Rica also provides an interesting case study of the balancing act between development and conservation in the attempt to transition towards "developed" status. However, as in the case of other developing nations with limited environmental budgets, Costa Rica faces considerable environmental enforcement challenges.

The pilot project is positioned to provide valuable information regarding enforcement and compliance efforts within the Costa Rican forestry sector. Collaboration with a broad spectrum of stakeholders, including legal experts, the regulated community, non-governmental organizations (NGOs), and ministry officials will aid in the development of a relevant, feasible program. The Costa Rican pilot project will provide MINAE, the Prosecutor's Office, and the Forest Regents Association (supervisory universities) with a specific set of measurements that can be used to identify environmental compliance and enforcement successes and failures in their organizations.

The following section provides a brief overview of the enforcement and compliance challenges faced by developing nations, many of which are applicable to Costa Rica; an overview of Costa Rica's environmental challenges also follows.

4.1 ENVIRONMENTAL ENFORCEMENT AND COMPLIANCE CHALLENGES IN DEVELOPING COUNTRIES

Developing countries are generally characterized by low-income economies and, often, the lack of complete self-sufficiency and independence (Zaelke, Salzman, and Hunter, 2002). The economic, social, and political situations in these countries often contribute to significant levels of environmental degradation (United Nations, 1997). Given the concentration of natural resources and biodiversity in developing countries, and the long-term economic benefits that conservation can provide, the need for effective environmental regulation in these countries is especially urgent.

Weak environmental enforcement, in addition to undermining efforts towards achieving sustainability, can result in the considerable loss of social welfare and revenue (OECD, 2001).

The factors listed below are commonly identified as challenges in the enforcement of environmental law and contributors to non-compliant behavior:

- Poverty
- Corruption
- Lack of resources (technical, human, and financial)
- Lack of political will and governance
- Lack of and/or violation of property rights
- Conflicts with customary rights of indigenous populations
- Complications inherent in balancing development with environmental protection
- Diverse cultural attitudes about the value of the environment

4.1.1 Environmental Protection and Economic Development: Conflicting Goals?

The fundamental need to alleviate poverty in the developing world is widely recognized by environmental protection advocates. The United Nations Stockholm Declaration, Conference on Environment and Development (Rio Summit), and World Summit on Sustainable Development (Johannesburg, South Africa) each centered on the linkages between poverty and environmental degradation (Zaelke, Salzman, and Hunter, 2002). The perception of an ever-present "tension" between the accomplishment of these goals, however, represents a significant threat to sustainability.

Indeed, the perspective that "environmental protection is a luxury to be addressed later" and a "drag on the engine of growth" represents a significant challenge to both the implementation and enforcement of environmental legislation (Zaelke, Salzman, and Hunter, 2002, pg.167). According to the Global Environment Fund (GEF, 2002), the perception of this tension is partially due to widespread lack of information regarding the benefits of environmental protection. The GEF affirms that the problem of under-valuing the environment is a significant long-term threat to poverty alleviation, as failure to protect the environment can result in the loss of significant potential revenue.

The final statement of the 6th INECE Conference in Costa Rica identifies an "Enforcement Gap" in developing countries, stemming from the lack of investment in enforcement and compliance capacity building. Apparent in this statement is the recognition of participants that poverty alleviation and environmental protection should be simultaneously addressed by policy-makers in developing countries. The statement declares:

> While poverty is a major cause and consequence of environmental degradation and calls for urgent remedial action, the failure to invest in the strengthening of enforcement and compliance programs is a key reason for the continuing degradation of environmental quality (INECE, 2002).

4.1.2 The Effects of Limited Capacity

In general, enforcement programs in developing countries are characterized by a lack of capacity; this lack of capacity may stem from: weak administrative and legal systems; limited

human resources, financing, equipment/technology; and inadequate training. The lack of capacity limits the ability of compliance assurance programs to engage in necessary enforcement and compliance promotion activities such as: inspections/monitoring, public education campaigns, compliance promotion/regulated community outreach, and the use and develop of dispute settlement mechanisms. The lack of resources may also limit or discourage innovative capacity in the private sector and can contribute to the inability of nations to uphold basic enforcement principles such as the Polluter Pays Principle, which states that those who cause pollution should be responsible for the costs (O'Connor and Turnham, 1992).

Without adequate administrative capacity, the rule of law cannot be maintained through enforcement activities. The United Nations Environment Programme's (UNEP) *Global Outlook 2000* summarizes how environmental regulation, particularly the implementation of legislation and enforcement of standards, is often impaired by the lack of institutional capacity; UNEP cites shortages of trained staff, weak enforcement and monitoring efforts, and a lack of interagency coordination as key factors contributing to weak institutional capacity (2000). Adequate capacity requires a well developed and functioning administrative and legal system as well. In addition to effective enforcement and compliance mechanisms, a well developed and functioning environmental regulatory framework would include: the setting of quality standards, the institution of a methodology for implementing regulations, and the performance of environmental cost-benefit and impact assessments for government policies (O'Connor and Turnham, 1992). A well-developed and functioning legal system, argue O'Connor and Turnham, is dependent upon a system of clearly defined property rights and enforceable contracts (O'Connor and Turnham, 1992, citing Menell). In general, poorly-defined property rights are associated with market and government failure.

Capacity issues related to environmental regulation are also strongly connected to political will; lacking political will threatens institutional capacity. The commitment level of leadership is a strong factor in the achievement of environmental compliance, particularly when high economic costs are associated with regulation. High regulatory costs, such as those associated with command and control regulatory strategies, are an obstacle without strong support from policymakers (O'Connor and Turnham, 1992). In addition, weak or uncommitted leadership can lead to problems of inequity and inefficient allocation of environmental goods. In many cases, environmental externalities are imposed by politically strong or affluent entities on those without the resources or power to influence governmental decision making (O'Connor and Turnham, 1992). The OECD states that, "In practice, 'pollutee suffers' may be as much the operative principle as 'polluter pays'" (O'Connor and Turnham, 1992, pg.6).

Corruption, or undue influence, may also be a concern in when institutional capacity is limited. Lacking public integrity standards, transparency in decision-making or accountability may facilitate the proliferation of corruption. There have been numerous international efforts to address corruption; these include initiatives for developing transparent processes in the United Nations (The Convention Against Corruption), OECD monitoring associated with the Anti-Bribery Convention, and the efforts of several NGOs (such as Transparency International) (US Department of State, 2004). Nevertheless, limited institutional capacity continues to generate corruption in developing countries – challenging the effectiveness of environmental enforcement efforts.

4.2 ENVIRONMENTAL ISSUES FACING COSTA RICA

Costa Rica provides an interesting case study of the dynamics between economic development and resource conservation. Indeed, Costa Rica has become a world leader in demonstrating the beneficial impact that environmental protection can have on economic development. The country is slightly smaller than the state of West Virginia, and has a population of nearly 4 million people. Despite the environmental pressure that the growing population exerts, approximately 25 percent of the countries total land area has been placed under some form of federal protection (Mauri, 2002).

Costa Rica is generally considered a middle-income developing country, and exhibits a relatively stable economy and democratic government (US Department of State, *Consular Sheet Costa Rica*, 2004). Unlike most Central American countries, Costa Rica enjoys high levels of education, sanitary water supplies, and considerable economic growth opportunities for its citizens (World Bank, 2000). In recent years, Costa Rica has gained a reputation for its strong commitment to environment protection and the reversal of declining environmental trends. In many respects, Costa Rica has overcome the challenges that have confronted most Central American countries. However, despite its past environmental achievements and stable economic profile, significant environmental problem remain. According to a 1999 report by the UN, titled *The State of the Nation on Sustainable Human Development*, these problems include deforestation (and the associated loss of biological diversity), chemical pollution, numerous mining problems such as water and soil contamination from chemical wastes, over-fishing, agricultural runoff, and population growth (Mauri, 2002, citing the United Nations). In order to address these issues, an effort needs to be made to strengthen the enforcement and compliance of existing environmental legislation, as well as the legislation itself.

4.2.1 Focus on Illegal Logging

Tropical forests house approximately six percent of the world's biodiversity and are arguably one of the most important ecosystems on the planet. These environments provide numerous ecological, social, and economic values to local and international communities (Instituto Nacional de Biodiversidad Costa Rica, n.d., 2004). A few examples of these benefits include eco-tourism revenue, revenue associated with biodiversity prospecting (pharmaceutical research), and the sale of raw timber and wood products. Forests also serve many indirect economic functions which benefit society and the environment, yet are often not recognized or included in market valuation of forest resource products. For example, these benefits include: reduced soil erosion and siltation of waterways, reduced risk of sedimentation of dams, increased water supply to agricultural lands and urban communities, water filtration, provision of biodiversity habitat, and increased global carbon sinks (Simula, Salmi, Puustajarvi, 2002). When governmental officials do not include these values in their cost benefit analysis of large-scale projects and agricultural development, complex forest management strategies may not appear attractive or beneficial to the country (World Rainforest Movement, 1999).

Participants in the "Workshop on Underlying Causes of Deforestation and Forest Degradation", which took place in Costa Rica in 1999, summarized various triggers of deforestation; many of which are applicable to a range of environmental problems. Several of the main factors contributing to deforestation include: land tenure disputes, social exclusion of local communities, inadequate resource management, conversion of forests to ranchland, lack of "forest culture"

(Hirakuri, 2003) in society and the timber industry, market failures, impacts from international trade, and illegal logging.

Economic incentives to disregard sustainable forestry management practices often encourage non-compliant behavior. For example, timber companies following forestry regulations and exhibiting good management practices may experience a market disadvantage in comparison with those who harvest illegally; complying with regulations results in the accrual of higher operation costs (CATIE, n.d.). Accordingly, many timber companies adopt less stringent management practices and fail to take a pro-active approach to compliance – thus avoiding economic penalties. The market's failure to adequately value forest products and encourage sustainable management practices results in lost federal tax revenue and increased expenditures to track and monitor illegal forestry practices (CATIE, n.d.). Despite these negative consequences, various governmental policies, such as land settlement policies promoting the conversion of forest to agricultural land, have perpetuated incentives for poor management practices; in effect, through encouraging deforestation, these policies have resulted in substantial losses of potential revenue (CATIE, n.d.).

As early as the mid-1900's, Costa Rica began to experience high rates of deforestation. Throughout the last fifty years, several government policies have encouraged deforestation through the promotion of land-use changes; these policies include subsidies for cotton, sugar, and beef (Silva, 2001). Though tropical forest covered approximately 50 percent of the country's land area in 1950, this coverage is currently only 25 percent (Mauri, 2004). The estimated current coverage value is greater (approximately 40 percent) if plantations and agro-forestry acreages are included in the calculation. Target coverage of 65 percent has been agreed upon by several forestry management experts (Alfaro, 2004.).

Conservation efforts in Costa Rica began in the 1970s, and gained considerable momentum in the mid-1980s (Mauri, 2004). The founding of the National Park system in 1970 served as a major conservation accomplishment, and was paralleled by the emergence of the forestry law framework; these accomplishments occurred in response to the escalating rates of deforestation. Over the years, the forestry law framework has evolved into a highly sophisticated collection of policies and programs designed to effectively manage forestry resources. As a result of its innovation and foresight, Costa Rica's national reserve system and legal framework has become a forestry management model for other developing countries. However, this system has also faced many legal and administrative challenges. This is partially due to continued legislative restructuring and a pervasive lack of institutional capacity. Since law provides the foundation for any authorized MINAE action, knowledge of how the legal framework functions in the forestry sector is necessary for the construction of an ECE indicator program.

During the end of the 1980's, MINAE realized that police action was insufficient to deal with issues of enforcement and compliance in relation to the Forestry Law (C. Herrerra, Personal Interview, October 7, 2004). The 1986 version of the forestry law was a mix of development and conservation; however, it created a "police state" in the forestry sector where owners of the land were viewed as bandits by society at large. Severe penalties for infractions of the law were a hallmark of this period, and created an adversarial relationship between industry, government and the public sector (C. Herrerra, Personal Interview, October 7, 2004). The early 1990s witnessed a shift in enforcement mentality from the police state approach to compliance promotion and civil methods of control. During the same time period, the General

Environmental Law was enacted to cover both protection and development of the nation's natural resources. The effect of this law was to add another layer of legal complexity to forestry management. In 1996, the fourth incarnation of the Forestry Law came into force – a law that not only contained specific provisions for governing forestry activities, but reorganized the institutional dimensions of forestry enforcement. The emerging "compliance promotion" strategy was formalized within the law, and new actors and relationships within the forestry sector were established.

Within the Forestry Law, the management plan has become the most prominently used implementation tool for monitoring and approving forestry activities. Management plans are the technical basis for approval of forestry activity permits. The plans are comprehensive documents prepared for MINAE officials (in the sub-regional offices of the Sistema Nacional de Áreas de Conservación (SINAC)) by forestry professionals from The College of Agricultural Engineers and The Technical Institute of Costa Rica. These plans also include information necessary for approval of PSAs, or forest service payments, which reward efforts to conserve, reforest, or sustainably manage forests.

Management plans not only outline proposed uses of forest resources, they also require the coordination of all entities involved in forestry activities; these "players" include small landowners, timber industry managers and workers, and MINAE officials. The forestry regents are prominent actors within the forestry management plan framework. Regents are non-state actors who draft, implement, and monitor the plans. Though it must be noted that management plans require the approval of MINAE prior to implementation, regents have, in many respects, replaced the traditionally held post of governmental officials. A description of the chief stakeholders in the management plan process follows below, coupled with an account of how these stakeholders interact and influence one another. Implicit in this discussion are the mechanisms through which ECE indicators may facilitate the assessment of the management plan process – from highlighting effective management practices to pinpointing the unsuccessful.

4.2.2 Description of Costa Rican Stakeholders

This section introduces the main players in the forestry sector of Costa Rica - actors who have direct ties to the legal structure of enforcement and compliance. Much of the information below was provided by interviews with key forestry stakeholders, including government, industry, and NGO representatives.

4.2.2.1 National System for Conservation Areas

SINAC is the main governing body of MINAE for the eleven national conservation areas. It was created under the Biodiversity Law of 1998, which brought together the Forestry General Directorate, the National Park Service, and the Wildlife Directorate. In relation to forestry management, SINAC oversees all three stages of the management plan process; these stages include the revision and approval stage, the implementation and monitoring stage, and the transportation stage (Contraloría General de la Republica, División de Fiscalización Operativa y Evaluativo, 2000). Since SINAC is a fairly decentralized organization with independent offices in each conservation area, coordination and standardization between the offices has proven to be difficult.

Each area has its own coordinator who governs the three main goals entrusted to them by national legislation. These primary goals include the development of forestry resources, management of wilderness areas, and protection of natural resources (Contraloría General de la Republica, División de Fiscalización Operativa y Evaluativo, 2000). Guiding the decisions of the general coordinators are the Technical Committees and Regional Councils. Amongst the eleven conservation areas, there are approximately 700 to 1,000 employees who either work in one of the eleven regional offices or in one of the thirty-three sub-regional offices. An official in charge of the Control and Protection Unit takes on the responsibility of monitoring and controlling management plans. Although the national territory is relatively small, the sub-regional offices often lack the resources needed to carry out all of their legislated duties (Contraloría General de la Republica, División de Fiscalización Operativa y Evaluativo, 2000).

SINAC funding comes from three main sources: entrance fees for National Parks, resource extraction within the National Parks, and taxes from the timber industry. Taxes have been notoriously difficult to collect, while the national budgeting system often does not work in SINAC's favor. All revenue brought in by the park system is entered into the national budget where it is then reallocated back into the park system, often at a loss for SINAC (S. Lobo, Personal interview, October 7, 2004). Budgetary constraints are often cited as major obstacles to the effective administration of forestry resources and sufficient monitoring of management plans.

In response to complaints on forestry law violations, SINAC refers cases to MINAE and their Environmental Tribunal. In most circumstances, the Tribunal advises MINAE to settle with the defendant due to the non-serious nature of the harm or lack of evidence (J.P. Gonzalez, Personal interview, October 6, 2004). More serious cases are referred to the prosecutor's office for deliberation. Further details about SINAC activities are presented in Appendix G.

4.2.2.2 Forestry Professionals

Forestry professionals, or regents as they are better known, are a key element in ensuring compliance with laws in the forestry sector. As noted, regents not only create the structure and content of the management plan, they also guide its implementation and monitor its successful completion. Although regents are not government officials, they act in the same capacity that SINAC once did; namely, they ensure the timely and lawful execution of management plans within the dictates of national law.

The role of the forestry regent was created under article 22 of the Forestry Law 7575. This article instituted a formal link between agricultural colleges and the government by creating an agent who ultimately answered to MINAE, but remained a third party monitored by their graduating college, and hired by private industry and landowners. In this way, forestry professionals would be trained in the technical and legal aspects of forestry management and act as the eyes of the government, while providing private consulting services to their employers (S. Lobo, Personal Interview, 2004). This new relationship between the private and public sector meant a shift in resource allocation for SINAC, an increased level of expertise guiding the field, and a continued decentralization of the forestry sector that began with the decentralization of SINAC (S. Lobo, Personal Interview, 2004).

Since regents are subject to oversight by SINAC and the college from whom they received their degree and license, they are legally bound by all regent-specific provisions in the law – as well

as internal college rules (Munoz, 1997). Regents receive their training from accredited technical colleges; the oversight responsibilities of these colleges include monitoring regent activities, assessing performance, and disciplining those who commit infractions of the forestry law or internal collegiate rules. Before a regent can receive his or her license to practice, he or she must sign a legally binding contract common to all public servants, called Fe Publica, or "Public Faith". This contract states that the public servant will perform in the interest of the public and will not promulgate any false information, nor hide any information regarding non-compliance if such a discovery should be made (S. Lobo, Personal Interview, 2004). In addition, regents are required to place a license fee in "escrow" which can be subject to confiscation. In this way, regents' responsibilities include professional and legal obligations that are subject to both penal and civil review (Munoz, 1997). Colleges have first priority in disciplining their graduates, but if a crime is of a grave enough nature, SINAC or the Prosecutor's office will take over the case and impose penalties (S. Lobo, Personal Interview, 2004). The most common actions for disciplining regents are suspensions, revoking of licenses and monetary fines (J.P. Gonzalez, Personal Interview, 2004, 2004).

Questions of regent credibility and effectiveness have been raised by nearly every actor in the forestry sector at some point in the Regency's short history. Government officials worry that regents may be acting as industry mouthpieces instead of independent agents; conversely, industry is skeptical about the separation of regents and SINAC enforcement agents – in sum, all actors question, "For whom are the regents working?" However, when pressed to give an opinion on the efficacy of the regency system, the majority of stakeholders consulted agree that an improvement in the forestry management system has been realized over the last decade, due in part to the work and experience of the regents. Appendix G presents more information about regency issues.

4.2.2.3 Industry

Extensive private industry participation is woven into the forestry enforcement structure through the management plan requirements; in addition, private industry enjoys a significant lobbying voice. In comparison to many international timber firms, Costa Rican timber firms are viewed as small players; average holdings are approximately 6 to 8 million hectares of timber land per firm, or 15 to 20 million acres (A. Barrantes, Personal interview, October 6, 2004). Given the limited occurrence of large timber companies, many firms have elected to join forestry chambers where lobbying efforts can be shared between businesses. Even though these chambers enjoy a powerful voice in congress, they are not guaranteed special status within the law (A. Barrantes, Personal Interview, 2004).

Within the legal framework, timber companies seeking logging permits are responsible for securing the services of a regent to ensure that a proper management plan is presented to SINAC for approval. Once the regent is hired, the company is contractually obligated to follow the dictates of the forestry professional (Munoz, 1997). Recordkeeping is also the responsibility of timber firms; approved permits must be available upon inspection of any forestry related activity performed by the company.

For industry, the regent's role is often viewed as the source of bureaucratic headaches, delays in permitting, and additional expenses. In business calculations, the technical components of forestry management related to regents and regulations are viewed as extraneous costs that do not act as investments (Munoz, 1997). Because of these frustrations, many players in industry

believe that forestry management should be completely privatized; or that regents should at least have more independence from state control (Barrantes, 2004).

However, despite this dissatisfaction with the degree of government intervention, the private sector is comfortable with how the industry is currently being regulated in many regards Barrantes, 2004). Indeed, the limited capacity for enforcement generates substantial opportunity for undetected violation of forestry law. Faced with legal obligations, firms often weigh the costs of compliance against the costs of being caught and base their decisions on these calculations. In spite of this cynical approach to forest compliance, large companies have not been identified as major players in the illegal extraction of timber. In recent years, industry has begun to rely more heavily on forestry plantations for timber supplies – as opposed to naturally occurring forests. In addition, a number of firms have begun to implement voluntary management strategies such as forestry certification in response to demand in the market for sustainable forest products.

4.2.2.4 Landowners

Small landowners are perhaps the most economically and socially vulnerable actors in the forestry management hierarchy. Their role is often ill-defined and subject to economic and legal constraints outside of their control. However, what occurs on their land can have large impacts on the quality and extent of forested lands in the nation.

To begin understanding the position of the small landowner within the law, examination of the first article of the most recent Forestry Law is beneficial. Article 1 begins (¶ 1) by stating that forests are protected in order to promote the sustainable use of natural resources. The next paragraph then limits where, and who can use various forest resources. Places such as mangrove ecosystems, the traditional homes of many rural residents, have been set aside for preservation – for local peoples, this provision has meant a displacement from their customary sources of building materials and daily means of foraging (Herrerra, personal interview, October 7, 2004). In the lands designated for resource extraction, many small landowners lack the funds necessary to engage in forestry activities; for example, landowners must have sufficient funding in order to hire a regent to prepare the necessary management plan. Given the inability to pay the high costs associated with management plans, landowners may form a relationship with loggers, who are capable of complying with the requisite regulations. These loggers act as intermediaries between timber companies and landowners - hiring regents, obtaining the necessary permits, and arranging labor and equipment. In exchange for these services, landowners receive a nominal payment for their timber, yet retain all legal responsibility for any illegal activities that occur on their land due to the loggers. (S. Lobo, Personal Interview, 2004).

Alternative business strategies on land designated as forests are also often outside the means of the small landowner. The land use constraints placed on landowners of forests has contributed to the conversion of forests to other agricultural purposes. Since pastures and "open" lands are subject to fewer restrictions and legal obligations under the permitting system, obtaining approval for timber extraction in these areas is quicker and less expensive. Unfortunately, this regulatory discrepancy has created a perverse incentive for landowners; they clandestinely convert their forest land to pasture land by removing low-lying vegetation, planting grasses, and moving cattle onto the land (if confronted, many claim that the land has always been so – which is difficult to disprove given historically weak land use monitoring). It could be argued that less stringent regulations on lands designated as pasture and open areas

has resulted in unnecessary forest degradation and fragmentation (C. Herrera, Personal Interview, October 7, 2004).

Land tenure is another significant complication for landowners, which can interfere with sustainable forest management. Approximately 20 to 30 percent of forested lands are owned without deeds or records in the public registry (C. Herrera, Personal Interview, October 7, 2004). The historical roots of this issue are easy to trace; however, remedying the situation is not as straightforward. In order to gain legal title to the land, owners of the property (who have often lived on the land for generations) must obtain a lawyer and pay the costly processing fees associated with these transactions. The process is not only expensive, but also time consuming and bureaucratic. However, obtaining a land title is the only way that landowners can legally engage in forestry activities and take advantage of the Payments for Environmental Services (PSA) program. This obstacle alienates small landowners from the regulatory framework and incentive programs, arguably encouraging land use change from forests to pastures or cash crops and promoting poor management practices (C. Herrera, Personal Interview, October 7, 2004).

4.2.2.5 Non-Governmental Organizations (NGOs)

NGOs are a diverse group of organizations with varying levels of resources and influence. In the forestry sector, large NGOs have taken on the role of advisory bodies to citizens, industry, and government. They have been able to focus on the needs of these diverse groups of actors and build consensus amongst them on balancing forestry development and conservation. In most cases, NGOs focus on local constituents and the considerable process of organizing and analyzing locally generated information (Arrieta, Lilliana, Personal Communication, October 4, 2004). They can also provide an experimental platform for innovative forestry practices and management techniques.

Within parks and conservation areas, NGOs can also act as regents, educators, researchers, providers of support services for families, and legal advisors. Some of the larger NGOs such as Fundación para el Desarrollo de la Cordillera Volcánica (FUNDECOR), can provide funding and expertise in such areas as implementing computing technologies, drafting ground surveys, and mapping of regions through satellite imagery (C. Herrera, Personal Interview, October 7, 2004). Outside of the parks and conservation areas, NGOs work in conjunction with financial service organizations, environmentalists, industry, and universities.

As agents outside of the government, NGOs are able to attain funding for forestry projects that may not be available to government bodies. Their status allows them to file complaints about all stakeholders and to lobby the legislature for modifications of the forestry legal framework (Alfaro, 2004). At the same time, NGOs can be constrained by their non-official status. Limited funding is available when external sources run low, and government approval is required for NGOs to enact programs on a national level. Clearly, however, it is apparent that Costa Rican NGOs can play a key role in forestry supervision and act as important stakeholders in the decision making processes of forestry management programs.

5.0 Pilot Project Process

The following section documents the chronological steps taken by the Bren Team to develop a pilot project in Costa Rica. This process has been documented in order to provide context for the team's results, and also to act as an example of successful and unsuccessful techniques for program development. The experiences and lessons learned from the indicator selection phase of the Team will be discussed in this section.

The team's specific process is summarized in Figure 5.1 below, and follows the USEPA Guidance Document (based on Figure 3.1 in Section 3.3).[3] However, the figure has been modified to reflect the influences of the World Bank, the United Nations, OECD, and various programs in the United States. Box 5.0, at the end of this section, contains the Team's assessment of the USEPA Guidance Document and offers suggestions to increase usability.

Figure 5.1: Model for Using and Developing ECE Indicators Developed by the Bren Team

Project Development *Best Practices*	**Selecting and Implementing Indicators** *Best Practices*	**Using Indicators** *Best Practices*
Develop common definitions for key terms	Develop the Conceptual Framework for Indicator Selection	Monitor performance with regular reports
Conduct a thorough review of indicator selection literature	Understand the Enforcement Process	Analyze performance of organizational units
Develop a library of indicators that have been implemented	Inventory existing data sources and identify potential indicators	Review effectiveness of specific programs
Engage Stakeholders	Evaluate Potential Indicators	Analyze behind the numbers
Determine project scope (sector and geographic)	Look beyond existing data	Review implementation at a larger scope
Develop Guiding Principles	Develop and distribute an implementation plan with recommendations for best implementation practices	Report to external audiences
Select criteria for evaluating indicators	Implement in phases	
Set feasible and usable goals	Monitor the implementation	
Outline employed enforcement and compliance strategies	Ensure timely and accurate reporting	

[3] Though an effort was made to present these steps chronologically; several of the steps in this framework were ongoing throughout the Pilot Project's duration.

The above Figure is the chronological process used by the Team to develop the Costa Rica Pilot Project. The sections in blue were completed; general recommendations for the remaining sections are included in Section 6.0.

5.1 GETTING STARTED: UNDERSTANDING ECE INDICATORS

ECE practitioners will have varied experiences with designing an indicator program, and as a result, the initial steps discussed below may be more appropriate for some than others. Given the Team's relative inexperience when initiating the Pilot Project, it was a priority to gain an understanding of the function and structure of ECE indicator programs. For example, the Team found it necessary to "develop a library of indicators in practice," but this does not need to be repeated in every program development effort (this would be an exercise in futility). Thus, these initial steps represent phases that may not be generally applicable to future pilot projects; nonetheless, the following steps will be briefly discussed:

- Develop common definitions for key terms.
- Conduct a thorough review of indicator selection literature.
- Develop a library of indicators that have been implemented.

The USEPA Guidance Document and the Paris Document (INECE-OECD) provided common definitions for key terms as listed in Section 3.2.1. Ultimately, the goal of this phase was to develop a strong understanding of ECE indicator terminology and develop a common vocabulary amongst Team members to ease communication.

The Team compiled a broad list of ECE indicators that are in use by INECE, the USEPA, Environment Canada, the OECD, the European Environment Agency, the World Bank, and UNEP and supplemented by literature from environmental and sustainability indicator programs. Forestry-specific indicators were also collected; both of these lists are included in Appendix D. These indicators are organized by type (sub-category) within the primary logic model categories and sourced to compliance assurance programs. The list clearly demonstrates which ECE indicators, or types of indicators, are being used most.

Considerations

There is little available guidance for designing indicator programs in developing and transition economies, and work that has been performed remains in the initial stages of development. Recommendations taken from the USEPA Guidance Document and the Paris were combined with the Team's field experience in Costa Rica to derive final recommendations for developing countries. However, the existence of critical methodological gaps, and lack of ECE indicator experience in developing nations has added an additional challenge to the Team's work.

5.2 PHASE 1: IDENTIFYING INDICATORS

5.2.1 Engage Stakeholders

The goals of the conference and stakeholder meetings were to scope the pilot project, to create a line of communication between stakeholders, and to encourage support of project goals .

Carolina Mauri, a prominent Costa Rican environmental law scholar, functioned as the Team's primary contact. Other stakeholders were representative of a diverse array of organizations including representatives from MINAE, the National Forestry Office (ONF), the Environmental Prosecutor's Office, industry, and environmental NGO representatives (a complete list of participants and those individuals interviewed in Costa Rica is provided in Appendix E).

To facilitate group interaction at the Expert Working Group Conference in San Jose, prior to the trip, a brochure was developed that summarized the structure of ECE indicator programs, common definitions, and potential benefits of indicators. After the conference, the Team arranged supplementary meetings with organizations, including those that were not in attendance. These additional interviews yielded a significant amount of information and provided a thorough understanding of the forestry sector in Costa Rica. Overall, collaborating with a wide variety of organizations aided in the development of a relevant and useful project.

Considerations

Geographic separation and limited, personal contact provided a challenge in stakeholder communication. Though the Team conversed with stakeholders via telephone and email, these mediums were not as productive as in-person discussions. .

5.2.2 Determine Project Scope

The USEPA Guidance Document discusses project scoping in terms of two essential questions:

- "Will the indicators be comprehensive (that is, will they cover all the laws and programs for which the agency is responsible) or focused (covering only a specific law or requirement, industry sector, geographic area or non-compliance pattern)?" (Stahl, 2004, pg.19)
- "Will the indicators be national (that is, covering the national compliance and enforcement program) or sub-national (covering a program at the regional/district, state or local/ municipal level)?" (Stahl, 2004, pg.19)

This section discusses the steps taken by the Team to answer these two questions.

A sector specific project can be useful in evaluating and refining an ECE indicator program prior to initiating a more comprehensive program; the process of trial and error at this smaller scale may prevent larger-scale, more costly mistakes. In addition, as Costa Rica has not used a formal ECE indicator program in the past, a large, complex program at the onset would have likely been infeasible.

The Team deliberated with Carolina Mauri prior to the conference to brainstorm a possible focus. She suggested that the forestry sector would be a useful and relevant focal area. She also indicated that the forestry sector could benefit from an analysis of enforcement and compliance efforts, had readily available data, and could pose as a model for future ECE indicator programs. Conference participants offered many suggestions for a sector focus - it became clear that there needed to be an in-depth discussion with the participants regarding the sector selection for the Pilot Project. An extensive list of sectors was generated from group

discussion and several of the most viable topics were reviewed in depth.[4] When discussing the various potential focal areas, the following questions were considered:

- What would be too complicated?
- What legal requirements would be addressed?
- Were there available data to analyze?
- Would stakeholders find value in the project?
- Would the scope of the project allow for completion under a realistic timeframe?

After extensive discussion and the exhaustion of new ideas, participants agreed that a project focusing on the enforcement of forestry regulations would be of the most value. Participants also agreed that the project should focus on a specific issue within the forestry sector.

The following forestry management focal areas were considered:

- Illegal logging (management plan violations and logging without a permit)
- The passage of management plans whose content is illegal according to the requirements of the forestry law (i.e. corruption).
- Violation of forestry buffer zone laws pertaining to logging near riparian areas and springs.
- The enforcement of a timber certification program.
- The processing of illegal timber.

Ultimately, the participants decided to focus the pilot project on logging activities. The legal framework pertaining to logging violations has existed and functioned for the past 20 years. Defining the geographic scope (sub-national or national) of the project also relied upon stakeholder consultation. Conference participants were interested in the potential of a dual pilot project that could allow for comparative analysis of two differing SINAC conservation zones. However, upon considering project constraints, everyone realized that selecting one conservation zone would be the most feasible option. The Central Volcanic Region (CVR) was identified as a target zone for the project.

Considerations

After extensive contact searching for specific regional data, it became apparent that there was not enough existing data with which to structure a pilot project on a zone-specific level. Considerable data were found to be organized on the national level and as a result, the Team's efforts focused on designing a general indicator program that would use the national data sets.

[4] Full documentation of this process is provided in the Conference minutes provided in Appendix D.

5.2.3 Developing Guiding Principles

Guiding principles are specific considerations used when constructing an indicator program. They are based on a set of criteria that are established by each program (these criteria differ from the ones used for indicator selection) (INECE-OECD, 2003, p. 17). The Team's approach to developing guiding principles focused on identifying the underlying goals, concerns, and constraints of the many internal and external stakeholders in the Costa Rican forestry sector through the Conference and personal meetings. Although these principles are similar to best practices, they are not one in the same.

Perhaps most clearly emerging from the conference was the need to develop an economically feasible indicator program that required minimal investment from MINAE and centered on using data that is currently being collected. In addition, MINAE officials cited institutional challenges to the implementation and use of indicators as a critical obstacle. Other participants noted the lack of strategic management and weak organizational structure of MINAE. During the first day of the Conference, the Team realized that the need for data sharing should be addressed (Appendix E provides the complete discussion of both of these obstacles and the complete Conference minutes).

The Conference also established a number of general goals for the Pilot Project which were similar to those identified in the USEPA Guidance Document. Many of them, such as improving the efficiency with which agencies use resources, are generally applicable to any ECE indicator program. However, a number of goals emerged that were specific to the Costa Rican Pilot Project, and included: improving forestry information systems, increasing data sharing, and promoting cooperation among stakeholders. All of these considerations were adopted as guiding principles and shaped the work of the Team.

5.2.4 Selecting Criteria

Criteria selection occurred on the second day of the Conference and took the form of a roundtable discussion amongst all participants. The sample criteria from the USEPA Guidance Document were used as an introduction and provided practical examples. Individual participants were asked to list any criteria they believed should be used to evaluate potential indicators. After several rounds of group revisions, a final list of criteria emerged nearly identical to that listed in the USEPA Guidance Document:

- **Relevant** to the goals, needs, and priorities of the stakeholders.
- **Feasible** to the costs of implementing and maintaining should not outweigh the value of the benefits, viability.
- **Transparent** to promote an understanding, and enlighten users about program performance.
- **Credible** to form complete and accurate data.
- **Functional** to encourage programs and people to engage in effective and constructive behavior and activities.
- **Comprehensive** to ensure the program is complete.
- **Adaptability** to be relevant to multiple goals, needs, and priorities of stakeholders.

- **Simplicity** to promote understanding and use.

Considerations

The Team is relatively confident that the selected criteria reflect the priorities of the stakeholders in attendance at the conference since careful planning, multiple stakeholder interviews following the conference, and continued follow-up were applied. However, the Conference's limited duration required moving quickly through crucial decision-making processes regarding the Pilot Project; this approach risked that decisions might be made without full information (and thus full consent).

Finally, in developing and transitioning nations, it is important to recognize the inherent limitations present when evaluating potential indicators. Criteria such as feasibility and simplicity may "trump" other desired criteria out of necessity. Criteria selection and application reflect the level of funding, organization structure, and inner-workings within regulatory agencies and cannot, therefore, be generalized amongst nations.

5.3 PHASE 2: SELECTING AND IMPLEMENTING INDICATORS

The Team attempted to develop a robust methodology that could be easily traced and replicated by ECE practitioners. Though efforts were made to follow a structured and objective selection methodology, this approach was not always feasible in practice. The indicator selection methodology was planned as follows:

- Develop a conceptual framework for indicator selection.
- Document the enforcement process for illegal logging, answering the following questions: How does SINAC enforcement function? What is the legal process for prosecution? How do Forestry Regents oversee management plans?
- Inventory existing data being collected in Costa Rica and identify potential indicators.
- Individually evaluate potential indicators using the criteria selected by participants in the Conference.
- Review the evaluation of individual indicators in the context of the logic model and select indicators for inclusion in the final program.
- Use the logic model sub-categories, enforcement process research (step 2), and ECE indicators catalogued from the literature review to supplement existing indicators to complete the final program.

This section reflects a trial and error process, in which techniques from multiple indicator selection processes were integrated to supplement ECE indicator literature. The "best practices" in section describes the lessons learned from this process.

5.3.1 Developing the Conceptual Framework

The logic model forms the backbone of the indicator selection process and was the focal point in planning the selection of indicators for the Pilot Project. Reviewing environmental management literature revealed that the adaptation of the logic model for ECE Indicators has been

streamlined, omitting steps and organizational categories within the logic model.[5] Thus, the first task in selecting indicators is refining a logic model as presented in the USEPA Guidance Document. The Team developed a logic model that incorporated the immediate outcome indicator category and an "externalities sidebar," as seen in Figure 3.1. Next, the Team approached the task of developing a structural framework for the Pilot Project indicators beyond that provided in the logic model's primary categories.

A theme throughout ECE indicator literature is the assertion that indicator programs are project-specific – this concept provided a basis for the Team's departure from other ECE logic models. Initially, the Team categorized the specific indicators within a logic model (this task was an iterative process, beginning in the Pilot Project's initial phases and continuing throughout). The goals of this activity were several-fold. First, as noted, the Team, sought to extend the framework for selecting indicators beyond the primary logic model categories, in order to develop a more clear structure for the Pilot Project indicators. Next the Team catalogued ECE indicators currently in use for the purpose of better understanding program design. Finally, the Team felt that collecting and organizing these example indicators would aid the development of more clear boundaries between the various logic model categories.

Once the indicators were organized within the logic model's primary categories, patterns emerged revealing significant overlap within each category. Though much of this overlap is intuitive (for example, it would be expected that any ECE indicator program would include monetary investment in enforcement activities as an input), the potential for sub-dividing the primary categories of the logic model became apparent. The team constructed several sub-categories, and although they are not intended to provide a rigid structure, they reflect the current "types" of indicators being used in various ECE indicator programs. The subcategories developed by the Team follow in Figure 5.2 (Appendix F, which contains sample indicator sets, clarifies sub-category titles).

[5] See Figure 3.2: A Logic Model Example, by Messer.

Figure 5.2: Logic Model Sub-categories

Inputs	Outputs	Immediate Outcome Indicators	Intermediate Outcome Indicators	Final Outcome Indicators
Funding	Inspections	Permitting	Compliance Promotion Results	Pollution Amount Prevent/Area Protected
Human Resources	Reported Violations	Regulatee Understanding	Compliance Rates	Ecosystem/ Species Health
Training Investment	Results	Voluntary Participation	Understanding Non-compliance	
Environmental Law	Compliance Promotion Outputs			
Bureaucratic	Public/NGO Outputs			
Public/NGO Inputs				

The Team used this framework as a menu for the Pilot Project. However, this general framework needed to be combined with pilot project specific details; thus, the Team identified and used the sub-categories relevant to the enforcement process in Costa Rica.

Considerations

The goal of this process was to better understand the function and use of the logic model in indicator programs. In part, this process was a response to the needs of the Team in relation to existing literature; however, any project may choose to refine the conceptual framework for organizing indicators. The logic models provided in ECE indicator literature differ significantly from other adaptations, omitting immediate outcome indicators and the externalities "bar." As stated in the introduction, this is not necessarily a limitation; indicator category titles may vary depending on user preference, which matters little if the requisite project components are included in the correct order.

5.3.2 Understanding the Enforcement Process

Constructing and understanding the enforcement and compliance processes for a given program's focus is a necessary step in selecting indicators. This stage of the indicator selection process involved summarizing available data about the enforcement efforts of MINAE, the Prosecutor's Office, and forestry universities. Although the Team recognized that voluntary measures may provide long-term and effective means to promote compliance, and alleviate the pressures of enforcement efforts by government officials, it is hard to quantify their performance

in relation to legal regulatory measures. This effort began by identifying trigger points in the law (see Appendix G) and by association, highlighting the legal obligations of the various actors in order to identify indicators that could measure their performance. The Team attempted to answer questions such as: What is each organization's jurisdiction? What laws are they charged with enforcing? What are their legal obligations under these laws?

Limitations of the enforcement process in Costa Rica that were identified through additional research are summarized in Appendix H. This information can provide a context for understanding the reasons for selecting certain indicators and can serve as a baseline for the type of studies MINAE may choose to extend.

Considerations

Enforcement and compliance processes are intricate and difficult to understand, even with years of experience working directly with them. The Team lacked formal training in Costa Rican environmental law and policy and relied on published sources for this information. From an external viewpoint, it was difficult to asses the enforcement that was actually occurring and its legal basis.

5.3.3 Inventory Existing Data Sources

Following the scoping of the Pilot Project at the Conference, the Team began assembling relevant ECE data related to forestry in Costa Rica. These sources included annual reports, academic papers, working papers, brochures, spreadsheets, and online data sources. The information was sorted, compiled, and analyzed to identify any data sets that could be useful in designing ECE indicators. Throughout the Conference economic constraints were stressed. Thus, the Pilot Project exhausted all measurements currently being collected prior to "looking beyond the existing data" and selecting additional indicators that would require further data collection. In cataloguing potentially useful data sets, the Team attempted to identify: primary sources (where figures were referenced), completeness of data (duration of collection), contact information for data administrators, and geographic, political, and temporal scales.

Considerations

The limitations faced in the "inventory of existing data" stage were based on 2 factors; the Team's status as foreigners not living in the country, and data collection challenges faced by many developing countries. Here follows a list of a few obstacles: a language barrier, time constraints, decentralized record keeping, lack of electronic data storage, incomplete data, and lack of primary source material. As a result, the Team's ability to accurately assess the specific nature of existing data collection activities was constrained. Some of the issues faced by Costa Rican organizations include:

- SINAC - decentralization, lack of resources, and incomplete data sets.
- NGOs - overlap, incomplete data, and unclear mandates – sometimes monitoring, working in semi-regulatory capacity.
- Prosecutor's Office – detailed data collected in hard copies as opposed to electronic copies.

5.3.4 Evaluating Potential Indicators from Existing Data

Initially, the Team considered limiting the use of criteria to informal, general guidance in selecting indicators. This initial decision was influenced by emerging concerns regarding the validity of evaluating ECE indicators individually; these concerns are addressed in the limitations section below. There was tension, however, between "loosely" applying criteria and following a methodology that could be tracked and replicated by program users. Despite these reservations, the Team devised a method for applying criteria to individual indicators in a structured fashion. However, the Team acknowledged the need to examine all potential indicators in the context of the logic model prior to elimination; this activity was seen as a check on the potential elimination of indicators that may appear unsatisfactory if evaluated individually. As a result, a two-phase process emerged for evaluating potential indicators:

- Evaluate each potential indicator with each criterion in a structured, repeatable method.
- Review each potential indicator in the context of the logic model, and determine its relationship to the other indicators in the program.

The first step in "phase one" was to determine what value to assign each criterion. To address this concern, a stakeholder survey was designed with the intention of having conference participants rank the importance of each indicator. For example, should feasibility be weighed more heavily than adaptability? The Team questioned whether the ranking of these terms would be productive since the process is subjective and prone to quality questions. Given all of the concerns, the Team decided that a structure process was not possible.

Nonetheless, the Team needed to apply criteria in a purposeful manner that could be clearly understood and replicated by users of the Pilot Project and other ECE practitioners. The Team relied on environmental indicator literature that contained a structured methodology for evaluating potential indicators with criteria. The framework is presented in Annex V of the document and is titled OECD Sets of Sectoral Environmental Indicators. Using this approach, the Team numerically evaluated each indicator in relation to each criterion on a one to three scale. In an effort to reduce subjectivity, criteria were defined by cross-referencing a selection of indicator literature.[6] In addition, written justifications for the numerical evaluations made in the criteria list were included, and the Team employed a review process involving three individual evaluations. The following is an example of the guidelines developed for the application of one criterion:

> *Relevant: linked to the environmental problem being addressed and the objectives of the regulatory agency.*
>
> *1: unrelated*
>
> *2: moderately linked*
>
> *3: directly linked*

[6] See Appendix C for a partial summary of the criteria literature cross-referenced to generate these definitions.

Unfortunately, this process proved still unsatisfactory in practice and resulted in another subjective product. How, for example, can ECE indicators be evaluated individually for "comprehensiveness", when the indicators function together within the logic model? As a result, the Team was left with little rationale for eliminating any of the potential indicators catalogued by using criteria. Therefore, the Team returned to the initial plan of evaluating indicators in the context of the logic model (Phase 2).

Criteria remained a consideration throughout this process, though in a more intuitive fashion. The Team consistently tested for relevancy, transparency (meaning clarity in this application), and functionality of indicators. Additional criteria, such as adaptability or feasibility, may not be as intuitive, and caused the Team to make a conscious effort to apply these more practical, focused, criteria throughout the indicator selection process.

Considerations

The use of criteria remains a critical component of indicator selection. If economic feasibility is identified by stakeholders as a criterion, efforts must be made to incorporate this constraint formally; other criteria, such as relevance and transparency (or clarity) will likely be implicitly considered when evaluating potential indicators in the context of the logic model and enforcement process.

The inherent problems associated with applying criteria could be better addressed in current literature; however the individual application of criteria for each program may prevent this expansion from occurring. What must be remembered is that criteria function together with a logic model to select indicators. Investment in inspector training, for example, cannot be assessed alone to determine if this indicator is relevant; the user must also examine an indicator that provides information on the results of this investment (e.g., violations detected). Moreover, an indicator that might appear prohibitively costly alone may be viewed as crucial within the context of the logic model – where the indicator's role within the program is illustrated.

5.3.5 Looking Beyond Existing Data

Upon evaluating potential indicators from the data inventory, the Team constructed three indicator sets from three separate logic models: the "SINAC" framework for logging activities, the "Forestry Regents" framework for violations with logging activities, and the "Prosecutor's" framework for the prosecution of all violations. To supplement the indicators collected from the inventory of existing data sources, the Team returned to the enforcement process research and the logic model. As described previously, the primary, logic model categories represent the basic components of each enforcement process: inputs (investments, training), outputs (inspections, violations detected), immediate outcome indicators (changes in knowledge or skills of the regulated community), intermediate outcome indicators (behavioral changes, compliance rates), and final outcome indicators (changes in the state of the environment). Flow charts of each enforcement process were used to identify and select indicators for project components that were not already "assigned" indicators from the previous phase. This process essentially involved a three step cross-referencing between the logic model primary categories, the documented enforcement processes, and the "menu" of sub-categories identified in compilation of the indicator matrix. From this process, the Team recommended indicators to "fill the holes" in the three frameworks. The process functioned as follows.

First, the logic model category to be "filled" was selected – project outputs, for example. Next, the flow charts constructed for each enforcement process were examined to determine what the key outputs were for each enforcement process. For example, key outputs in the Prosecutor's Office process are "enforcement actions taken" and "violation results". If indicators for these outputs were not identified from the data inventory and evaluation of potential indicators, then indicators were recommended. Thus, "percent of enforcement actions resulting in convictions" and "percent of enforcement actions resulting in acquittals" were identified as indicators for the Prosecutor's Office. The team examined the catalogue of internationally implemented ECE indicators and relevant sub-categories to validate these selections. The sub-categories served as a "menu" to ensure that crucial project components had not been overlooked in the enforcement process "flow charts". The sub-category of "violation results" contains several, referenced indicators; these specific indicators, proven in use by other countries, served as guidance for determining how to best design the indicators.

The three completed indicator sets, within the logic model frameworks, are included in Appendix F. Explanations of each indicator are provided. The use and implementation of these indicator sets are explained in Section 6.0, Costa Rican Recommendations. Listed below are the three indicator sets in logic model format.

Figure 5.3: Indicator Sets in Logic Model Framework

KEY:
1. Sub-categories highlighted in Blue
2. Pilot Project Indicators, with available data, highlighted in white.
3. "Ideal" Indicators highlighted with gray.

SINAC Indicator Set in Logic Model Format:

Input (Investments)	Output (Activities)	Immediate Outcome (changes in knowledge, skills, attitudes of the Regulated Community)	Intermediate Outcome (actual behavioural changes of Regulated Community)	Final Outcome (impact on the ambient environment)
Funding	**Inspections**	**Permitting**	**Compliance Promotion Activity**	**Pollution Amount Prevented/Acres Protected**
Total Annual Funding SINAC	Number of inspections/patrols conducted by SINAC Inspectors or officers	Number of applications for Environmental Service Payments (PSA program)	Number of Landowners participating in FONAFIFO Environmental Service Payment Program	Total forest cover (by area or % of total land cover) per unit time, excludes plantation cover.
Total Funding for FONAFIFO compliance promotion (environmental service payment program)	% of Forestry Management Plans audited/evaluated by SINAC		**Compliance rates**	Forest cover lost to illegal logging
Human Resources	Number of SINAC Inspections/patrols conducted at/on: protected areas, highways (targetting transportation), and processing sites.		Total Number of Forestry Violation Prosecutions Initiated	Flora/fauna population levels (species dependent on forest cover)
Total Number of SINAC Employees	**Reported Violations**		Total Number of Convictions resulting from Management Plan Violations (and as a percentage of permits executed legally versus abused), by charge and violator category (engineers, landowners, tiber companies)	
Number of SINAC Enforcement and Compliance Officers, ideally by job title/assignment (i.e. parks, refuges, private lands, etc.)	Total Number of Illegal Logging Public Complaints		Total Convictions resulting Illegal Logging without a permit, by charge and violator category (landowners or timber companies)	
Training	Total Number of Management Plan Violations sent to SINAC by Regents		**Understanding Non-compliance (need to combine some of these)**	
Number of Training Courses offered per year for inspectors	Total Number of Illegal Logging Violations (i.e. charges filed) detected by SINAC Inspectors and nature of violation.		Number of Logging without a permit violations above threshold level (i.e. distinguish major/minor violations)	
Number of MINAE/SINAC Inspectors with University Degree (or average years higher ed per inspector)	% of Illegal Logging violations sent to Prosecutors Office by SINAC that result in prosecution		Number of Management Plan Violations above threshold level.	
Inspector salary comparison, versus per capita for Costa Rica	**Compliance Promotion**		Logging without a permit categorized by location- where permit available, where permit denied, where legal cutting never allowed (i.e. buffer zones or protected areas)	
EXTERNALITIES: The user of this indicator set must consider factors beyond the scope of enforcement efforts that contribute to both regulatee behavior and the resulting environmental impacts.	Outreach activities associated with the FONAFIFO Environmental Service Payment program			

Pilot Project Indicators for the Prosecution Office in Logic Model Format			
Inputs	**Outputs**	**Intermediate Outcomes**	**Final Outcome (impact on the ambient environment)**
Budget	**Complaints/ Prosecution**	**Compliance rates**	**Pollution Amount Prevented/Acres Protected**
Budget for the Public Ministry (Prosecutor's office)	Overall percent of cases reviewed by prosecutor's office compared with number of cases received.	Total Number of Forestry Violation Prosecutions Initiated	Total forest cover (by area or % of total land cover) per unit time, excludes plantation cover.
% Change of Prosecutor's budget over time.	% of complaints received by MINAE (and the Forest Regents) that are sent to the Prosecutor's Office	Total Number of Convictions resulting from Management Plan Violations (and as a percentage of permits executed legally versus abused), nationally and by province or SINAC zone and actual charge	Forest cover lost to illegal logging
Training Investment	% of Citizen Complaints occurring in Protected Areas	Overall percent of fines collected (Regents, Landowners, Loggers)	Flora/fauna population levels (species dependent on forest cover)
Amount spent by the Prosecutor's office to train MINAE and communities to understand the law	Number of enforcement actions by prosecutors office.	**Understanding Non-compliance (need to combine some of these)**	
Number of ECE Employees	**Time**	Management Plan Convictions Categorized: Engineers, Landowners, Timber Companies	
Number of Environmental Prosecutors (who prosecute forestry cases)	Duration of Complaint to Settlement Process	Logging without a permit categorized: Landowners, Timber Companies	
	Violations	Number of Logging without a permit violations above threshold level (i.e. distinguish major/minor violations)	
	Total Number of Illegal Logging Public Complaints, nationally, regionally, and where sent (SINAC, Forestry Engineers, Prosecutor's Office)	Number of Management Plan Violations above threshold level.	
	Types of Prosecution	Logging without a permit categorized by location- where permit available, where permit denied, where legal cutting never allowed (i.e. buffer zones or protected areas)	
	Overall percent of cases that result in a conviction (including the total amount of fine, jail time, community service and reforestation charged).		
	Overall percent of cases settled with reparation actions involved.		

Regent Indicators in Logic Model Format			
Inputs	**Outputs**	**Intermediate Outcome (actual behavioural changes of Regulated Community)**	**Final Outcome (impact on the ambient environment)**
Complaints	**Complaints/ Regents**	**Compliance Promotion Activity**	**Pollution Amount Prevented/Acres Protected**
Number of Complaints received by colleges.	Overall percent of cases reviewed by colleges compared with number of cases received.	Number of Landowners participating in FONAFIFO Environmental Service Payment Program	Total forest cover (by area or % of total land cover) per unit time, excludes plantation cover.
Budget	Percent of cases under administrational review.	**Compliance rates**	Forest cover lost to illegal logging
Annual Budget of colleges.	Percent of cases under judicial review.	Total Number of Forestry Violation Prosecutions Initiated	Flora/fauna population levels (species dependent on forest cover)
Salary indicator for regents (anti-corruption).	% complaints sent to Prosecutor's Office (about regents).	Total Number of Convictions resulting from Management Plan Violations (and as a percentage of permits executed legally versus abused), by charge and violator category (engineers, landowners, tiber companies)	
Training Investment	Number of written warnings.	Total Convictions resulting Illegal Logging without a permit, by charge and violator category (landowners or timber companies)	
Number of Training Days per regent, per year.	**Time**	**Understanding Non-compliance (need to combine some of these)**	
Number of Training Courses offered per year for regents.	Length of case from complaint to settlement or conviction.	Number of Logging without a permit violations above threshold level (i.e. distinguish major/minor violations)	
Number of ECE Employees	Total number of Management Plan Violations Reported to Prosecutor's Office by Forestry Engineers Association (from Forest Regents)	Number of Management Plan Violations above threshold level.	
Number of forestry regents.	**Prosecution**	Logging without a permit categorized by location- where permit available, where permit denied, where legal cutting never allowed (i.e. buffer zones or protected areas)	
Type of Forestry Infraction	Number of enforcement actions taken by the colleges.		
Province Where Forestry Infractions occur.	**Management Plans**		
Type of Forestry Infraction.	# of management plans approved.		
Management Plan Violations detected by regents.	**Management Plans**		
Total Number of Violations detected by regents.	# of regent reports missing.		
Management Plans	**Violation Results**		
# of management plans prepared.	Number of engineers sanctioned, suspended, and not sanctioned.		

Considerations

The three primary actors (The Forest Regents, SINAC, and the Environmental Prosecutor's Office) for which these frameworks have been designed should recognize that these indicator sets are only recommendations and may be adapted as necessary to satisfy their needs. These recommendations will likely provide a basic structure, which those tasked with compliance management will need to alter to reflect data availability and various other constraints. The Costa Rican Stakeholders should evaluate each logic model, and assemble a feasible set of indicators for implementation. Stakeholders may refer to the Universidad de Costa Rica's Sustainability Indicators for further information and advice on the implementation and use of indicators in Costa Rica.

Box 5.0: Review of the USEPA Guidance Document

In 2004 the United States Environmental Protection Agency issued a Draft *Performance Measurement Guidance for Compliance and Enforcement Practitioners* (USEPA Guidance Document) written by Michael M. Stahl and Robbi Farrell. As stated in its introduction, "the purpose of this document is to provide guidance to environmental compliance and enforcement (ECE) practitioners for identifying, implementing and using ECE indicators." This document provides a general framework for implementing an ECE indicator program, and highlights the key steps that have proven valuable to practitioners from numerous countries. By compiling this information, Stahl and Farrell have streamlined a complicated process while providing the first step-by-step guide for users who would like to implement their own ECE indicator program. However, at several critical stages, more specific, practical instruction would be beneficial. By expanding upon the concepts and recommendations espoused, the USEPA Guidance Document could further strengthen its position as the foremost guide for ECE indicator programs.

The following discussion highlights the sections in the USEPA Guidance Document where a more thorough treatment of the topic could prove valuable for the user.[7] As stated in the USEPA Guidance Document, the specific steps taken by countries will vary depending upon their unique circumstances. However, descriptions of techniques can provide a starting point for users who have less familiarity with ECE indicator programs, while providing a point of comparison for the more experienced users of the document.

In addition, the document is based primarily upon the experiences of OECD countries, and may not reflect the unique situations faced by developing nations – which, arguably, are the audience that may benefit most from this type of work. Recognizing that the document is meant to be broadly applicable, explicit recommendations based upon national economic status may not be desirable or appropriate (however, this is certainly a consideration for ECE indicator program design that will need to be addressed in the future).

[7] For a more comprehensive discussion of the team's assessment of ECE indicator literature, see Section 3.0 of our final document. In addition, the Pilot Project Process section (5.0) contains the Team's methodology in addressing these limitations.

ESTABLISHING COMMON DEFINITIONS FOR KEY TERMS/UNDERSTANDING ECE INDICATOR CONCEPTS

The USEPA Guidance Document provides a useful overview of ECE indicators that touches upon their many uses and benefits. For many users, this introduction will suffice as a review of known material, but for others, a more comprehensive understanding of indicators will be necessary. The document could provide a list of supplemental readings from sources such as INECE, the World Bank, the OECD, the United Nations, and various reports on ECE indicator programs in other countries (such as Environment Canada's Pilot Projects).

SELECTING CRITERIA FOR EVALUATING POTENTIAL INDICATORS

This is perhaps the most arbitrary step in an ECE indicator program, yet is also one of the most important steps for providing program credibility and acceptance by a wider audience. Due to the difficult nature of identifying criteria and formally incorporating them into an indicator selection process, any concrete methods of application that have been applied in the past may underscore useful techniques for future practitioners. The USEPA Guidance document could detail the EPA's specific process while providing additional examples and sources. Two documents which at least touch upon the use of criteria are the OECD's *Development, Measure and Use of Environmental Indicators* and a 2002 article by Lisa Segnestam titled *Indicators of Environment and Sustainable Development: Theories and Practical Experience*. The former provides an appendix which highlights a quantitative approach (though this involves subjective assignment of rankings) for evaluating potential environmental indicators. Segnestam provides a comprehensive, conceptual overview of the use of criteria in environmental indicator programs; however, there are important distinctions that should be acknowledged. These distinctions involve the context within which evaluation occurs; this conceptual issue should be addressed within the USEPA Guidance Document.

The USEPA Guidance Document suggests that indicator sets should be shaped by the addition and elimination of indicators based upon the individual application of criteria to each indicator. Yet ECE indicators function as a whole – this implies that criteria should be applied in within the context of the entire indicator program in order to ensure that a comprehensive indicator set is selected. For example, an indicator's role in the entire program must be acknowledged prior to evaluating its feasibility or relevance. Considered individually, the indicator's importance may be overlooked.

Moreover, the current suggestions for criteria include several closely related, nearly synonymous terms; in practice, these terms may promote confusion. Other programs have avoided this problem by categorizing desired "indicator traits" into broad criteria such as policy relevance, analytical soundness, and measurability. The USEPA's criteria could be placed within the appropriate, broad category to avoid confusion.

APPLYING THE LOGIC MODEL

The USEPA Guidance Document states that the logic model can "graphically depict the relationships between resources invested, activities undertaken and the results of those activities"; the model is suggested to serve as a "road map" for how the enforcement and compliance program reaches its goals. While the concept of the logic model is explained, there is minimal practical advice on actually applying the logic model. As this step is critical to ensuring a successful program, a more in-depth discussion on this topic should be pursued. For example, the USEPA Guidance Document could provide a more comprehensive example program within the conceptual model offered; this example program should be accompanied by a narrative, or step by step description, of precisely how the logic model was employed to select the indicators therein.

In addition, though the Guidance Document does provide several indicator examples, there is minimal discussion of program structure beyond the logic model categories. Despite the acceptance that no universal indicator set exists, the document may be able to provide the reader with a more structured notion of the types of indicators ECE programs generally employ. In the Bren Group's cataloguing of current indicators in practice, it became apparent that there are several commonalities amongst indicator programs (i.e. most programs include monetary investment as an input indicator). Discussion of these themes may prove valuable to the reader.

The USEPA Guidance Document logic model also does not formally include externalities. This may be more problematic, as it is not simply the result of combining categories to streamline the model; it involves the exclusion of factors that may be critical in understanding the effects of enforcement and compliance activities (e.g., market pressures, bio-physical changes). In using a linear framework, like the PSR model, the logic model and project-specific frameworks focus attention on simple, linear relationships, deflecting attention from socioeconomic and ecological factors that influence the interaction of project cycles. Thus, the inclusion of the externalities, whether formally in the logic model or as a written supplement, reminds the user of the complexity of these relationships.

INVENTORY EXISTING DATA

The "inventory of existing data" section of the document is brief, quickly highlighting the purpose of this step. While the essential concept of examining existing data that may be used to build indicators is communicated, little practical guidance on how to conduct the inventory is offered. Further guidance could be provided on the types of considerations that should be borne with regard to data sources (examples of concerns are provided; yet, the ideal characteristics of data are not discussed), timing of the inventory (such as when is the best time to target the search in order to avoid extraneous data – i.e. after the program designer has applied the logic model and has an idea of the types of indicators being sought), and a section on how the criteria can be incorporated into the inventory (for example, the practitioners/program designer may simply inventory related data indiscriminately, or he or she may choose to consider potential data against prioritized criteria). Overall, structured recommendations and formal concerns for the inventory of existing data may aid practitioners in improving the efficiency of this process.

SELECT AN APPROPRIATE COMBINATION OF INDICATORS

The USEPA Guidance Document could incorporate an example methodology for the selection of indicators, with practical advice in structuring this process. The need to clearly outline the enforcement process of the chosen project should be highlighted since it will form the basis of any indicator selection process when coupled with the logic model. In turn this plan can guide the inventory of existing data sources, and clearly identify gaps that should be filled when looking beyond existing data.

CONCLUSION

The USEPA Guidance Document is a key manual that any user of ECE indicators should consult. The document takes advantage of the knowledge gleaned from the trial and error of practitioners from a variety of backgrounds; yet expanding upon these experiences could further strengthen its contribution to the field. By providing examples of the techniques that have been employed, the USEPA Guidance Document will be able to engage a larger, more diverse audience.

6.0 Costa Rica Recommendations

Section 6.0 provides both specific and general strategies for Costa Rican Stakeholders to consider during the implementation and use phases of the pilot project. The Team developed these recommendations from research and stakeholder consultation in the Costa Rica forestry sector, "best practices" identified in enforcement and compliance indicator program literature, recommendations from enforcement and compliance practitioners in E-dialogues, and relevant strategies from environmental and sustainability indicator applications. This section provides a starting point for future coordination of the pilot project by MINAE/SINAC enforcement program managers; the information in this section should be viewed as suggestions that pilot project users may select from. Sections 6.2 and 6.3 follow the general "best practices" recommendations, which are presented in more detail in section 7.0.

6.1 IMPLEMENTING INDICATORS

6.1.1 Implementation Methodology

Use "internal teams" for implementation design and analysis

Application: A consistent team within SINAC will fill this role in Costa Rica. The team should include managers from the regional offices to maximize local expertise, and the team should be also diverse, for example, the team will need technical experts as well as managers who posses decision-making and problem solving abilities. For example, the team might include technical experts with knowledge in LANDSAT and GIS applications, experienced managers, and statisticians. As the implementation of the project will require data collection from the forestry regents, SIREFOR, and the environmental prosecutor's office, the SINAC team should consult regularly with these organizations.

Conduct a pilot project before full-scale implementation

Application: An initial forestry project will allow MINAE to gain experience, additional enforcement and compliance indicator pilot projects in other sectors might be considered after this phase. If MINAE feels limited by resources, an even smaller-scale pilot project may be desirable in one conservation area. This experience would allow forestry enforcement program managers to determine the usefulness of specific indicators, identify the most effective methods of data analysis, and make appropriate project changes prior to national implementation.

Consider implementation in "phases"

Application: MINAE may consider implementing the pilot project in phases. For example, Stakeholders could first implement a partial list of the recommended indicators (those determined to be most critical) and slowly add the additional indicators over time. Since there may be financial and logistical constraints in full-scale implementation of the project, this incremental approach would make the project more manageable.

Develop a "quality control" program

Application: Costa Rican data collection agencies should work together to set standardized methodologies for data collection and analysis. For example, data should be reported in the same units of measure and collected over the same time periods. This will help to ensure reliable and comparable data. SIREFOR would be a good choice for leading this effort because they collect the majority of forestry data.

Use Adaptive Management

Application: Stakeholder priorities and goals change over time for various reasons. For example, MINAE could change the goals and direction of SINAC during the life of the project. Moreover, environmental regulations and enforcement strategies change over time. As these aspects of regulation flux, the focus of the indicator program should follow. As the likely lead agency for the program, SINAC needs to redefine the project if the goals change.

6.1.2 Stakeholder Involvement/Coordination

Give stakeholders a feeling of project "ownership"

Application: Project "ownership" will facilitate support and overall success of the project. The abundant amount of Costa Rican stakeholders involved with forestry issues in Costa Rica should be relied on to provide assistance and information though out the project. By involving these stakeholders and keeping them abreast of progress, they will be more willing to help.

Utilize a variety of agencies and organizations for project support

Application: Many of the agencies and organizations that work with forestry issues in Costa Rica work within a specific niche and specialization. Utilizing their expertise would help expand the project because it increases the knowledge base. Also, by familiarizing a variety of people with the benefits of enforcement and compliance indicators, it adds to the project's legitimacy.

Develop an implementation plan and distribute to all participants and stakeholders

Application: The implementation plan should be distributed to all of those involved in the pilot project, including managers at the following agencies and organizations: MINAE, SINAC, SINEFOR, FUNDACOR, and the National Forestry Office. Plan developers should consider the same criteria that were applied to the indicators. For example, the plan must be "simple" so that it is easy to understand and interpret. In addition, as numerous agencies and organizations are currently collecting data needed for the pilot project, the implementation plan should clearly assign data collection activities to avoid duplicative efforts.

Communicate how managers are currently using the project information

Application: Frequent updates on how the indicators are being used by managers at the various regulatory agencies and organizations should be conveyed to the various stakeholders. These communications may be though different types of media, depending on the intended audience.

Develop and distribute progress reports during implementation

Application: SINAC should distribute progress reports on a periodic basis to all stakeholders. This will create continued support for the project and give the project legitimacy.

Educate the public about the efforts and get feedback

Application: In order to get public support for the pilot project and create project transparency, Costa Rican citizens should have access to the successes and failures of these enforcement efforts. The internet is a simple way to disseminate this information with minimal expense. In addition, town meetings can target those without web access.

6.2 USING INDICATORS

6.2.1 General Analysis Recommendations

Ensure that all the data "line up" when making comparisons

Application: The data will only be useful if the data is comparable. For example, all forest cover data used should either include or eliminate plantation coverage in the calculations of forest cover change. This is dependent on proper coordination of data collection activity in the implementation phase of the project. The development of methodology sheets, as discussed above, should ensure that the data does line-up; however, data should be re-checked prior to analysis for inconsistencies.

Focus on specific organizational units and/or enforcement strategies during analysis

Application: Indicators should be analyzed in a way that meshes with the pilot project's goals. The analysis can focus on a subset of information, in order to evaluate a particular facet of enforcement and compliance. For example, one stage of the pilot project analysis could focus on organizational units such as the Regent System, the Environmental Prosecutor's Office, or SINAC management of federally protected lands. Another phase of the analysis could evaluate the effectiveness of specific program enforcement tools within these program areas, such as increased inspections, management plan review, or inspector/agent training. In addition, the information should always be examined in the larger context to ensure the big picture is included in the analysis.

Analyze beyond the data that indicator sets provide

Application: The data that indicator sets provide should be analyzed within a larger framework. For example, indicator sets such as the regent-related indicators should be analyzed in relation to the indicators designed for SINAC and the Prosecutor's Office. This will provide a better sense of the strengths and weaknesses in each enforcement area. In addition, data can be analyzed in relation to more subjective information. For example, indicators dealing with prosecutor efficiency can be related to internal employee performance evaluations to gauge the accuracy of the data. Perhaps most important is the need to compare the results of analysis with external factors that may influence relationships between enforcement, compliance, and environmental impact. Increasing market demand for timber, for example, may increase illegal logging despite more effective enforcement activity. Environmental factors must also be considered; forest-disease, for example, may reduce forest cover and give the appearance of inflated deforestation rates.

6.2.2 Technical Tools

Use comparators in order to give the data more meaning

Application: Indicator data may not always appear useful and relevant when viewed in the absence of comparators, which give context to indicator data. For example, an indicator that estimates the profit generated from illegal logging in Costa Rica will have more meaning when compared to the forestry sector's overall economic output. Similarly, the significance of indicator data describing the number of cases brought for forestry-related violations is highlighted when related to the total number of cases brought by the prosecutor over the same period. Comparators must be selected carefully for they can strengthen or weaken the appearance of indicator significance.

Set baseline and target values before the analysis phase

Application: Setting specific baseline and target values may not be immediately feasible for each indicator in the pilot project – as there may not be existing data for these indicators. Once data collection begins, baseline values may be interpreted after an adequate collection period passes (the duration of this period may be decided through data observation – if values fluctuate widely, a longer baseline collection period may be warranted). For indicators with existing data, such as forest cover, past and current data can provide the baseline. Target values should be set, in order to provide context for indicator interpretation. For example, an overall goal of increasing forest cover would warrant a target value higher than the baseline; maintenance of current forest cover would simply rely on the baseline. Another example of a target value could be the desired conviction percentage for illegal logging violations; progress towards this goal could be tracked over time.

Use Time series analysis techniques

Application: Time series methods of statistical analysis reveal complex patterns (autocorrelation, seasonal variations, or other trends) that often emerge in data points collected over time; recognizing these patterns is essential for the demonstrating of meaningful statistical relationships.

6.2.3 Reporting

Ensure that the method of data presentation corresponds to the specific audience

Application: Data must be presented in a way such that the audience can easily understand the information. Certain stakeholders, such as SINAC ecologists, may better understand scientific terminology, yet prosecutors may also required to interpret scientific data. Thus, enforcement progress reports should be tailored so that they can be understood by the varied stakeholders.

7.0 Best Practices

In any field, "best practices" serve as a guide, concept for others in similar situations. The unique qualities of each enforcement and compliance indicator programs means that no "universal" set of indicators exists. However, as noted by Michael Stahl of the USEPA in the first e-dialogue, "We can develop best practices and general concepts and principles that can be of great help to all of us (INECE, E-Dialogue for Identifying Indicators, 2004)." Recognized best practices in the enforcement and compliance indicator field derive from the hands-on experience of experts who have completed work in enforcement and compliance indicator program development, implementation, and use.

The team contributed to this effort by supplementing these ideas with best practices drawn from literature related indicator applications, communications with practitioners via e-dialogues, and hands-on experience developing the Costa Rica Pilot Project. The best practices listed below for the development and indicator selection phases are largely drawn from our trial and error experiences with the pilot project. The best practices listed below reflect the team's experiences in applying recommendations from this literature. The pilot project phases reflect the Team's direct application with indicators; the Team then gleaned the recommendations for program implementation and use solely from literature and communications with practitioners.

By no means a complete overview of the best practices for program development, implementation, and use, this list serves as a tool and guide for future program designers. It contains many practices that may seem instinctual; however, no matter how obvious a best practice may appear, documenting these practices is critical – otherwise, they may become lost in the program design process. Where applicable, specific examples of how these practices have been implemented in past and current indicator programs is provided. In other cases, the Team's application of best practices in the pilot project is related. However, not all best practices are accompanied by "applied" examples.

7.1 PROJECT DEVELOPMENT

7.1.1 Literature Review

Begin with a review of indicator literature.

Before developing an enforcement and compliance indicator program, it is necessary to have a general knowledge of enforcement and compliance indicators and their importance. Since enforcement and compliance indicators are a relatively new concept, and there is a limited amount of literature on the subject, it may prove useful to examine literature on related indicator applications (such as environmental and sustainability indicators). Though in practice a comprehensive literature review may not be always be an efficient use of time in order to gain knowledge of the basic components of indicator program structure is necessary. A list of key literature on indicators, focusing largely on enforcement and compliance indicators, can be found in Appendix I.

Conduct a literature review of relevant/related projects.

When designing a pilot project, it is important to identify lessons learned from related efforts; though various compliance assurance programs face unique strengths and weaknesses, some experiences may translate across geographical and political boundaries.

Best Practice Applied:

There are pilot projects, in varying stages of completion, currently taking place in Argentina, Brazil, and Mexico; these countries share many regulatory strengths and weaknesses with MINAE. The experiences of these pilot projects were drawn upon by the Team in developing the pilot project for Costa Rica.

7.1.2 Scope

Narrow the scope of the project.

Focus on a specific sector, region, and/or policy. Narrowing the scope of a pilot project makes the process more manageable and feasible, minimizing the associated financial burden. This step may require making an initial trade-off between program comprehensiveness and feasibility. More importantly, this strategy allows the project users to learn from the pilot project experiences and apply these lessons to larger-scale projects later.

7.1.3 Stakeholder Involvement

Identify and Initiate Contact with Relevant Stakeholders.

Include all project stakeholders to ensure involvement, acceptance, and cooperation of the project by these critical actors. To facilitate this consultation, a manager or contact person at each agency and organization should be identified to ensure that a strong line of communication and participation is established and maintained.

Educate Stakeholders.

Enforcement and compliance indicator programs have only recently emerged, and are relatively unknown to many outside of the regulatory community (even amongst environmental organizations). A basic enforcement and compliance indicator introduction (i.e. a presentation or written brief) will often be necessary to communicate the structure, function, and benefit of indicator programs.

7.1.4 Criteria

Incorporate Criteria in every aspect of the project.

In an enforcement and compliance program, a set of criteria should be developed to evaluate potential indicators. These criteria help to select indicators based on the needs of a specific program. Criteria should also inform other aspects of the project. For example, implementation plan designers should consider the same criteria set used to identify indicators in designing the plan.

7.1.5 Selecting Indicators

Understanding the Regulatory Process.

Understanding the regulatory process involved in the targeted sector (or specific regulation) is a critical, initial step indicator program design. Indicator programs flow from a clear understanding of the enforcement and compliance process; the inputs, outputs, outcomes, and environmental impacts associated with the relevant regulatory process should be researched. These relationships should be conceptually organized; the logic model framework can be used for this step, though a more complete flow chart provides a useful supplement.

Developing a Conceptual Framework.

The logic model has become the accepted conceptual framework for developing enforcement and compliance indicator programs. The model, however, may be adapted to specific projects depending upon user preference. Primary categories may be retooled, for example, if clarification is needed. It is essential that the implications of these adaptations be clearly understood and explained.

Having established the logic model format desired, the practitioner must clearly distinguish amongst the primary indicator categories. Studying sample indicators in the context of the logic model can provide clarity in this process. Standard definitions are included in Section 3.2.1.

It is also useful for enforcement and compliance practitioners to understand the types of indicators that are currently being used in compliance assurance programs; such an understanding reveals how such programs are generally structured. In this regard, the Team's indicator list and logic model sub-categories may provide valuable resources for practitioners engaging in program design; these resources can provide the user with a "menu" of potential indicator sub-categories. However, it is critical to note that the logic model is inherently project-specific, and thus the actual components of each project vary.

Inventory Existing Data.

Appropriate time must be allotted to the inventory of existing data; this requirement may vary greatly depending upon the project scope and other project-specific aspects, including: the degree of centralization of the regulatory agency, data recording procedures, and bureaucratic complexity. Moreover, there may be numerous sources of usable information, such as: industry, non-governmental organizations, and government agencies at various levels (local, regional, national); various regulatory agencies may differ in their willingness to accept non-governmental data.

The quality and dependability of data must be considered when executing the data inventory. Data from non-governmental organizations and the private sector may be less reliable than that from government sources. In other instances, this may be reversed. In Costa Rica, significant outside funding has led to sophisticated data collection and management activities by NGOs; thus, the equipment and techniques employed by some NGOs may rival or surpass those of federal, regional, or local agencies.

The inventory of existing data should be as focused as possible. Thus, it should not begin prior to gaining a thorough understanding of the relevant enforcement processes. Inventorying data

without an adequate understanding of the enforcement process will result in the need to process and eliminate extraneous data, adding inefficiency to the indicator selection process. A focused inventory of existing data, based on a solid understanding of the key components of the targeted sector or regulation, will result in a higher percentage of potential indicators satisfying the selected criteria.

Evaluate Potential Indicators.

Evaluating potential indicators should be done in the context of the selected criteria and the program's conceptual framework. The validity of evaluating individual indicators, out of the logic model context, is questionable. Enforcement and compliance indicators function together to provide information on the effectiveness and efficiency of enforcement efforts; thus, an indicator viewed in isolation may not appear to satisfy any number of criteria. In addition, the manner in which criteria are applied may be dependent upon the nature of the criteria.

Several criteria, generally those that encompass policy relevance or general usefulness, are considered implicitly at all stages in the process. For example, when inventorying existing data indicators that are not policy relevant will not be catalogued. Thus, these criteria may not have to be expressly considered later in the process. Other criteria, generally those that describe the data quality or associated costs, are not implicit, and they warrant structured consideration by the design Team (feasibility, data reliability).

Finally, all potential indicators should be reviewed in the context of the relevant regulatory process to ensure that the indicators are providing information related to one of these components.

Look Beyond Existing Data.

This step is informed by the enforcement and compliance process of the project in question, as organized within the logic model. An indicator should be provided for each step in the enforcement process. A comparison of the results of potential indicator evaluation against an outlined enforcement process (e.g. identifying the steps in the logic model) should reveal gaps in the program. These gaps, enforcement process components for which potential indicators were not identified from existing data, should be filled with new indicators. In terms of designing new indicators, the list of indicators in practice (Appendix D) provides numerous example indicators. The logic model sub-categories provide a menu for looking beyond existing data; these categories may be reviewed to identify any indicator types that have been overlooked in reviewing the enforcement process.

7.2 IMPLEMENTING INDICATORS

7.2.1 Methodology

Develop an implementation plan and distribute to all participants and stakeholders.

The internal team formed at the implementing agency will need to develop a detailed implementation plan. An implementation plan should be distributed to participants at the onset of an enforcement and compliance indicator project. The plan should include detailed information about the specific indicators, data collection procedures, and deadlines that need to

be met. This will act as the "blueprint" for implementation. The developers should get input from other stakeholders on design aspects of the plan.

Use "internal teams" for implementation design and analysis.

The lead agency should form an internal team of a manageable size to help develop and carry out the implementation plan. The internal teams should follow the project from the development phase into the implementation phase; this group should become "owners" of the program. They should use their expertise and knowledge about the project to identify any potential obstacles that could occur during implementation and find appropriate solutions. In addition, experts from a variety of backgrounds should be on hand to provide input to the team (Stahl and Ferrell, 2004). For instance, if technical issues arise, a group of "expert consultants" should be available as a resource (INECE, E-dialogue on Using and Implementing Indicators, 2005).

Best Practice Applied:

Internal teams at the USEPA, "…worked on developing plans to implement measures, including the development of new information collection and reporting processes" (INECE-OECD, 2003, pg.14).

In the second INECE e-dialogue, a Brazilian enforcement and compliance practitioner commented that the size of the internal team is an important consideration. Brazil's current enforcement and compliance indicator program is overseen by the National Environmental Council and a large number of staff. The large size of the team makes implementation much more difficult. USEPA finds that a small implementing team is typically more successful, but high-level decision makers must be included to some extent (INECE. *E-Dialogue on Using and Implementing Indicators*, February 15-March, 2005).

Conduct a pilot project before full-scale implementation.

A pilot project will further the development of a comprehensive enforcement and compliance indicator program. A pilot project serves as the "dress rehearsal" for a full-scale enforcement and compliance indicator program; it could take place on a sub-national scale or focus on a certain sector.

Best Practice Applied:

The Canadian pilot projects both focus on a specific sector: agriculture and mining. Canada is using its pilot projects for initial evaluation and analysis of enforcement and compliance indicators and to "gather sufficient data to determine which performance measures are effective for each sector studied" (INECE-OECD, 2003).

The Oregon Plan for Salmon and Watersheds includes a set of environmental indicators to determine environmental trends. The INR at Oregon State University has played an advisory role for the Plan. INR recommended that the State first complete a pilot project, refine the study design, and then apply lessons learned to the larger program, in order to create a more successful program in the long run.

Consider implementation in "phases."

Implement a program in "phases." This will allow for evaluation as a program progresses, and it should make a program more manageable from a financial and logistical standpoint (Stahl and Ferrell, 2004). The lessons learned from each step in the process can be used to refine and enhance an enforcement and compliance indicator program before it is used on a large scale.

Best Practice Applied:

If the entirety of the Pilot Project is overwhelming, stakeholders should consider implementation in phases. For example, stakeholders could first implement a partial list of the recommended indicators and add more as time progresses. Or stakeholders could choose to focus efforts on a single region, in order to evaluate the smaller program before moving to the national scale for the Pilot Project.

Develop a "quality control" program.

Any enforcement and compliance indicator program should be evaluated in terms of quality as it is being implemented. A "quality control" program can assure that useful, accurate data is being collected (Stahl and Ferrell, 2004). In the long run a system of "checks and balances" will make the program more credible and useful. Data collection agencies should work together to set standardized methodologies for data collection and analysis. This will help to ensure that data are reliable and comparable. For example, data should be reported in similar units of measure. It would also be useful to have an outside consultant review the methods to prevent agency bias.

Analyze the program in relation to its goals.

Internal teams should continue their ownership role of the project as it progresses. They should ensure that goals are being met and any necessary changes are made to the program.

Best Practice Applied:

The NJDEP performed a "self-critical assessment" of their indicator program throughout the implementation process. For example, various workgroups were established to review the strengths and weaknesses of the program and determine areas that needed improvement. Technical program area advisors offered specialized support for Information/Technology issues.

Redefine project goals as they change.

Stakeholder priorities may change throughout the program for various reasons. Since it is important that program goals are well-aligned with the selected indicators, the focus of the indicator program should follow as the priorities flux. In making these modifications, the lead agency should be very transparent in their efforts. They should document all of the changes and distribute them to the other stakeholders, in order to build consensus. This will require numerous stakeholder meetings and communications.

Best Practice Applied:

The mission of the Chesapeake Bay Program is to restore the ecosystem health of the Bay. The Program uses a set of environmental indicators to determine the health of the Bay. Their experience found that the specific indicators must be updated as the Agency's priorities and goals changed.

Refine the program if certain things are not working as planned.

If the program is not meeting its goals, stakeholders need to pinpoint areas that are not working as planned and make appropriate changes. They need to document changes and distribute them to the other stakeholders in order to build consensus. This will require numerous stakeholder meetings and communications. The agency must be very transparent in their efforts.

7.2.2 Stakeholder Involvement/ Coordination

Give stakeholders a feeling of project "ownership."

Stakeholders should have a feeling of project "ownership." If they "own" the program, they should make more of an effort to help the program succeed. By involving a variety of stakeholders and keeping them abreast of progress, they will be more willing to help when issues arise.

Coordinate with all stakeholders and participants.

Coordination with all those impacted by the program is vital during implementation. This is especially important for the program to run efficiently.

Best Practice Applied:

The IITF was created to implement a set of environmental indicators that assess the progress of the Great Lakes Water Quality Agreement. IITF suggests dividing the monitoring and data collection over a variety of participants, so that the task at hand is more manageable. It is important to, "…support the establishment and operation of Lake-specific monitoring committees designed to coordinate monitoring, data gathering, and data quality activities by multiple agencies and organizations" (Indicators Implementation Task Force, 2000).

Link the indicators program to other planning efforts.

In order to discover conflicting or overlapping goals among different programs, it is important to understand other planning efforts. If goals overlap, there may be ways to help both projects increase efficiency. If goals conflict, resolutions should be found. Program transparency and frequent communications between stakeholders will help implementers link their efforts to others.

Best Practice Applied:

The NJDEP utilizes an environmental indicators program to evaluate their Agency's environmental policy and management efforts. They have found that an indicator program needs to be closely linked to other planning initiatives. By keeping upper level management and agency staff closely abreast of the program and its progress, they have been able to align the goals of their indicator program with other related projects.

Utilize a variety of agencies and organizations for project support.

Valuable insight and expertise can be gained, by utilizing a variety of agencies and organizations for project support. Also working with many agencies and organizations paves the way for expansion of the program, since it familiarizes a variety of people with the benefits of enforcement and compliance indicators. This also provides a sense of program legitimacy.

Best Practice Applied:

INR found that it is vital to gain support from a variety of stakeholders in order to have a successful project. Data collection alone requires the participation of various agencies and funding sources. Therefore, educating and gaining support from various levels of government and non-governmental organizations was essential. These organizations may also have valuable input for the project design (Institute for Natural Resources, 2004).

7.2.3 Reporting

Develop and distribute progress reports to management and staff.

It is important to distribute reports that communicate how managers are currently using the program information and other program progress. This will highlight the benefits of the program to others and should attract valuable input and feedback. The communication can be though various types of media depending on the audience such as hard copies, website postings, and in-person meetings.

Best Practice Applied:

NJDEP distributes information to their management team through an "Annual Progress Briefing;" this document is also passed to staff level personnel. This briefing has allowed managers and staff to feel an attachment to or "ownership" of the indicators program and it has allowed them to better understand the purpose behind the program (Kaplan and McGeorge, n.d.).

IITF recognized the importance of coordination between all levels of program participants and issued periodic update reports during implementation.

Report to external audiences in order to increase program support and encourage feedback.

Managers can use public reporting and education as a type of public relations tool to gain external support for the program. The internet is a simple way to disseminate this information without much expense. In addition, town meetings are a good idea to target those without technology resources.

Best Practice Applied:

The Chesapeake Bay Program uses a set of environmental indicators to determine the health of the Bay, and then they relay this information to the public in way that is easily understood. In order to better understand the goals of the community and to obtain essential public support for the efforts, the organization developed a Communication and Education Subcommittee (USEPA, 1999).

The Netherlands environmental agency prioritizes public education. "In the end, in a democratic setting it is the public that legitimizes the enforcement. We simply are out of business if we lose their support" (INECE, 2005).

7.3 USING INDICATORS

7.3.1 Analysis Focus

Focus on specific organization units and/or specific program areas during analysis.

Enforcement and compliance indicators can be analyzed in terms of a focus area. First, the data can be examined to evaluate the performance of specific "organizational units" such as a regulatory agency or a regional office (Stahl and Ferrell, 2004). This analysis should focus on data trends over time for a specific organization and can be used to identify any problem areas at the enforcement level. In addition, the analysis can focus on specific program areas, such as compliance with a specific regulation (Stahl and Ferrell, 2004). For example, indicator data should be assessed to see if compliance is increasing or if enforcement levels are appropriate. Ultimately, this information would be useful to pinpoint program areas that need attention.

7.3.2 Methodology

Ensure that all the data "line up" when making comparisons.

When comparing data within an indicator program or across indicator programs, data should "line up" to avoid misinterpretation (Born et al, 2001). For example, data should be collected with a common methodology, and it should be reported in consistent units of measure. Indicators also need to be thoroughly described and defined; to ensure that data interpretation is consistent across indicator programs. "Success requires management to use the new measures in a structured, consistent way to monitor key outputs, identify and address performance issues, and facilitate in-depth analysis of specific program components" (INECE-OECD, 2003, pg.15).

Best Practice Applied:

Many nations have begun to increase their data management tracking systems to ensure data uniformity. Scotland is converting a large amount of data into a consistent electronic form. In addition, the USEPA is trying to link their data to other data sources (INECE, E-Dialogue on Implementing and Using Indicators, 2005). "Consistency over time in terms of concepts, data sources and methods is crucial to the analytic usefulness of indicators" (Born et al, 2001, pg 9.)

Analyze beyond the data that indicators provide.

Typically, indicators do not give the entire picture of a situation; they serve as a "signal" that something is wrong. Further analysis is often needed to understand the complete picture. Indicator data should be supplemented with other pertinent information during analysis, in order to put the indicator in context (OECD, 2003). In other words, it is very useful to "analyze behind the numbers" of an indicator program (Stahl and Ferrell, 2004, pp.17-18).

7.3.3 Technical Tools

Use comparators in order to give the data more meaning.

Using a "comparator" value puts the data in perspective and makes it more meaningful. For example, the amount of emissions decrease is placed in context when the total amount of emissions is also presented (Segnestam, 2002). Without this added information, the indicator has much less meaning.

Set baseline and target values before the analysis phase.

Estimating "baseline" values before a program starts can help track changes over time; this analysis will provide insight into program improvements. "Target" values can help to monitor how well the indicator initiative is helping to reach the program's ultimate goals.

7.3.4 Reporting

Develop and distribute progress reports to management and staff.

Disseminate meaningful information about indicator program performance to the appropriate stakeholders. Program managers and staff should receive a program progress report on a regular basis (Stahl and Ferrell, 2004). As stated by Michael Stahl of USEPA in the second INECE e-dialogue, "These reports provide a periodic snapshot of whether we are producing the appropriate amount of certain activities and whether those activities are leading to the proper results" (INECE. *E-dialogue on Implementing and Using Indicators*, 2005). Overall, the report should discuss important findings of the data analysis, including outputs and outcomes. Old data should be provided in the report to serve as a comparison or "benchmark." In addition, frequent meetings are necessary throughout the indicator program to update management and staff (Segnestam, 2002).

Best Practice Applied:

The USEPA distributes monthly reports to all of the senior management staff, so they can track the above indicator performance issues (INECE-OECD, 2003).

Report to external audiences in order to increase program support and encourage feedback.

Reports should also be provided to "external audiences" such as the public, legislators, industry and other stakeholders (Stahl and Ferrell, 2004). These reports should be similar to the reports given to the managers but they should focus more on the key results. Managers can use public reporting as a type of public relations tool to gain external support for the program.

Best Practice Applied:

The Netherlands environmental agency prioritizes public education. Henk Russinki of the Netherlands commented in the second e-dialogue that "In the end, in a democratic setting it is the public that legitimizes the enforcement. We simply are out of business if we lose their support" (INECE. *INECE E-dialogue on Implementing and Using Indicators*, 2005)

Ensure that the method of data presentation corresponds to the specific audience.

There are several things that one should keep in mind when presenting data. First, the program manager must develop an appropriate distribution list. It is important to know the audience because certain stakeholders may have more technical expertise then others. Certain types of graphs, charts and maps may provide a visual presentation that is easily understood by everyone. Frequently updating a program's web-site can provide stakeholders with the most current information. Although websites can easily disseminate information, hard copies of reports may be more useful in areas with little advanced technology available (Segnestam, 2002).

8.0 Conclusions

Perhaps the most critical limitation in the development of ECE indicator programs is the lack of adequate guidance in the indicator selection and analysis processes. The literature lacks any discussion of the complex steps required to understand these processes. This missing information added to difficulties in selecting indicators for the Pilot Project and impeded the overall project accomplishments.

Though the Team was unsuccessful in developing a structured, robust methodology for evaluating potential indicators with criteria, the trial and error process yielded several valuable conclusions. Foremost, the value of evaluating ECE indicators individually is questionable. ECE indicators function together within the logic model to provide information to the user, thus evaluation of any single indicator out of this context may result in limited conclusions. Nevertheless, criteria that describe the data quality or associated costs may warrant structured, explicit consideration by the design team. Other criteria, such as those that encompass policy relevance or general usefulness, are considered implicitly at all stages in the process – and, thus, explicit consideration may be unnecessary.

The Team's experience in analyzing ECE indicator program structure has yielded additional conclusions. Analysis of indicators in practice has revealed that ECE indicator programs may share some structured, common-themes beyond those associated with the primary logic model categories. Recognition of these themes may aid future program development efforts. In addition, the use of the logic model in selecting indicators generated significant though, varied approaches, and – ultimately – lessons learned. As the Team identified the lack of explicit guidance for indicator selection as a critical shortcoming, the approach outlined in the Pilot Project Process represents – at worst – a baseline for future reference. The Team's three-step selection process offers a relatively objective method for identifying policy relevant ECE indicators. Overall, the Team's maintenance of a detailed narrative throughout the Pilot Project development and indicator selection phases can provide a useful reference for future practitioners who become stymied at various stages. Although considerable work remains, the Best Practices Document provides a starting point for future ECE program designers.

Finally, the product of the Pilot Project represents the initial stages of an ECE indicator program of forestry law enforcement. Though the Team faced numerous, critical limitations, which clearly detracted from the quality of the final recommendations, a structure has been provided which can be built upon by MINAE compliance assurance program managers. Ultimately, this work can increase the efficiency and effectiveness of the enforcement of forestry law in Costa Rica – preserving valuable tropical forest and maintaining the associated long-term benefits.

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Appendix A: E-dialogue Summary

INECE E-Dialogue Summary: Good Practices for Identifying Environmental Compliance and Enforcement Indicators

(18 August – 09 September 2004)

http://inece.org/forumsindicators.html

1.0 INTRODUCTION

1.1 Goals of the e-dialogue

The goal of the e-dialogue was to solicit ideas and country-specific examples and experience from environmental enforcement practitioners on good practices for identifying environmental compliance and enforcement (ECE) indicators.

1.2 Participants

Michael Stahl, Director of the Office of Compliance at the United States Environmental Protection Agency, moderated the e-dialogue. 62 people registered for the e-dialogue, and there were 17 participants[8] who posted a total of 39 comments over the three-week period of discussion. The participants represent a wide range of professional activities and country locations, including Argentina, Canada, Mexico, the Netherlands, Brazil, Finland, Armenia, UK, Malta, Czech Republic, Morocco, Russia, Australia, the US, Bahrain, Paraguay, Scotland, Republic of Belarus, New Zealand, Zambia, and Egypt.

2.0 OVERVIEW OF THE DISCUSSION

2.1 Stakeholder Groups

The discussion began with the question, "What stakeholder groups need to be consulted in the process of identifying indicators and what are their roles?" Responses included:

- **Enforcement authorities, officer groups, internal staff and management:** provide extensive on-ground experience (Maria Di Paola; John Gavitt; Nerina Holden), and administer the law and accompanying regulations (Geoff Garver).
- **The regulated community**: ensure compliance efforts (Maria Di Paola).
- **Academia, non-governmental organizations, citizen groups, and international experts**: provide different and substantive perspectives, and supplemental information (Di Paola; Gavitt).

[8] Michael Stahl, Ken Markowitz, Maria di Paola, Maryna Yanush, Adriana Bianchi, John Gavitt, Antonio Benjamin, Nerina Holden, Yvan Lafleur, Geoff Garver, Morten Hojer, Angelique van der Schraaf, Markku Hietamaki, Wout Klein, Ladislav Miko, Sergey Dayman, Linda Duncan

- **Judges and Prosecutors:** help define the main environmental problems; resolve conflicts between stakeholders; and take immediate legal action (Maryana Yanush); offer valuable perspective about agency performance and how indicators are used (Mike Stahl; Holden).
- **Industry and the business sector:** necessary in order to ensure guaranteed support of changes (Holden).
- **Government Auditors** (Holden): interested from a budgetary standpoint.

Stakeholders should be involved in the indicator design process, but it is important to determine at what stage each stakeholder should be included (Antonio Benjamin). "…it is useful to bring industry into the process of identifying indicators at the beginning, but NGOs and other stakeholders should be brought in around the same time so that no group appears to be getting preferential treatment" (Stahl). Program designers should consider engaging all sectors and stakeholders with a set of questions regarding what is important to them, what general principles should be considered to develop and use indicators, and if they have ideas for specific indicators. (Stahl)

It is also crucial to never make promises to various stakeholders or guarantee consensus. Yet, it is important to ask for their ideas, evaluate them and then make a decision that satisfies the greatest number. A follow-up meeting to explain these decisions is also critical for stakeholders to support and understand the ECE indicator program. (Stahl)

The discussion subsequently turned to assessing how to motivate stakeholders to become involved in the identification process. Multiple methods were identified, depending on the stakeholder group. Suggestions included:

- **Government agencies:** If national agencies oppose developing an ECE indicator program, pressure from a coalition of the above stakeholders can be hard for an agency to ignore, especially if legislators are included in the group.
- **Employees:** Ideas to specifically motivate employees include: involving the staff in development; sending clear signals from the management; providing adequate training; and making reports visible to the public (Lafleury, Stahl).
- **Civil society:** Allow groups to participate in selecting indicators; implement legislation that requires all agencies to monitor progress; urge NGOs, media reports, the public, and academia to put pressure on ECE indicator programs to increase performance; and create internal motivation and ownership for the program personnel.
- **Affected parties:** Compliance is also encouraged through communication with parties affected by the relevant laws and regulations (Garver).

2.2 Purposes of ECE Indicators

As part of the identification process, stakeholders should consider how and why they want to use the ECE indicators. Being clear about the purposes the indicators will serve generally makes the job of identifying potential indicators much easier. One must ensure that "…setting goals or targets and defining indicators [is] one in the same action" (Wout Klein). As goals

change, the selected indicators should be reviewed (Sergey Dayman). Robert D. Behn's article, "Why Measure Performance? Different Purposes Require Different Measures" "provides a comprehensive list of purposes [of ECE indicators], and the importance of each depends on the setting in which the ECE program is operating" (Stahl). Behn's eight reasons why it is important to measure performance are as follows:

- To Evaluate
- To Control
- To Budget
- To Motivate
- To Promote
- To Celebrate
- To Learn
- To Improve

Other purposes and uses of ECE indicators include:

- Indicators serve as a tool of state and managers in evaluation, control, motivation and improvement (Ladislav Miko).
- Indicators can provide a purpose beyond these "administrative uses." "[Indicators] in the long run feed back into the policy making process, so that environmental policies are designed to be more easily enforced and less reactive to begin with" (Morten Hojer).
- An indicator program can increase the involvement and motivation of various stakeholders. For example, indicators:
    - Help managers monitor and control the operation of programs
    - Build public support
    - Create a public sense of ownership by increasing overall environmental
    - quality
    - Improve overall environmental program performance
- The output indicators or performance indicators can be helpful in justifying budgets to funders; they can illustrate that a program is increasing its quantifiable indicators (Gavitt; Stahl).

2.3 Institutional Barriers

Participants also considered the types of institutional barriers that need to be defined in the "identification" stage of an ECE indicators project. Institutional barriers can hinder the development and implementation of ECE indicator programs. Some of the most common barriers include:

- No dedicated budget to pursue enforcement

- Few qualified officers
- Minimal training
- No clear enforcement policy or directives
- Inappropriate influences
- Lack of real political or senior level administrative support for fair, consistent, appropriate enforcement actions (Duncan).

The ability of a program to be effective depends on the institutions in charge of policy implementation and good governance practices. In addition, fragmentation of these programs with poor delineation of responsibilities, low local participation, and lack of technical capacity all limit progress. Gaining consensus of the various stakeholders can be very difficult (Bianchi), but this is especially important when various agencies and governmental branches need to cooperate and communicate (Stahl, Yanush).

Lack of technical capacity, available data, or maturity of an agency can greatly limit an ECE indicator program. "Compliance culture," legislation, and public and private institutional support are often still in the development stages, which limits full implementation of a program. In these cases, it helps to have programs and NGOs to set small incremental goals over a number of years and maintain steady progress. These programs should develop basic output indicators and focus on building data collection capacity. It is also essential to keep the public informed to increase compliance. Overall, outcome indicators are difficult for developing programs (Stahl). This is especially true for wildlife and trade issues (Yanush).

Data collection can also be a barrier to compliance. The type of data collected and the inspectors collecting the data must be consistent or data collected over a number of years could be worthless (Yanush; Angelique van der Schraaf; Stahl). Inspectors must be motivated, or else consistency can easily be lost (van der Schraaf). Some inspectors are hesitant to collect and record data. One reason is a lack of managerial support; managers do not push for additional data collection and inspectors see it as an unnecessary burden (van der Schraaf). A good technology system such as a properly designed database could reduce some of this additional burden (Markku Hietamaki). Data reports need to be constantly reinforced through clear management, annual training efforts, and publishing reports (Stahl).

Inspectors can also become a barrier when they feel that their jobs may be threatened, if they collect data that is not positive or if they pursue an enforcement action against politically connected stakeholders. "…many people are reluctant to collect data that could eventually be used against them" (Lafleury). In some jurisdictions enforcement officers face real threat of personal harm or firing for taking enforcement action (Linda Duncan). Including as many stakeholders, managers, and employees in the indicators selection process may help to mitigate this potential problem. A good indicator should "motivate" and not threaten the employee (Miko).

One barrier that is commonplace throughout the world is the lack of financial resources dedicated to enforcement activities. This often equates to too few enforcement officers without enough training. The lack of support can be partially attributed to the low prioritization given to environmental issues in many nations. A society needs to understand the link between enforcement and environmental and human health improvement. Society must also have confidence in the "environmental information infrastructure," in order to trust ECE indicators

(Hojer). If the citizens support environmental enforcement, governmental priorities may begin to reflect this change. More detailed peer reviews of the data collection may help mitigate this issue (Hojer).

2.4 Criteria for Identifying a "Good" ECE Indicator

Indicators should be:

- Relevant – to program goals, objectives, or priorities
- Transparent – accessible and understandable by users
- Credible – based on data that is complete and accurate
- Functional – encourages the right behavior among program staff and regulated entities
- Feasible – value of indicator justifies or outweighs the cost of implementation
- Comprehensive – cover important operational aspects of program being measure (Stahl)

3.0 CONCLUSION

During the discussion, participants considered a variety of issues surrounding the question of how to best identify indicators for ECE programs. Participants discussed involvement of stakeholders, institutional barriers to establishing indicators, the purposes indicators can serve, and the criteria that can be used to evaluate potential ECE indicators.

Some general observations on the discussion:

4. Though we are all working in ECE programs, these programs are quite different with respect to their authority, capacity, maturity, and effectiveness. Each program resides in a particular political and economic setting, and each setting is very different. This makes finding lessons and ideas which apply to all programs very difficult, but I think we were able to identify some general rules or practices that can be helpful to most programs trying to develop and use ECE indicators.
5. We should acknowledge -- as shown by this e-dialogue -- that there is growing interest and need for ECE indicators. Compared to even three years ago, there are now many more countries and agencies trying to make progress on indicators. I think this is a very positive sign, and it argues for continuing to nurture a community of practitioners who can learn from each other. INECE and other organizations can play a very important role in keeping this community together.
6. If the "identify, implement, and use" construct is viewed as a continuum, I think many nations have moved into the identification and implementation stages, and a few have moved into the stage of actually using indicators to manage and improve their programs. It might be useful to track over time the progress that countries and nations make through this continuum. And it will be helpful for more nations to share their experience with other nations trying to make progress through the identify, implement, and use stages.

7. Because of the diversity of our programs, it will be difficult, if not impossible, to develop one set of indicators that can be universally applied. But we can develop best practices and general concepts and principles that can be of great help to all of us. The Indicators Working Group of INECE is drafting a guidance document that attempts to capture these practices and principles, and it should be ready early next year. This e-dialogue and the others to follow will inform the best practices that are described in the guidance document. (Stahl)

Appendix B: Guidance Document
By Michael Stahl and Robbi Farrell

PERFORMANCE MEASUREMENT GUIDANCE for COMPLIANCE AND ENFORCEMENT PRACTITIONERS

Draft 1 – 8/17/04
For review by

Expert Working Group on
Environmental Compliance and Enforcement Indicators,
International Network for Environmental Compliance and Enforcement

Draft Prepared by

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PERFORMANCE MEASUREMENT GUIDANCE for COMPLIANCE AND ENFORCEMENT PRACTITIONERS

PERFORMANCE MEASUREMENT GUIDANCE for COMPLIANCE AND ENFORCEMENT PRACTITIONERS

I. INTRODUCTION

The purpose of this document is to provide guidance to environmental compliance and enforcement (ECE) practitioners for identifying, implementing and using ECE indicators. The guidance provided in this document is drawn from the experiences of countries at various stages of developing and using ECE indicators. The document was written so as to be useful to countries considering whether to develop indicators, those in the early or mid-term stages of an indicators effort, and those already using indicators to report to the public and make program management decisions.

The guidance is organized around three stages or steps: identifying potential indicators and selecting an appropriate combination; designing and implementing the indicators selected; and using the indicators to improve program performance and enhance accountability to stakeholders. For each of these stages, best practices are presented. This three-stage model is summarized in Table 1 below.

Table 1.
Model for Using and Developing ECE Indicators

Identifying Indicators →	**Designing and Implementing Indicators** →	**Using Indicators**
Best Practices	Best Practices	Best Practices
Determine scope	Use internal teams to determine how to implement	Monitor performance with regular reports
Apply logic model	Conduct pilot projects	Analyze performance of organizational units
Develop guiding principles	Implement in phases	Review effectiveness of specific programs
Select criteria for evaluating indicators	Consult with experts	Report to external audiences
Develop common definitions for key terms	Monitor the implementation	Analyze behind the numbers
Inventory existing data sources	Develop and distribute an implementation plan	
Look beyond existing data	Ensure timely and accurate reporting	
Select appropriate combination of indicators		

Although this document offers examples of indicators currently in use in specific countries, it does not advocate on behalf of individual indicators or a uniform set or system of indicators. Instead, it provides practical advice about steps and practices that can be adapted for use by countries, agencies or programs so they can design indicators that meet their own needs and recognize their own constraints.

In addition to describing the practices in each of the stages of the model (Sections III, IV, and V), the document provides definitions of key terms (Section II), describes the importance of ECE indicators, presents benefits and barriers associated with development and use of indicators (Section VI), and briefly discusses indicators for international comparisons (Section VII).

II. GETTING STARTED: BASIC QUESTIONS AND DEFINITIONS

A. What Are ECE Indicators?

The word "indicator" is rooted in the Latin verb *indicare*, which means to disclose or point out, to announce or make publicly known, or to estimate or put a price on. Indicators can be thought of as pieces of evidence that provide information on matters of broader concern. For example, a legendary environmental indicator was "the canary in the coal mine." Miners would bring a caged canary into a coal mine. If the canary perished, it served as an "indicator" that harmful gases were building toward a level unsafe for miners.

There is a significant body of knowledge and experience concerning environmental indicators – measurable pieces of information that inform us about the status of an area's environmental health. Policy makers have used these indicators for years to assess and report environmental program performance. They have also been used to communicate information about the state of the environment to the public.

The OECD member countries have agreed to use a framework for discussing environmental indicators known as the pressure-state-response model. Under this model, indicators fall into three categories: indicators of environmental pressures (e.g., trends in air emissions), indicators of environmental conditions (e.g., trends in ambient air quality), and indicators of societal response (e.g. air regulations). Indicators of societal responses show the extent to which society responds to environmental concerns. They refer to individual and collective actions and reactions, intended to mitigate or prevent environmental harm, reverse damage already inflicted, and preserve natural resources.

Environmental compliance and enforcement (ECE) indicators are an example of societal response indicators. As with indicators of environmental expenditures, taxes and subsidies, price structures, market shares of environmentally friendly goods and services, and pollution abatement rates, they reflect societal responses to the environmental conditions identified.

ECE indicators are also important tools for translating and delivering concise, credible information in a manner that can be readily understood and communicated to decision-makers, regulators, industry, the general public, and other audiences.

B. DEFINITIONS OF KEY TERMS

Before an in-depth discussion of ECE indicators can occur, clear definitions of the terminology are essential.

Compliance. The OECD defines compliance as the behavior response to regulatory requirements. Similarly, Environment Canada defines compliance as a state of conformity with the law. Hence, compliance indicators include those measurable pieces of information that inform about regulatees' behavior response to regulatory requirements such that they conform to laws and regulations.

Enforcement. The OECD defines enforcement as the application of all available tools to achieve compliance. In a broad sense, the OECD definition of enforcement includes compliance promotion, compliance monitoring and non-compliance response. Enforcement indicators include those measurable pieces of information that inform about compliance promotion, compliance monitoring and non-compliance response.

Inputs. ECE indicators are expressed as inputs, outputs and outcomes. Inputs include time, staff, funding, materials, equipment and the like that contribute to an activity. While of limited usefulness in and of themselves, they speak to the government's commitment and are important components for determining efficiency and return on investment. When considered together with outcomes, inputs can be used to determine the level of effort required to achieve an outcome. Managers can use this information to analyze efficiency in their programs.

Outputs. Outputs are activities, events, services and products that reach a regulatee. Examples include the number of inspections performed, the number of compliance assistance workshops provided, and the number of enforcement cases issued. These indicators demonstrate a level of effort toward an outcome, but they do not indicate the degree to which the outcome is achieved.

Outcomes. Outcome indicators measure the results of an agency's outputs, and are generally divided into two categories: **intermediate** and **final outcomes**.

- **Intermediate** outcome indicators measure progress toward a final outcome, such as a change in behavior or other results that contribute to the end outcome. An example of an intermediate outcome of an inspection would be a change in facility management practices.

Further discussion about the benefits of intermediate outcomes can be found at page 13.

- **Final** outcome indicators measure the ultimate result the program is designed to achieve, such as an improvement in ambient air quality or a reduction in the number of people living in areas in which pollutant standards were exceeded. When final outcome indicators are designed with the program's goals and objectives in mind, they should enable managers and others to determine whether the program's activities, or outputs, are achieving those goals.

C

A discussion about the limitations of output indicators and the need for outcome measures can be found at page 13.

Program managers are among the primary users of ECE indicators. Until recently, managers commonly measured program performance in terms of activity counts, or outputs, such as the number of inspections conducted and the number of enforcement cases initiated. Though outputs alone give some sense of enforcement presence, they do not enable analyses of the extent to which a program is achieving its goals. By identifying, designing and using meaningful ECE indicators, managers and others can evaluate and communicate to others how well these

programs respond to priority environmental problems. More specifically, program managers can use ECE indicators for three major purposes:

Monitoring program operations

ECE indicators can help to ensure that personnel and resources are used appropriately to accomplish the agency's goals. This type of analysis could compare inputs and outputs; for example, how many activities of various kinds are conducted within a given period of time with a given amount of resources. Examples include the number of inspections conducted annually and the number of enforcement warnings and charges issued per year.

Enhancing accountability

ECE indicators can enhance the accountability of environmental compliance and enforcement programs that report results to central budget authorities, legislative bodies, environmental constituency groups, and the general public. Since there are multiple audiences, it is often necessary to use multiple indicators to provide a full account of program performance. Input-related indicators identify the allocation of financial and human resources. Output-related indicators show the extent of activities carried out. Outcome-related indicators show the results achieved or the effects of the activities.

When taken together, inputs, outputs and outcomes relate a given amount of resource allocation to a number of enforcement cases settled and the corresponding reduction in pollution (e.g. kilograms of pollution reduced). These indicators can also be valuable as an internal tool to motivate program staff and managers and to recognize and celebrate accomplishments.

Assessing program performance

ECE indicators help program managers learn what is working and what is not working and determine what needs to be done differently to achieve desired outcomes. For many, this is the primary purpose and most important reason to invest in development and use of performance indicators. For example, managers can compare outputs (number of inspections) with outcomes (compliance rates) to learn whether more inspections lead to greater compliance. Similarly, comparing the number of inspections by sector with corresponding changes in compliance rates can help management identify sectors in which inspections have the greatest impact. Managers can look for patterns and relationships between activities and results, and make improvements where necessary. When used in this way, ECE indicators are an invaluable management tool.

III. PHASE 1: IDENTIFYING INDICATORS

The practices described below for identifying indicators are based on the experience of national environmental enforcement and compliance programs from around the world. While all of these practices are highly recommended, they are best viewed as a menu from which national programs can choose practices appropriate for their specific situation. The practices should not necessarily be used as a step-by-step process.

A. Determine the Scope of the Indicators

A fundamental issue that needs to be resolved at the beginning of any effort to develop indicators is the scope of the effort. Two questions need to be answered to determine the scope:

- Will the indicators be **comprehensive** (that is, will they cover all the laws and programs for which the agency is responsible) or **focused** (covering only a specific law or requirement, industry sector, geographic area or non-compliance pattern)?

- Will the indicators be **national** (that is, covering the national compliance and enforcement program) or **sub-national** (covering a program at the regional/district, state or local/ municipal level)?

Comprehensive National Indicators

To assess the overall effectiveness and improve management of the national environmental agency's program to ensure compliance with environmental requirements in all federal statutes and regulations, indicators will need to be comprehensive and national.

Developing a set of comprehensive national indicators is very complex, since it involves many persons, multiple agencies, collection of data from many sources, and may require implementation of a national system.

> ***The U.S. EPA has developed a system of comprehensive national compliance and enforcement indicators. For more information about EPA's ECE indicators, see http://www.epa.gov/compliance/planning/results/index.htm***

Comprehensive Sub-National Indicators

To assess the overall effectiveness and improve management of the compliance and enforcement program of a regional or district office of the national environmental agency, a state or provincial agency, or a local or municipal agency, indicators will need to be comprehensive and sub-national.

This type of effort has the advantage of being a more manageable size than a comprehensive national effort. Developing a comprehensive set of indicators at a regional, state or local level

can often provide a means of testing a system of indicators that can later be applied to the national program.

Focused National Indicators

This type of effort is necessary when a national environmental agency wants to assess the effectiveness and improve management of a focused national initiative to address a specific noncompliance pattern or environmental risk.

Focused national indicators might be developed for an inspection and enforcement initiative to improve compliance among the petroleum refining industry, a targeted enforcement initiative to improve compliance with all air pollution requirements, or a strategy that integrates incentive and enforcement to reduce emissions of a specific pollutant into water bodies.

This type of effort is also a more manageable size than the comprehensive national effort because it focuses on a specific component or piece of the national program. For a focused national effort it is often advisable to develop indicators that are short-term and specifically tailored for the initiative being measured, rather than develop permanent long-term indicators that would be necessary for a comprehensive national set of indicators.

> ***Environment Canada has developed a set of focused national ECE indicators. For more information about Environment Canada's indicators, see …***

Focused Sub-National Indicators

To assess the effectiveness and improve management of a focused initiative to address a specific non-compliance pattern or environmental risk at the regional, provincial/state, or local/municipal agency, use focused sub-national indicators.

This type of indicator might be developed for a regional or state effort to use inspections and enforcement to control deforestation, or a municipal initiative to combine assistance followed by enforcement actions to limit illegal dumping of waste on the land.

Focused sub-national indicators are generally short-term and specifically tailored for the initiative, and developing and using such indicators can provide a very useful learning experience for developing comprehensive national indicators at a later time.

B. Engage Stakeholders

Because the target audience for ECE indicators is diverse and comprises a multitude of perspectives, consultation with all stakeholder groups is key to success in identifying, designing, and implementing indicators. Early engagement with the users – both internal to the organization as well as external groups – will provide invaluable information to help define the scope of measures and priority information needs. Stakeholder input helps to ensure that measures will be accepted as legitimate indicators of program performance, and will have the

best chance of meeting the needs of all interested parties. Stakeholder participation may also help identify all expected uses for the measures, and highlight the need to collect new or different data than that already available.

As part of its National Performance Measures Strategy (NPMS) to develop and implement an enhanced set of performance measures, the U.S. Environmental Protection Agency (EPA) Office of Enforcement and Compliance Assurance (OECA) conducted over twenty public meetings with a wide array of stakeholders, consulted with experts and practitioners, and reviewed dozens of studies and articles. This outreach and research effort was extremely beneficial to EPA's efforts to identify better performance indicators.

> ***For a set of questions used by EPA to guide their discussions wit stakeholders, see Appendix A***.

Through consultation with the full range of stakeholders, much can be learned about which indicators are most meaningful, how various audiences will use indicators, and how indicators can contribute to effective program management. The table below summarizes the ways in which ECE indicators are used by various target audiences.

Table 2.
Target Audiences and Uses for ECE Indicators

Target Audience	How Indicators Can Be Used
Government policymakers, legislators, oversight agencies	Assess progress in achieving goals, targets, standards Assess effectiveness of existing policies and instruments Identify priorities for future policy, legislation Assess program efficiency Assess costs and benefits of regulatory framework Inform budget process
Regulators	Assess effectiveness of regulations in achieving goals Identify future priorities for regulation and enforcement
Subnational/territorial authorities	Assess compliance rates by industry sector Identify implications of outcomes for planning decisions
International organizations	Assess progress in achieving international goals, targets, standards Compare progress on international goals across countries Assess program efficiencies
Industry	Compare compliance rates across sectors Assess own compliance within a sector
Environmental advocacy groups	Assess effectiveness of ECE programs Assess compliance rates in a locality
General public	Understand risks to health and well-being in their locality Assure transparency and effectiveness of government

C. Apply Logic Model

A logic model can be a useful tool for identifying performance indicators. Logic models graphically depict the relationships between resources invested, activities undertaken and the results of those activities. It should clearly demonstrate a results chain from activities to outcomes, and serve as a "road map" of how the program will achieve its goals.

The key to using a logic model is to follow logically linked stages of the program: inputs, outputs, reach, intermediate outcomes, and final outcomes. For purposes of identifying meaningful ECE indicators, the logic model can elucidate what outputs and outcomes need to be measured. If insufficient resources are available to yield the desired outcomes at the scope intended, the scope may be reduced or outcomes modified to match available resources.

Table 3.
Sample Logic Model for ECE Programs

Inputs *resources*	**Outputs** *activities*	**Intermediate Outcome** *behavior change*	**Final Outcome** *environmental impact*
Personnel Funds for salaries, contracts, IT, etc.	Inspections conducted Enforcement actions taken Fines assessed	Greater understanding of how to comply Improved facility management practices Increased compliance	Reduced pollution emissions Improved ambient water quality Reduced contaminant burden in wildlife species

To learn more about using logic models, see* Additional Resources *at the end of this guide.

D. Develop Guiding Principles

Discussions with external stakeholders and program managers and staff will often yield ideas that are broader than suggestions about specific indicators. The discussions will also capture general principles that can be used to guide the identification of indicators. These principles are valuable feedback from important audiences, and should be taken into account in the development and use of indicators. In developing its own principles, EPA drew from stakeholder input, consultation with experts and practitioners, and a literature review.

***The guiding principles used by EPA can be found at Appendix B*.**

E. SELECT CRITERIA FOR EVALUATING POTENTIAL INDICATORS

After external stakeholders and program managers and staff have identified potential indicators, those indicators will need to be evaluated to determine whether they should be implemented. A set of criteria should be used for this evaluation. The discussions with stakeholders can be very useful for identifying such criteria. Based on discussions with stakeholders, U.S. EPA determined that its indicators should be:

- **relevant** to the goals, objectives, and priorities of the agency and to the needs of external stakeholders
- **transparent** so they promote understanding and enlighten users about program performance
- **credible** and based on data that is complete and accurate
- **functional** in that they encourage programs and personnel to engage in effective and constructive behavior and activities
- **feasible**, that is, the cost of implementing and maintaining a measure should not outweigh its value to the program
- as **comprehensive** as possible with respect to the important operational aspects of program performance

In applying these criteria to potential indicators it will often be necessary to compare the relevance and importance of the information produced by a potential indicator against the feasibility or cost of implementing that indicator. For example, industry representatives suggested that EPA should count the instances when companies or facilities voluntarily implement environmental management systems, and that this could be an indicator of industry commitment to environmental compliance. Though EPA felt this information could be valuable, the discussions about implementation of the indicator quickly identified that there would be difficult and costly reporting and data quality problems. The indicator was then dropped from further consideration. This tension between the value of an indicator versus its cost of implementation came up often in EPA's evaluation of potential indicators.

F. DEVELOP COMMON DEFINITIONS FOR KEY TERMS

The importance of having a clear set of definitions at the beginning of any effort to develop indicators cannot be overstated. Defining key terms that will be used in discussions with stakeholders provides a framework for organizing ideas, and allows agency program managers and external stakeholders to see how potential indicators might be used to improve management of the program.

> ***Λ Definitions of key terms can be found in Section I. These definitions can be used or modified by ECE programs as they identify, design and implement indicators.***

Of particular importance is the distinction between output and outcome. As ideas for potential indicators are suggested by stakeholders, clear definitions can be used to categorize indicators and determine whether the set of indicators suggested provides an appropriate mix of outcomes and outputs.

G. INVENTORY EXISTING DATA SOURCES

A key step for identifying environmental compliance and enforcement indicators is to assess the existing data available to support indicators. Is data currently being collected that can be the basis for useful indicators? For example, if data is being collected about enforcement actions issued by regional or district offices and by the national program, such data should provide basic output indicators that can be valuable in monitoring operations. Collection of enforcement action data might also be expanded to begin gathering information about results from enforcement actions (that is, pollutant reductions), thereby providing intermediate outcome indicators.

H. LOOK BEYOND EXISTING DATA

One potential pitfall in the identification of indicators is to consider as feasible only those indicators which can be supported by data that is currently available. Many important potential indicators will not be identified or given due consideration if the search for indicators is constrained by using only existing data. If performance indicators have not been used in the past, existing data will likely be limited to activities or outputs. Measuring outcomes, however, will likely require setting up a process for collecting new data.

I. SELECT AN APPROPRIATE COMBINATION OF INDICATORS

In selecting indicators it is critical to strike an appropriate balance between outputs and outcomes. A mix of output and outcome indicators will be necessary to serve the purposes of external stakeholders and program managers and staff. Further, using output and outcome indicators can allow patterns to be identified regarding what types of outputs produce the most effective outcomes. As greater understanding of these patterns is gained, program strategies can be adjusted accordingly.

Although output indicators provide basic information to program managers and provide a sense of “enforcement presence” to regulated industries and the public, output indicators have several limitations. First, they do not measure the environmental results achieved by program activities. Though they may provide insight about the number of enforcement cases taken over a period time, they do not tell program personnel or the public whether these cases reduced pollution emissions, improved facility environmental management practices, or returned the facility to full compliance. Second, output indicators reveal very little about the state of compliance. They do not tell us what percentage of the regulated universe is in compliance or what the level of compliance is in key segments of that universe. Third, output indicators say little about progress toward achieving environmental goals or addressing particular environmental problems. Knowing the number of inspections or enforcement actions does not indicate whether the agency’s mission is being achieved, or whether a strategy to address a particular environmental problem has been successful.

In identifying and implementing environmental compliance and enforcement indicators, it should be recognized that intermediate outcomes can be a source of very valuable indicators. In fact, intermediate outcomes should be emphasized when developing and implementing indicators. The advantage of intermediate outcomes is that they are often directly caused by the activities

and outputs of the program – there is no ambiguity about the causal link between the enforcement actions and the resulting pollutant reduction, for example. Unfortunately, many efforts to develop indicators falter when they focus only on outputs and end outcomes. This is because there is often at best only a very weak link between the government activity and an improvement in an environmental condition. Also, measuring changes in end outcomes can be very expensive, the end outcomes may take years to appear, and improvements in end outcomes such as air or water quality can be influenced by many factors beyond the scope of government activity. For all these reasons, intermediate outcomes should receive appropriate consideration in any effort to develop indicators.

At the end of its process for identifying potential indicators, EPA selected a set of indicators for implementation. Those indicators are listed in Table 3.

Table 3.
Sample Output and Outcome Indicators for ECE Programs

INDICATOR TYPE	**Indicator**
Outputs	Number of inspections and investigations conducted
	Number of civil and criminal enforcement actions
	Number of facilities/entities reached through compliance assistance efforts
	Number of training courses and other capacity building efforts provided to state, tribal or local programs
Outcomes	Pounds of pollutants reduced through enforcement actions
	Pounds of soil removed, gallons of groundwater treated via enforcement actions
	Dollar value of pollution control projects required by enforcement actions
	Number of audits and self-corrections by companies/facilities using EPA policies
	Number of entities seeking compliance assistance from EPA Compliance Assistance Centers
	Actions taken as a result of assistance from EPA Compliance Assistance Centers
	Rate of recidivism among significant violators and average time to return to compliance
	Statistically valid compliance rates for key regulated populations

IV. PHASE 2: DESIGNING AND IMPLEMENTING INDICATORS

Design and implementation of new indicators is a critical step that may be overlooked in the rush to begin using indicators sooner rather than later. This is the time to define accurate and reliable performance indicators in detail, pilot test them and correct mistakes before reporting indicator data to the public or using it to assess and improve performance. As mentioned in the previous section on identifying indicators, the practices described below are best viewed as a menu from which to choose rather than a step-by-step process.

A. USE INTERNAL TEAMS TO DETERMINE HOW TO IMPLEMENT

One approach for completing the design and implementation is to develop teams within the organization to define the selected indicators in precise detail, review relevant data already available, develop information collection and reporting processes as needed, and establish a schedule for testing and implementing the indicators. These work groups can be very useful in identifying and overcoming barriers to effective implementation. They will have the added benefit of involving staff and increasing their sense of ownership of the new indicators.

B. CONDUCT PILOT PROJECTS

The use of pilot projects to develop and implement environmental compliance and enforcement indicators is highly recommended. Pilot projects provide a period of time for indicators to be developed and tested before being implemented fully. During this period, data can be analyzed, indicators can be refined or adjusted, and mistakes can be corrected. Pilot projects can be designed to test indicators on a small scale (for example, a focused sub-national project as described above), and can then be expanded and applied on a larger scale (for example, a comprehensive national project). Pilot projects are most helpful when there is a concerted effort to identify the lessons learned from the project at its conclusion.

C. IMPLEMENT IN PHASES

For environmental compliance and enforcement programs implementing multiple new indicators, it is advisable to implement in phases over a reasonable period of time. Although this may mean that the full set of indicators is not available in the immediate future, the time spent developing them produces more accurate information and spreads the implementation burden over a more manageable period of time.

D. CONSULT WITH EXPERTS

When sufficient internal expertise does not exist, agencies should not hesitate to bring in outside experts to fill in knowledge gaps when developing performance indicators. This can be particularly helpful when developing complex measures, such as statistically valid compliance rates. Experts in sampling, statistical analysis, and performance-based management of public programs can provide useful assistance. They can help determine whether potential indicators meet the criteria set forth in E. above.

E. MONITOR THE IMPLEMENTATION

Implementation of a new indicator or set of indicators requires ongoing management attention to ensure that the appropriate data is collected, that it is collected in an efficient manner, and that the indicators provide the understanding of program performance anticipated. Monitoring implementation can also help determine whether certain indicators need to be dropped from or added to the implementation effort.

F. DEVELOP AND DISTRIBUTE AN IMPLEMENTATION PLAN

It is important that a plan is developed that describes the tasks to be completed to implement new indicators, and provides a schedule of deadlines for completion of the tasks. The plan should also clearly spell out the uses for the new indicators. The plan should be distributed to program managers and staff, and to external stakeholders as appropriate.

G. ENSURE TIMELY AND ACCURATE REPORTING

Reporting of data, especially data to support new indicators, by internal or external parties will need to be reinforced through multiple communication mechanisms on an ongoing basis. Steps will also need to be taken to ensure the quality of the data (e.g., random data audits, sampling and verification of specific data fields) through a continuous program of quality control. One of the most effective ways of ensuring timely and accurate reporting is for senior managers to demonstrate that they are using indicators to make decisions about program strategy and resource allocation.

V. PHASE 3: USING INDICATORS

Performance indicators can serve many purposes. Public management literature suggests a wide variety of uses for performance indicators by public sector programs and organizations. Among the most common uses are:

- Formulate and justify budget requests
- Help make operational and resource allocation requests
- Motivate personnel to make program improvements
- Identify performance problems and needed corrections
- Provide data for in-depth program evaluations
- Support strategic and other long-term planning efforts
- Communicate with public and enhance accountability
- Improve program effectiveness

Performance indicators that can be used for all, most, or even some of these purposes can be of great benefit to a program or agency.

For environmental compliance and enforcement programs, there are at least four ways to use performance indicators. These practices are highly recommended, but are best viewed as a menu from which to choose, rather than a step-by-step process.

A. MONITOR PERFORMANCE WITH REGULAR REPORTS

A monthly or quarterly report on performance indicators can be provided to program managers and staff. These reports can provide a current account of performance in producing key outputs and outcomes. Such reports can be organized to break out data for a program as a whole, or for various program components. In addition to data about performance indicators for the current year, the reports should also provide data about performance in the previously completed fiscal year to provide a benchmark.

> ***Appendix C provides examples of the types of data that can be included in a monthly or quarterly report***.

B. ANALYZE PERFORMANCE OF ORGANIZATIONAL UNITS

Data from indicators can be organized to provide a current report of performance by a particular organizational unit, such as a regional or provincial office of a national agency. These reports could contain data about performance in the current fiscal year, three-year trends on key outputs and outcomes, and comparisons to performance of other regional offices. Such reports can lead to identification of specific program management and performance issues that might need to be addressed by managers of the organizational unit.

C. REVIEW EFFECTIVENESS OF SPECIFIC PROGRAMS

Data from indicators can be used to review the effectiveness of particular programs (e.g., compliance with clean water laws or requirements). Studies of the effectiveness of specific programs could be organized around five performance-based questions that provide a framework for analysis. The five questions are:

- Is the program contributing to the goal of protecting human health and the environment through our actions and strategies?
- Is the program changing the behavior of the regulated community in ways that lead to improved environmental performance?
- Is the program achieving appropriate levels of compliance in key populations?
- Are we achieving the appropriate levels of enforcement activity in the regulated community?
- Is the program providing appropriate assistance to our state and tribal partners to support them in contributing to improving environmental performance?

Under each question, the relevant performance indicators are arrayed to address the question as thoroughly as possible. The framework allows data about results and the activities that produced them to be analyzed. These data can be examined for patterns and more can be learned about the combinations, types, and amounts of activities that produce the most desirable results.

D. REPORT TO EXTERNAL AUDIENCES

Many environmental agencies provide reports to the public in response to laws or policies requiring such reports. For environmental compliance and enforcement programs, performance indicators can provide valuable information to the public, legislative overseers, regulated industries, and environmental organizations. Such programs can be well-served by providing an annual report to external audiences. Reports that emphasize results and outcomes achieved through activities and outputs of the program can enhance support for the compliance and enforcement mission. By describing accomplishments in terms that emphasize results – pounds of pollution reduced through enforcement actions, improved practices at facilities from compliance assistance, improved rates of compliance in an industry sector – an account of performance is provided that is meaningful to multiple audiences.

E. ANALYZE BEHIND THE NUMBERS

When using indicators to improve performance, program managers and staff should understand that data from indicators have their limitations. A number that provides the amount of an output or outcome produced does not tell program personnel all they need to know about that output or outcome. Such numbers need a context (e.g., a time period, a benchmark or standard for comparison, etc.) to realize their full value as a management tool. In many instances, data from indicators provide a kind of warning light that signals a need for deeper analysis or further investigation to understand the forces and influences that shape program performance.

VI. BENEFITS AND BARRIERS TO IDENTIFYING, IMPLEMENTING AND USING INDICATORS

Environmental compliance and enforcement programs that undertake an effort to identify, implement, and use performance indicators will reap many benefits and confront many barriers during that effort. The benefits can be very rewarding and the obstacles very daunting. To help programs and agencies anticipate both the benefits and the barriers, they are described below.

A. BENEFITS OF ECE INDICATORS

When programs or agencies are able to establish a set or a system of performance indicators for their compliance and enforcement efforts, the indicators often provide a steering mechanism for program managers and staff, a window through which the public can view results and ensure program accountability, and a demonstration to regulated facilities and companies that compliance is expected and taken seriously.

For practitioners in environmental compliance and enforcement programs, the benefits of performance indicators include the following.

Improved Control of Program Operations

Even a very basic set of output indicators will increase understanding about what is being produced, and when combined with data about inputs, judgments can be made about whether resources are being produced efficiently. At a minimum, basic output indicators can help determine whether program staff are performing fundamental program activities.

Improved Ability to Set Goals and Adjust Strategies

By using indicators as a management tool, goals can be set regarding the amount of activities or results that should be produced over a period of time. Indicators can also be used to identify needed adjustments in the mix of activities or results the program is producing.

Improved Decision-Making for Resource Allocation

Output and outcome indicators can be analyzed to determine whether resources need to be increased, shifted, or altered in some way to meet goals and achieve desired results. Indicators provide an understanding of the relationship between outputs and outcomes, thereby enhancing the ability of program managers to increase resource investment in preferred outcomes.

Improved Ability to Identify and Correct Performance Issues

Indicators that can be organized by type of output or outcome, by organizational unit, and by program area increase program managers' ability to identify performance problems and investigate them further to design solutions.

Improved Ability to Motivate Employees

There is much truth to the oft-repeated statement that "What gets measured gets done." Performance indicators send a clear signal to program personnel about what needs to be

accomplished. Setting a goal to achieve a certain amount of a specific output tends to organize and focus some portion of resources on achieving the goal.

Improved Ability to Communicate with the Public

Performance indicators help external audiences understand and support program activities. Output indicators can convey to the public that funds are producing some amount of inspections, enforcement actions, or other activities. Outcome indicators can convey that these activities are resulting in important outcomes such as reduced pollution, increased compliance, and improved environmental management at facilities.

B. BARRIERS TO DEVELOPMENT AND USE OF ECE INDICATORS

There are many obstacles that impede the identification, implementation and use of performance indicators by environmental compliance and enforcement programs. Some of these obstacles are broad, institutional issues that affect adversely the overall operation of the whole environmental agency, not just its compliance and enforcement program. Other obstacles are more narrow but still troublesome, and they pertain to the difficulties surrounding performance measurement in general.

For developing and transitioning countries, there are at least four barriers that impede the development and use of indicators.

Compliance Culture in Formative Stages

In many countries, the obligation to comply with environmental (and other) requirements is not yet ingrained deeply. In some countries, the rule of law is not yet embraced fully by citizens, businesses, and institutions of government.

Environmental Laws Not Implemented Fully

Environmental laws may be relatively new, they may have undergone significant changes, there may not be much experience with the implementation of these laws or sections of the laws, and there may be impediments to implementation of specific sections of the laws.

Environmental Agencies Not Mature

The operation of environmental agencies may not be very sophisticated, they may possess limited capabilities and they may have severe resource shortages, and may even be struggling for viability.

Systematic Data Collection Lacking

Some countries lack data systems or may be only beginning to develop them. In the absence of organized efforts to report and collect data, even basic output indicators are difficult to establish.

These challenges are inter-related. For example, developing a compliance culture may be impeded in countries where environmental laws are not fully functional, and the lack of data reporting and collection systems may slow the effectiveness of environmental agencies. Finally, the fundamental tension between economic development and environmental protection is often exacerbated in developing and transitioning countries. The emphasis on economic improvement or expansion can often cause environmental protection to be a low priority for government attention.

Duration of Implementation

Identifying and implementing a useful set or system of performance indicators takes time. Most of the agencies making progress in developing and using performance indicators have taken three or more years to establish them. An effort of this duration requires persistence, a long-term commitment, and continuity among the responsible personnel.

Lack of Interpretive Skills

Even if programs are able to establish indicators, interpreting their meaning -- "understanding what's behind the measures" -- requires a sophisticated understanding of program operations and a skill for diagnosing problems. Often these skills are in short supply, particularly in initial attempts to use indicators to identify performance issues.

Misuse by External Audiences

When indicators data are shared with the public, there is an increased likelihood that such data will be inadvertently or knowingly misused by advocacy groups. This prospect often discourages program managers from initiating an effort to establish indicators. Or, if there is an instance of misuse, program managers reduce their support or even discontinue the effort to develop and use indicators.

VII. INDICATORS FOR INTERNATIONAL COMPARISONS

ECE indicators can be developed for assessing progress in implementing national programs. There are many advantages, however, in developing indicators that can be used for international comparisons of individual country efforts in meeting national and international objectives. By considering OECD's Core Set of indicators as they develop their own, developing and transitioning countries will be better positioned to make comparisons of their programs with those of other countries using the same indicators.

The OECD, when initiating its programs of environmental indicators, recognized that there is no universal set of indicators; rather, several sets exist, corresponding to specific purposes and uses. Within this framework, a Core Set of environmental indicators has been designed to help track environmental progress and the factors involved in it, and analyze environmental policies. The OECD countries commonly agreed upon the use of the OECD Core Set, which is published regularly and is available on OECD's website at www.oecd.org/env. The Core Set contains some 50 indicators, and covers issues that reflect the main environmental concerns in OECD countries. It incorporates core indicators derived from sectoral sets and from environmental accounting. Indicators are classified following the PSR model: Indicators of environmental pressures, both direct and indirect; indicators of environmental conditions; indicators of society's responses. This approach has also been embraced by other international framework programs, including the United Nations Headquarters and United Nations regional offices, the United Nations Environment Programme, the World Bank, and the European Union.

The cooperation within OECD countries focused on identifying commonalities and comparable elements. OECD countries have used the indicators within the framework of OECD "peer reviews," in which a group of like-minded countries work together on improving their individual and collective performances in environmental management. These reviews assist individual governments to assess progress, promote continuous policy dialogue among the countries, and stimulate greater accountability of their governments towards public opinion within their OECD region and beyond.

The list of issues covered by the OECD Core Set of indicators was not considered as final and exhaustive. The measured characteristics have been undergoing changes as scientific knowledge and policy concerns evolved. Furthermore, since the issues have been of varying relevance for different countries and different contexts, a certain balance had to be kept between the need for flexibility and the need for longer term monitoring and analysis. In this context, each country supplements the core set with additional indicators of its own particular interest. Over time the list will be expanded with indicators of progress of both social and environmental factors. Common international work on ECE indicators is expected to contribute to this process.

VIII. ADDITIONAL RESOURCES

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APPENDIX A

Questions to Guide Discussions with Stakeholders

Questions for all stakeholders

- What criteria should be used to identify appropriate performance indicators?
- What makes a 'good' performance indicator – relevance, transparency, feasibility?
- Are there particular indicators that seem most promising?
- Are there indicators that are most urgent for EPA to adopt?
- What are the strengths and weaknesses of the three categories of performance indicators – outputs, intermediate outcomes and final or end outcomes?

Questions for state environmental agencies

- Are states currently measuring outcomes of enforcement actions?
- Are states currently measuring compliance assistance outputs and their impacts?
- Are states able to use end outcome indicators to measure the performance of their enforcement and compliance assurance program?

Questions for industry associations

- How can information be collected to develop compliance rates that are based on representative samples of industry sectors?
- What information would be needed to measure positive change or achievements in environmental management by regulated entities? How would such information be collected?
- How could EPA structure categories of violations or enforcement actions to differentiate levels of harm or gravity?
- How can information be collected about the number of facilities or companies that have implemented environmental management systems?

Questions for environmental advocacy groups and other non-governmental organizations

- How can EPA more effectively measure the deterrent effect of its enforcement actions?
- What changes should be made to current EPA enforcement output indicators? Are there current indicators that should be reduced or eliminated to make room for outcome indicators?

Questions for other federal regulatory agencies

- Are other federal agencies measuring the outcomes or results of enforcement actions?
- Are other federal agencies measuring the outputs or outcomes associated with compliance assistance or other non-enforcement approaches to compliance?
- Are other federal agencies using compliance rates to measure performance? Are any of these agencies using sampling techniques to make compliance rates statistically valid?

Questions for budget oversight agencies

- What indicators are currently used by such agencies to evaluate the performance of EPA's enforcement and compliance assurance program?
- Are there other indicators such agencies would prefer as supplements or replacements for current indicators?

APPENDIX B

Guiding Principles for Discussions with Stakeholders

***A combination of indicators – outputs and outcomes, quantitative and qualitative, statistical and narrative, aggregated and disaggregated, national and local -- is necessary to measure performance, inform management, and serve the full range of audiences and purposes*.**

No single number, fact, or category of measure (e.g., output or outcome) can convey all the information necessary to comprehensively measure performance. The mission of EPA's enforcement and compliance assurance program is complex. Its responsibilities are multiple, and the tools used to achieve them are multi-faceted. Therefore, a variety of performance measures is needed to ensure accountability, improve management, and increase program effectiveness.

Performance indicators are most effective when they reflect management priorities and are linked to a limited number of program goals and objectives.

Successful performance measures demonstrate the degree to which organizations or programs are achieving their goals and desired results. The number of measures should be limited to key performance elements essential for producing data that aids program evaluation and decision-making. Performance measures should reflect those operational aspects (e.g., quality, fairness, timeliness, cost, etc.) considered to be management priorities.

***Increased use of outcome indicators presents many challenges, because agencies or programs may influence – but not necessarily control – outcomes*.**

Outcomes cannot generally be attributed or causally linked solely to the activities of an agency or program since most outcomes are influenced by many factors external to the agency. For example, compliance rates might be influenced by economic conditions that are conducive to investment in environmental management by companies or facilities. Agencies need to be careful not to take too much credit for successful achievement of outcomes; nor should they probably take too much blame when outcomes are not achieved.

Problem-specific, tailor-made performance indicators are effective for evaluating performance in solving specific environmental and non-compliance problems.

When agencies or programs identify and target high-risk, high-priority environmental or noncompliance problems, their performance in mitigating or solving such problems can best be evaluated using tailor-made indicators that specifically relate to each problem.

Performance measures should be used principally to improve effectiveness and manage more strategically, rather than simply to report accomplishments to the public in a more interesting way.

If developed and used correctly, performance indicators should permit more sophisticated analysis of results and activities that produced them, allow comparisons of the relative effectiveness of specific tools and strategies, and lead to informed resource allocation that is

more likely to achieve the desired results. A well designed and wisely utilized set of performance indicators can put strategy and vision, goals and objectives at the center of management attention.

APPENDIX C

Examples of Data for Monthly/Quarterly Reports

- Number of inspections conducted

  Data organized by:

  - Regional/provincial office
  - Statute or program area

- Number of enforcement actions issued

  Data organized by:

  - Type of action (e.g., civil, criminal)
  - Regional/provincial office
  - Statute or program area

- Amount of fines/penalties assessed

  Data organized by:

  - Type of action (e.g., civil, criminal)
  - Regional/provincial office
  - Statute or program area

- Amount of investments in pollution control/beneficial projects[9]

  Data organized by:

  - Type of action (e.g., civil, criminal)
  - Regional/provincial office
  - Statute or program area

- Enforcement actions resulting in improved facility practices

  Data organized by:

  - Type of practice
  - Regional/provincial office

[9] Some countries have authority to require violating companies to invest in pollution control or beneficial projects as a condition of setting or concluding an enforcement action.

- Statute or program area

➢ Enforcement actions resulting in pollution reduction

Data organized by:

- Type of pollutant
- Regional/provincial office
- Statute or program area

➢ Regulated entities reached through compliance assistance

Data organized by:

- Industry sector
- Type of assistance
- Regional/provincial office
- Statute or program area

➢ Increased awareness, improved practices, pollution reduction through compliance assistance

Data organized by:

- Type of result
- Type of assistance
- Regional/provincial office
- Statute or program area

Appendix C: Criteria Matrix

Criteria	Description	Source
Adaptable		
Geographically Adaptable	Indicators should be reportable across a range of geographic scales from the national level to the provincial and local levels, depending on the needs of the user.	(Born et al, 2001, pg.3)
Adaptable across Sectors	Indicators should be reportable across a range of sectors.	(Born et al, 2001, pg.3)
Adaptable to National or regional scale	National or regional level: The indicators are preferably national in scope or relevant to an issue of national concern. If the developer or user wishes to create an index, it is also an advantage if the indicator is quantifiable.	(Segnestam, 2002, pg.15)
Comprehensive		
Comprehensive	As comprehensive as possible with respect to the important operational aspects of program performance.	(Stahl, 2004, pg.8)
Comprehensive and Relevant	Indicators within a given domain should form a coherent, theory-based set that taken together offer insight into the policy area in question exceeding what any single indicator or data set can offer alone.	(Born et al, 2001, pg.2)
Comprehensive, Policy-Relevant, and Credible	Indicators should be single measures that summarize more complex and detailed underlying data related to a specific policy-relevant theme. The underlying data must be accurate, credible and accessible to analysts who wish to investigate the factors behind movements in the aggregate indicator.	(Born et al, 2001, pg.2)
Comprehensive	Coverage.	(World Economic Forum, 2002)
Credible		
Credible	Credible and based on data that is complete and accurate.	(Stahl, 2004, pg.8)
Analytical soundness (Credible)	An environmental indicator should: be theoretically well founded in technical and scientific terms; be based on international standards and international consensus about its validity; lend itself to being linked to economic models, forecasting and information systems.	(OECD, 2003, pg.5)

Credible	Data quality: Data are/will be collected to yield measures that are scientifically acceptable and support sound conclusions about the state of the system being studied.	(Office of Environmental Health Hazard, 2005, pg. 8)
Credible	High quality and reliability. Indicators, and the information they provide, are only as good as the data from which they are derived. For most monitoring systems there is a discrepancy between what is realistic or practical for the moment, and what would be most useful or "ideal", for the system to cover.	(Segnestam, 2002, pg.15)
Credible spatial and temporal scale	Appropriate spatial and temporal scale. Careful thought should be given to the appropriate spatial and temporal scale of indicators. Since the environmental impact of activities seldom coincides with administrative boundaries, indicators often need to be measured on different scales.	(Segnestam, 2002, pg.15)
Empirical and Policy Relevant	Indicators should directly measure or be highly correlated with a parameter that has been found through theory or empirical evidence to represent either 1) a desired policy outcome variable or 2) a variable that can be used to control policy outcomes.	(Born et al, 2001, pg.2)
Feasible		
Feasible	Feasible, that is, the cost of implementing and maintaining a measure should not outweigh its value to the program.	(Stahl, 2004, pg.8)
Feasible	Realistic collection or development costs. Indicators must be practical and realistic, and their cost of collection and development therefore need to be considered. This may lead to trade-offs between the information content of various indicators and the cost of collecting them.	(Segnestam, 2002, pg.13)
Functional		
Functional	Functional in that they encourage programs and personnel to engage in effective and constructive behavior and activities.	(Stahl, 2004, pg.8)
Functional	Representativeness: The indicator is designed to reflect the environmental issue it is selected to characterize.	(Office of Environmental Health Hazard, 2005, pg. 8)

Functional	The indicator should reflect an issue that could have significant costs or benefits for current or future generations (for example, technological advances, political stability, loss of biodiversity, status of children and desertification).	(Segnestam, 2002, pg.16)
Functional and Reflect Critical Issues	The indicator should reflect an issue that involves thresholds beyond which small changes could potentially lead to irreversible effects (for example, endangered species becoming extinct).	(Segnestam, 2002, pg.16)
Policy-relevant and possess utility for users	An environmental indicator should: • provide a representative picture of environmental conditions, pressures on the environment or society's responses; • be simple, easy to interpret and able to show trends over time; • be responsive to changes in the environment and related human activities; • provide a basis for international comparisons; • be either national in scope or applicable to regional environmental issues of national significance; • have a threshold or reference value against which to compare it so that users are able to assess the significance of the values associated with it.	(OECD, 2003, pg.5)
Timely and Iterative	Indicators should be produced in a timely fashion on a regular and consistent basis such that meaningful trend analysis can be conducted.	(Born et al, 2001, pg.3)
Relevant		
Relevant	Relevant to the goals, objectives, and priorities of the agency and to the needs of external stakeholders.	(Stahl, 2004, pg.8)
Relevant	The indicator should reflect changes in important endowments (for example, public infrastructure, air or water quality, natural resource stocks and governmental institutions).	(Segnestam, 2002, pg.16)
Policy-Relevant	Decision support: The indicator should provide information appropriate for making policy decisions.	(Office of Environmental Health Hazard, 2005, pg. 8)

Policy-Relevant (to program objectives) and Functional	Direct relevance to objectives. The indicator selection must be closely linked to the environmental problems being addressed. It is therefore important that the problem to be addressed is well defined. Vague or overly broad problem formulation, such as "loss in biodiversity" are of little use in selecting indicators (and may well indicate that the issue itself is not very well identified).	(Segnestam, 2002, pg.13)
Policy Relevant (to target group or constituents) and Functional	Direct relevance to the target group. Different target groups could have different needs and uses for the information provided by the indicators. To carefully consider who the target group consists of is therefore central. For example, an authority responsible for the monitoring of an environmental aspect in a country is likely to need more detailed information than the general public could even digest. The authority could therefore need a larger set of indicators, while the general public would be satisfied (and probably the indicator initiative would be more successful) with a small set of "headline" indicators (that is, indicators that signal something which makes people react as we do when reading the headlines in a newspaper).	(Segnestam, 2002, pg.13)
Time Relevance	Recency.	(World Economic Forum, 2002)
Relevance	Relevance.	(World Economic Forum, 2002)
Sensitive		
Sensitivity	The indicator should be able to distinguish meaningful differences in environmental conditions with an acceptable degree of resolution.	(Office of Environmental Health Hazard, 2005, pg. 8)
Transparency		
Measurability (Transparency)	The data required to support the indicator should be: readily available or made available at a reasonable cost/benefit ratio; adequately documented and of known quality; updated at regular intervals in accordance with reliable procedures.	(OECD, 2003, pg.5)

Understandable and Easily Communicated (Transparent)	Indicators should be generally understandable by non-specialist audiences and easily communicated.	(Born et al, 2001, pg.2)
Transparency	Clarity in design. It is important that the selected indicators are defined clearly in order to avoid confusion in their development or interpretation. Clarity can mean different things for different groups of people – whether the indicator needs to be scientifically very solid, or rather be very communicable is therefore something to consider. Who the audience of the indicators is central for this selection criteria.	(Segnestam, 2002, pg.13)
Transparent	Transparent so they promote understanding and enlighten users about program performance.	(Stahl, 2004, pg.8)

Appendix D: ECE Indicator List and Forestry Indicator List

ECE Indicator List

KEY:	
ECE Indicators placed in primary logic model categories denoted with light blue.	
Sub-categories denoted with blue.	
Implemented indicators denoted with white.	
Indicators added by the Team are denoted with grey (intuitive examples, not found in literature).	
are intermediate outcomes.	
Input Indicators	**Reference**
Funding	
Amount of funding of research and advocacy in environmental protection	Russia
Amount of environmental expenditures	China, Georgia, Kazakhstan
Share of environmental expenses of total government budget	World Bank
Amount of resources used to target areas of non compliance	Scotland
Percent of environmental expenditures per sector (i.e. forestry versus air pollution)	
Percent of environmental expenditures within sector by position (i.e. links in enforcement chain - inspectors versus prosecutors)	
Percent of environmental expenditures spent on enforcement (versus education, outreach, research, etc.)	
Percent of environmental expenditures spent on compliance promotion and assistance (i.e. softer measures, awareness campaigns, certification programs, etc.)	
Amount of investment in citizen understanding and/or awareness campaigns	
Human Resources	
Number of compliance enforcement and promotion officers	Netherlands
Number of inspectors per region	Czech Republic
Percent of operatives/inspectors aimed to stop illegal deforestation with special funding	Mexico
Percent of operatives/inspectors per sector	
Percent allocated to various tasks within sector (i.e. highway inspections versus forest inspections versus processing inspections in forestry sector)	
Virtually any combination of the above replacing inspector with prosecutor (i.e. total prosecutors, prosecutors per sector, prosecutors per region)	
Bureaucratic	
Number of environmental supervision institutions	China
Number of people supervising the environment	China
Training	
Number of foreign business trips/inspector/year	Czech Republic
Number of inspectors trained per year	Czech Republic
Number of training days/inspector/year	Czech Republic
Number of staff trained in environmental law	World Bank
Number of training courses and other capacity building efforts provided to state, tribal or local programs.	Scotland, United States
Number/percent of inspectors with four year degree, advanced degree, etc.	
Dollar amount spent on training per inspector per year	
Comparative analysis of inspector salaries (i.e. versus national average or other relevant comparison)	
Replace inspector with prosecutors for many of the above; may also be interested in training investment of relevant judicial body (i.e. federal judges in Costa Rica)	
Environmental Law	
Level of accomplishment in environmental legislation	Mexico
Promulgation of new environmental regulations	World Bank
Number of amendments (or similar) to environmental legislation and assessment of their quality (weakening or strengthening)	

Public/NGO Inputs	
Number of citizen participation committees in critical zones	Mexico
Number of active NGOs	World Bank
Total financial inputs of NGO within relevant: state/province and/or sector	
Output	
Inspections	
Number of inspections	Scotland, Czech Republic, Georgia, Kazakhstan, Mexico, Netherlands, Russia, United States
Number of license reviews	Scotland
Annual inspection plan implementation	Georgia
Average number of inspections per inspector	Ghana, Kazakhstan, Russia
Percentage ratio of land, air, water, and fauna protection inspections	Kazakhstan
Inspection quality and efficiency	Kazakhstan
Number of missing discharge monitoring reports	Massachusetts Government
Number of inspections among sectors	
Number of inspections at strategic locations (i.e. transport, processing, cutting in forestry)	
# unannounced inspections versus announced	
Reported Violations	
Number of detected violations by inspectors/regulatory agency	Georgia, Kazakhstan, Russia
Number of public complaints lodged with higher authorities	Massachusetts Government
Number of complaints by non-governmental organizations lodged with higher authorities	
Number of written warnings	Alberta Environment
Lawsuits filed with (or by) investigating authorities to initiate a legal action	Russia
Number of cases brought to trial by prosecutors	
Relevant outcomes	
Number of cases reviewed by the courts	Georgia, Ghana, Kazakhstan, Russia
Number of convictions	
Number of settlements	
Number of "not guilty" verdicts	
Measures taken to restrict or suspend facilities due to violation of environmental legislation	Kazakhstan
Number of Administrative Compliance Orders	United States, Massachusetts Government
Number of Administrative Penalty Complaints	United States
Number of Administrative Penalty Order Settlements	United States
Number of issued injunctions on facilities	Kazakhstan, Russia
Number of revisions and administrative decisions issued in time period	Czech Republic
Number of resolutions per state against number of lawyers	Mexico
Number of cases tried per lawyer versus convictions, settlements, etc.	

Compliance Promotion	
Application of environmental management systems	Massachusetts Government
Number of compliance promotion campaigns	Netherlands
Number of certification packages mailed to those involved in the project	Florida Department of Environmental Protection
Number of compliance promotion meetings	Canada
Number of compliance promotion workshops being held	Florida Department of Environmental Protection
Public/NGO Outputs	
Increase in citizen participation	Mexico
See above category (citizen and NGO initiated cases	
Data sharing, data gathering activities of NGOs	
Immediate Outcome	
Permitting	
Number of applications received for environmental permits	Scotland
Number of Environmental Impact Assessment Reports received	Ghana, Kazakhstan, Russia
Number of facilities not submitting permit renewal applications	Massachusetts Government
Understanding	
Percent of entities reporting improved understanding of regulations	United States
Number of requests for information according to particular laws in time period	Czech Republic
Voluntary Participation (actual compliance changes are intermediate outcomes)	
Number of facilities designing their own self-policing compliance programs	United States
Percent of high-risk industries enrolled (in compliance promotion campaign)	Mexico
Voluntary agreements with initiatives for: waste minimization, diffuse pollution and habitat enhancement	Scotland
Number of facilities enrolled in product certification programs	
Intermediate Outcome	
Compliance Promotion Activities	
Actions taken as a result of assistance from EPA centers	United States
Facilities/firms voluntarily disclosing violations	United States
Number of audits and self-corrections by companies/facilities using EPA polices	United States
Behavioral changes due to compliance assistance rendered	United States
Number of entities seeking compliance assistance from EPA assistance centers	United States
Implementation of activities as defined by the Annual Coordination Plan of the Ministry	Georgia
Compliance rates	
Number of detected violations by inspectors/regulatory agency	Georgia, Kazakhstan, Russia
Number of public complaints lodged with higher authorities	Ghana, Russia
Lawsuits filed with (or by) investigating authorities to initiate a legal action	Russia
Number of convictions	
Number of settlements	
Number of "not guilty" verdicts	
Measures taken to restrict or suspend facilities due to violation of environmental legislation	Kazakhstan
Number of Administrative Compliance Orders	United States, Massachusetts Government
Number of Administrative Penalty Order Settlements	United States

Number of issued injunctions on facilities	Kazakhstan, Russia
Number of revisions and administrative decisions issued in time period	Czech Republic
Percent of entities reporting pollution reductions	United States
Percent of entitles taking actions to improve the environment	United States
Statistically valid compliance rates for key regulated populations	United States
Reduction in the release of pollutants due to suspension of a production process	Kazakhstan
Amounts of money spent on compliance that result from enforcement actions	United States
Amount invested in pollution control	United States
Number of judicial actions that facilities/industries are subject to	United States
Number of initial non-compliance charges per firm	
Understanding Non-compliance	
Percent of significant violators in each media that have new or recurrent significant violations within two years of receiving a formal enforcement action	Florida Centre for Public Management
Rate of significant violators and average time to regain compliance	United States
The average time needed by state either to return violators to compliance or issue enforceable compliance plans	Florida Centre for Public Management
Amount of quarterly compliance and outcome targets being met	Scotland
Number of facilities in significant compliance compared to total number of permitted facilities	Florida Centre for Public Management
Rate of pollution levy collected versus total charges levied	China
Final Outcome	
Pollution Amount Prevented/Acres Protected	
Amount of ambient load of pollutants released in air and water	Netherlands
Acres of wetlands protected	United States
Gallons of groundwater treated through enforcement actions	United States
Pounds of contaminated soil removed	United States
Total pounds of pollutants reduced through enforcement actions	United States
Annual and daily average total loads of emission (NOx and SO_2)	China
Any relevant statistic can be inserted here (total pollutant loads, acres protected, volume of soil cleaned, etc.) - measurable physical changes to the environment	
Human/Species/Ecosystem Health	
People served by drinking water systems brought into compliance	United States

Forestry Indicator List

Indicator	Type of Indicator	Country where Implemented	Source
Capacity building for National Agencies and Community Groups	Input	Vietnam	
Develop information system on forest cover, timber stocks, and timber sources	Input	Center for International Forestry Research	
Ease of legal logging	Input	Vietnam	
Extent to which Institutional Framework develops and maintains efficient physical infrastructure to facilitate the supply of forest products and services and support forest management	Input	United States	http://www.mpci.org/rep-pub/1995/santiago_e.html
Extent to which Institutional Framework develops and maintains human resource skills across relevant disciplines	Input	United States	http://www.mpci.org/rep-pub/1995/santiago_e.html
Extent to which Institutional Framework enforces laws, regulations and guidelines	Input	United States	http://www.mpci.org/rep-pub/1995/santiago_e.html
Extent to which Institutional Framework undertakes and implements periodic forest-related planning, assessment, and policy review including cross-sectoral planning and coordination	Input	United States	http://www.mpci.org/rep-pub/1995/santiago_e.html
Extent to which Institutional Framework provides for public involvement activities and public education, awareness and extension programs, and makes available forest-related information	Input	United States	http://www.mpci.org/rep-pub/1995/santiago_e.html
Extent to which Legal Framework clarifies property rights, provides for appropriate land tenure arrangements, recognizes customary and traditional rights of indigenous people, and provides means of resolving property disputes by due process	Input	United States	http://www.mpci.org/rep-pub/1995/santiago_e.html
Extent to which Legal Framework encourages best practice codes for forest management	Input	United States	http://www.mpci.org/rep-pub/1995/santiago_e.html
Extent to which Legal Framework provides for periodic forest-related planning, assessment, and policy review that recognizes the range of forest values, including coordination with relevant sectors	Input	United States	http://www.mpci.org/rep-pub/1995/santiago_e.html

Extent to which Legal Framework provides for the management of forests to conserve special environmental, cultural, social and/or scientific values	Input	United States	http://www.mpci.org/rep-pub/1995/santiago_e.html
Extent to which Legal Framework provides opportunities for public participation in public policy and decision-making related to forests and public access to information	Input	United States	http://www.mpci.org/rep-pub/1995/santiago_e.html
Extent to which the Economic Framework supports the conservation and sustainable management of forests through investment and taxation policies and a regulatory environment which recognize the long-term nature of investments and permit the flow of capital in and out of the forest sector in response to market signals, non-market economic valuations, and public policy decisions in order to meet long-term demands for forest products and services	Input	United States	http://www.mpci.org/rep-pub/1995/santiago_e.html
Extent to which the Economic Framework supports the conservation and sustainable management of forests through non-discriminatory trade policies for forest products	Input	United States	http://www.mpci.org/rep-pub/1995/santiago_e.html
Federal funding in forest health and management	Input	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf
Forestry based training	Input	Philippines	
Incentives for informants	Input	Vietnam	
Incentives for legal trade	Input	Vietnam	
Increase in enforcement policy and procedural reform	Input	Indonesia	
Increase in training/capacity building for enforcement agency	Input	Indonesia	
Number of persons trained by category (i.e. 60 forest techs)	Input	Haiti	World Bank, Paper No. 71
Strengthening of positive incentives for enforcement agents	Input	Indonesia	
Support development/application of new technology and products	Input	Center for International Forestry Research	
Incentives for forest clearing	Input		World Bank, Paper No. 71
Frequency and extent of State forest resource planning and assessment	Input	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf
State forestry employee salaries	Input	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf

USDA Forest Service employees	Input	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf
Strengthening of the public and NGO's knowledge of enforcement efforts	Input or Immediate Outcome	Indonesia	
Custom controls	Input or Output	Center for International Forestry Research	
Existence of active State forestry advisory committees	Input	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf
Existence of laws and policies requiring State forest-related planning/assessment	Input	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf
Forest planning on national forest land (status, acres)	Output	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf
Forest planning on non-industrial private forest land (acres)	Output	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf
Adaptive management measures and monitoring measures	Output	Indonesia	
Amount of timber seized	Output	Papua New Guinea	
Community Based Forestry Management Plan	Output	Philippines	
Confiscation of forest products per year	Output	Philippines	
Incidences of illegal logging	Output	Philippines	
Number of confiscation cases	Output	Malaysia	
Number of people questioned/investigated	Output	Papua New Guinea	
Regular monitoring and checking of import/export areas	Output	Malaysia	
Total transit passes applied for/issued	Output	Papua New Guinea	
Protected forest as a percentage of total forest budget	Output		World Bank, Paper No. 71
Ratio of managed forest to non-managed forest	Output		World Bank, Paper No. 71
Age class by forest type (acres)	Intermediate Outcome	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf
Area of roadless forest	Intermediate Outcome		World Bank, Paper No. 71
Area of forest converted for other uses	Intermediate Outcome		World Bank, Paper No. 71
Forest land conversion (acres)	Intermediate Outcome	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf

Fragmentation: average patch size, amount of edge, inter-patch distance	Intermediate Outcome	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf
Parcelization: average size of private land holdings	Intermediate Outcome	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf
Percentage of harvested area left to natural regeneration	Intermediate Outcome		World Bank, Paper No. 71
Conversion of illegal acres to legal acres of forest	Intermediate Outcome	Version of indicator used in Gaza	World Bank, Paper No. 71
Price of processing illegal logs	Intermediate Outcome	Indonesia	
Transporting timber without proper customs declarations	Intermediate Outcome	Indonesia	
Amount of known logging outside concession area	Intermediate or Final Outcome	Indonesia	
Area of forest	Final Outcome		World Bank, Paper No. 71
Forest fragmentation Index	Final Outcome		World Bank, Paper No. 71
Forest land change (percent)	Final Outcome	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf
Forest land clearance (acres)	Final Outcome	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf
Timberland area (acres)	Final Outcome	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf
Total forest area (acres)	Final Outcome	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf
Amount of logging in protected areas	Intermediate or Final Outcome	Indonesia	
Total transit passes surrendered	Outcome	Papua New Guinea	
Amount of proceeds from illegal logging: the residual of world price less costs of extraction	Final Outcome	World Bank	
Amount of processed illegal logs	Final Outcome	Indonesia	
Rate of deforestation	Final Outcome		World Bank, Paper No. 71
Reserved forest land (acres)	Final Outcome	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf

Total forest area (acres)	Final Outcome	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf
Total land area (acres)	Final Outcome	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf
Size class by forest type (acres)	Final Outcome	United States	http://www.na.fs.fed.us/sustainability/pdf/base.pdf

Appendix E:
Conference Attendees and Minutes

Expert Working Group Attendees
October 4, 2004

MORNING SESSION

Ken Markowitz, Session Chairman, INECE, USA

Carolina Mauri, Key Contact, Universidad de Costa Rica, Costa Rica

Jose Pablo Gonzales, Environmental Prosecutor, Prosecutors Office, Costa Rica

Ana Louisa Leiva, Legal Counsel to the Minister, MINAE, Costa Rica

Leon Gonzalaz, Environmental Watchdog, Costa Rica

Adolfo Johanning Perez, Contraloria's Office

Liliana Arrieta, Contraloria's Office

Marielos Alfara, Camara Costariccense Forestal

Ana Maria Comacho, CEDARENA

AFTERNOON SESSION

Ken Markowitz, Session Chairman, INECE, USA

Carolina Mauri, Key Contact, Universidad de Costa Rica, Costa Rica

Jose Pablo Gonzales, Environmental Prosecutor, Prosecutors Office, Costa Rica

Ana Louisa Leiva, Legal Counsel to the Minister, MINAE, Costa Rica

Leon Gonzalaz, Environmental Watchdog, Costa Rica

Adolfo Johanning Perez, Contraloria's Office

Liliana Arrieta, Contraloria's Office

Viviana Guitierrez, Universidad de Costa Rica, Costa Rica

Experts Working Group Attendees
October 5, 2004

MORNING AND MID-AFTERNOON SESSION

Ken Markowitz, Session Chairman, INECE, USA

Carolina Mauri, Key Contact, Universidad de Costa Rica, Costa Rica

Jose Pablo Gonzales, Environmental Prosecutor, Prosecutors Office, Costa Rica

Ana Louisa Leiva, Legal Counsel to the Minister, MINAE, Costa Rica

Leon Gonzalaz, Environmental Watchdog, Costa Rica

Adolfo Johanning Perez, Contraloria's Office

Liliana Arrieta, Contraloria's Office

Interviewed Stakeholders

OCTOBER 6, 2004

Jose Pablo Gonzales, Environmental Prosecutor, Prosecutors Office, Costa Rica

Alfonso Barrantes, Executive Director, National Forestry Office, Costa Rica

OCTOBER 7, 2004

Ana Luisa Leiva, Legal Counsel to the Minister, MINAE, Costa Rica

Carlos Herrera, Sub-director, FUNDECOR, Costa Rica

OCTOBER 8, 2004

Leon Gonzalaz, Environmental Watchdog, Costa Rica

Carlos Calvo, SINCA/ SINEFOR, Costa Rica

Franlin Gonzalez, Departmento Estadisticas, Costa Rica

Experts Meeting
October 4, 2004

MORNING SESSION

3 STAGES OF A PILOT PROJECT (KEN)

1. Identification (define scope, determine what we will be identifying, use criteria to see if it is functional)
2. Implementation (how are we going to do this)
3. How are we going to use this information? Critically evaluate.

Comments/Questions:

Jose Pablo: Do you need to know all 3 stages up front?

Ken: yes, you need to tie your goals to all stages

Ana Luisa: Who defines criteria?

Ken: you would – it depends on the situation

Ken: We are here to provide technical expertise. Programs that are currently underway are in Argentina (Water and Air Pilot Indicator Project) & Brazil (new law requires indicators) & Canada

Lilliana: Need to be clear about goals. It is very expensive to work with local people and communities – they usually have a lot of information but they can't/don't put it all together since it requires a lot of time. Agencies need to start obtaining more information. This project needs to be part of the "National Strategy" or else there will be no change.

Ken: Could the project focus nationally on one law? This would set an example.

Lilliana: Possibly the policy about plantations and how they have improved quality of life?

Ken: We need to be careful to differentiate between environmental quality indicators and ECE indicators

Lilliana: Goals in environmental work take 10-20 years to see results. Need a lot of training etc.

Jose Pablo: suggests looking at the forestry sector management plants because there are a limited number of plans, so this may be easier to work with.

Ana Luisa: There is no government strategic management and no political structure that can do this work.

Alexandria: The Center for National Environmental Information was created but it hasn't been very successful. There is a lack of communication among agencies (sometimes a jealousy component). There is also a lack of technical resources (old equipment and only 3 people). The National Geographic Institute sells information and there are technical conflicts. The National Environmental Strategy is being developed now.

Ana Luisa: The information has to be improved.

Ana Luisa: ECE information is included but accessibility is a big issue.

Alexandria: National Geographic Institute isn't considered "official." There was an attempt to make it an official organization in 1998 but it didn't work.

Ken: Is Prosecutors office using this information?

Jose Pablo: They are not used to working with indicators so they adapt to the information that is available. For example they call MINAE to see if someone has a permit. MINAE collects data on the number of inspections.

Ken: How do you use this data?

Ana Luisa: The information is used a lot. For example the Emergency Commission uses weather data to prevent disasters. In forestry, they use it for contracts for payment of environmental services and to properly monitor forest plantations. Municipalities use ArcView information on forest cover.

Leon: There is a lot of information but people don't know how to use it. The institutions are very selfish in sharing information. They typically have a "short-term" mentality (thinking of the next government) and there is a lot of corruption. The country doesn't need detailed and sophisticated indicators, but they should be simple. Maybe only a few indicators would be best. There needs to be political will to do something with the data.

JOSE PABLO'S PRESENTATION

- (See PowerPoint presentation for majority of information)
- The Prosecutors Office was created in 1993 and now there are only 3 environmental prosecutors. They look at the more complex issues.
- Citizens, NGOs etc. can bring cases.
- Cutting forests illegally is one crime. Planting something else is also a crime.
- MINAE feels that they must grant all permits.
- They have prosecuted the engineers (or regents) for their crimes
- Sometimes the laws are conflicting (i.e. developers can cut forest within the maritime zone)

MARIELOS ALFARO'S PRESENTATION

General Information

- Costa Rica is not an agricultural country, but a forestry country
- 24% of the country is protected

- 40% of the country has forestry cover as of 2000 (conservation, plantations, and agro forestry). This number should be near 65% cover.

- The GIS maps she has may change with what you include but you need to use the same methodology when you do the calculations/mapping in different years.

- Illegal deforestation is a critical issue. The main problem is at the border with Nicaragua. This includes cutting in lands that aren't their property.

Corruption

- Anything can be purchased at the Ministry

- Control points have a fee. You can pay the fee and take illegal logs through.

- The checkpoint in Limon is the worst for corruption.

Illegal Deforestation

- No collected information about illegal deforestation

- There is a Decree that gives and established time to carry logs (6am-5pm) but the schedule isn't respected.

- Who are the illegal loggers? People with equipment and trucks that can go to property that isn't theirs or National Forests.

- Where does the wood go? Informal sectors, like the furniture sector. The illegal wood is 10% or more cheap.

- Most illegal wood is smuggled in the bottom of trucks.

- The Forestry Sector wants to stop illegal logging.

- There is no coordination between governing organizations. There is also little motivation or teamwork.

Certification System

- Costa Rica implemented a certification system in 1998 based on a Scandinavian model. This model was so complex that it couldn't be implemented. They tried to track from the final product to the tree.

Plantations/land use

- At various periods plantations weren't profitable in CR because other countries had so many.

- Forestry production is more expensive in CR than in other South American countries because land is cheaper in other places.
- Nicaragua is now competing with reforestation.
- Costa Rica is the only South American country with the capacity to make pallets. They will be able to export a lot of these when the free trade agreement with the US comes into force.
- Cattle ranching land has been abused and production is decreasing.
- There is a payment for environmental services system for owners that do conservation.
- Most people get into reforestation because of incentives, not business.
- Agricultural land is limited and not likely to increase.

Ideas for change

- Environmental Tribunals have started to prosecute the owner of the property, even if they aren't involved in the logging. This puts pressure on them to monitor their land better and stop illegal foresters.
- Control should be done at the industrial areas or distribution centers where the processing of the wood is completed. There are only 200 processing plants, but thousands of miles of highway. (easier to control)
- The processing plants are registered with the tax authority and Ministry of Labor, so they should also register with the Ministry of Environment.
- Control the volume of wood, so you know where it comes from.
- Prosecute those who buy illegal wood (can involve the taxing authority)
- MINAE needs to change the control of the highways. They need officials working 24 hours, instead of 8 hours.
- Use GIS to check the properties.
- Leon: individual should be more active when they buy furniture. Government should go after the big fish.

AFTERNOON SESSION

AGENDA

- Various topics for individual pilot project
- Project to pursue
- Breakdown to access performance. Must have provision of law to analyze and comply.

TOPICS FOR THE PILOT PROJECT

Overall questions: What is too complicated? What laws have outputs that have not been put to use yet?

1. Evaluation of Maritime Zone Law

Problem: people invade illegally. *Question: what type of houses are build, and how to systematically get people out of the maritime zone.*

Two crimes involved:

1. Municipalities obligation to enforce and comply by themselves, if not done then:
2. Judicial and administrational enforcement through prosecution. Question how injection orders are executed.

2. Forest Law: Analyze general land use plans.

Amount and location of management plans, including location of non-compliance of the plan

Illegal Logging

Legal Framework

Permits: standardize methodologies of management

Legal vs. Illegal Forestry Management plans

No monitoring of execution of a Management Plan. Responsibility left to an Environmental Engineer, thus the person implementing the plan is paid by the person with the land, not a public person, making the plans not transparent. Also, there is weak control of transport and communications.

Analyze Settlements in Judicial Arena: yet form 1998 to today the change in the data does not show the reality because 90% of all cases are settled, and what is being offered is not documented. Some prosecutors accept plans that are not equal to the value of the damage done.

The social component of reclamation is not documented. Nor does it show the real community value, which leads to illegal settlements.

Illegal logging: cutting in public and private areas without permits and plans

Yet, where is the data? CATIE has this data: 25% of all cutting illegal, therefore 75% legal logging, yet with tainted management plans.

Invasion of buffer zones, i.e., rivers, cliffs, etc. *What are rates of buffer zone compliance? How is compliance assured? In this case, MINAE is not a preventative organization.*

Article 33: Management Plans often authorize cutting in buffer zone, which creates an overlapping problem. Article 58: sanctions placed on invasion of an area. Article 90: sanctioning of buffers for wildlife.

Focus on buffer areas in cities because it is easier to control because city public areas are being invaded and watershed areas are being changed because of destruction of buffer zones. Also, currently, there is a law pending in congress on buffer zones.

Overall, buffer zones are complicated because of the the different laws, and they are a dot in the huge problem of forestry.

Settlements

Is valuation done? Is the environmental damage assessed by the MINAE? What is the official methodology, money and time used for settlements?

3. Waste Management

4. Water Management/Pollution

Identify the institutions involved and their responsibilities.

Make the legislation more effective.

5. Air Pollution
6. Biodiversity
7. Wildlife Planning
8. Mining
9. Urban Planning/ Zoning

Outcome of Discussion

Rates of forestry conviction is low. Also you can separate the settlement issues and the illegal management plans. Overall, there is lots of data on management plans. An NGO has reviewed 100 management plans on the Osa Peninsula.

The question could be: what does NINAE do to ensure compliance in this area? There are 11 conservation areas that aren't centralized: compare two of these areas, e.g. the Osa Peninsula and the Central Volcanic Range area because they have the most consistent data.

Value of the Project

The Minister would be interested in the project if indicators are created to measure progress towards compliance. The main concern is that MINAE can't follow the recommendations.

TOMORROW

Scope, Goals, Tasks, Strategies, Value of project within the Ministry and the Prosecutor's Office

How to achieve value?

Most of the problems are practical problems that are not in the law. Thus, who do you design a project to satisfy the true needs of the Ministry? How can a sectors experience be used everywhere? By showing an example of how a sector solved a problem.

Most prosecutor violations are without management plans, yet how do you know activities are getting at them? What are the legal instruments to enforce cutting of a tree to put cutting of a tree through the forestry law channels, i.e. Management Plans for the prosecutor to use. Could we get support of the industry? The project could be used to point to better sources of data and implementation techniques.

Create a logic model to assess the current situation; must be realistic and feasible. How will the information be collected? And how can this be integrated into the environmental agencies.

Possible Indicators

2205-2006 Number of inspections per year, number of cases before the court and the administrational tribunal, number of management plans involve, number of illegal management plans approved, number of sanctions, etc.

Illegal logging with Management Plans?

Find illegal logging through complaints and MINAE inspectors; yet how corrupt are these officials?

Experts Meeting
October 5, 2004

SECTOR TOPICS CONSIDERED FOR THE PILOT PROJECT

Maritime zone

- Administrative, municipalities
- judicial enforcement, government
- analysis of general land use plans
- analysis of concession giving process, # and who
- actors
- illegal actors

Forestry

- management plans
- monitoring
- permits
- control
- illegal logging
- legal framework
- standardize methodologies of measurement
- buffer zones
- analyzing settlements

Waste Management

Water Pollution

Air Pollution

Biodiversity

Mining

Urbanization

- Planning
- Zoning

PROJECT CHOICE: FORESTRY

Country Areas

- Cordillera Volcanica Central, Osa
- Tempisque y Tortuguero

Goals

- How best to achieve compliance
- Assess structure
- Information sharing
- Assessing illegal logging
- Target illegal activity
- Specify pressure points

Scope Ideas

- Noncompliance – cutting with no permits
- Noncompliance with issued permits
- Limit to the Cordillera Volcanica (primary industry in the future)
- Role of the forest regents
- Complement the information database of SINAC

Scope

- Geographic: Central Volcanic Range
- Illegal Activity; illegal harvesting, non-compliance with permits/MP, transportation, processing
- Actors; legal actors, regents, topographers, landowners, loggers, sellers, transporters, consumers, processors
- Information sources; SINAC, FUNDECOR, Forestry Chamber, Prosecutors, CENIGA, FONAFIFO, Contraloria, Procuraduria, Centro Cientifico Tropical, Observatorio Desarollo de C.R., CINPE, Instituto Tecnologico de C.R., CATIE, CEDARENA, Colegio Agronomos/Fiscalia
- Identify the laws
- Timeframe
    - Oct-Nov: data collection, indicator selection
    - Dec-Jan: análisis, initial results, send initial results to expert groups
    - Feb-Mar: discussion of analysis with stakeholders (meetings), presenting analysis
    - Apr: final results, recommendations, next steps, lessons learned

Goals

1. Improve compliance with forest laws and policies
2. Improve Forestry Information Systems (quality and quantity)
3. Foster cooperation and information sharing among stakeholders
4. Better target activities to increase compliance (more efficient use of human and financial resources)
5. Link output indicators to outcome indicators
6. Information inventory of existing data; identifying data gaps
7. Provide meaningful indicators and information for decision makers (policy makers, MINAE, prosecutors, police, environmental sector/public institutions)
8. Increase public participation and awareness
9. Identify mechanisms to improve control of illegal deforestation (tools and procedures); strengths and weaknesses
10. Identify areas to improve capacity building (e.g. training)
11. Identify the role of the stakeholders (e.g. the forestry engineers)
12. Create an efficient monitoring system
13. Identify patterns and motives in illegal activities
14. Identify and publish illegal actors (name and shame); promote

Relevant Laws

1. Forestry Law of 1996
2. Implementing regulations
3. Environmental Framework Law (Ch. 7: protected areas; art. 17: env´t impact assessments; art. 48)
4. MINAE´s Organic Laws and Regulations
5. Biodiversity Law (Ch. 2)

Work Plan			
Activity	**Responsible Person**	**Time**	**Outputs**
Prioritize goals	Students with consultation	Oct.	
Develop long-term project strategy (beyond 6 months)	Students with consultation (INECE & MINAE)		
Develop data collection strategy (types, contacts, etc)	Students with consultation		
Contact information sources			
Inventory and organize data			
Analysis of data			
Develop criteria for indicator selection			
Select Indicators			
Strategy to apply and analyze data with the indicators			
Draft report of initial findings and recommendations			
Develop promotion strategy and development of materials (English and Spanish)			
Circulate and review initial findings			
Integrate comments			
Develop set of indicators, recommendations and conclusions			
Evaluate process with consultation			
Prepare final document with reviews			
Circulate final document			

Information Available to Collect

1. Liliana´s document
2. Adolfo; documents
3. Carolina; contact names and e-mails (establishment)
4. Viviana; English version of Forestry Law 1996, Biodiversity and Constitution

5. Ana Luisa; contacts in MINAE and SINAC
6. Jose; statistics, settlements
7. Leon; meeting on Friday
8. Marielos; contact for Thursday

Criteria for Evaluation

1. **Relevant** to the goals, needs, and priorities of the stakeholders
2. **Feasible**, the costs of implementing and maintaining should not outweigh the value of the benefits, viability
3. **Transparent**, promote an understanding, and enlighten users about program performance
4. **Credible**, complete and accurate data
5. **Functional**, encourage programs and people to engage in effective and constructive behavior and activities
6. **Comprehensive**, as possible
7. **Adaptability**
8. **Simplicity**, easy to understand and use

Appendix F: Indicator Sets and Explanations

KEY:
1. Sub-categories highlighted in Blue
2. Pilot Project Indicators, with available data, highlighted in white.
3. "Ideal" Indicators highlighted with gray.

SINAC Indicator Set in Logic Model Format:

Input (Investments)	Output (Activities)	Immediate Outcome (changes in knowledge, skills, attitudes of the Regulated Community)	Intermediate Outcome (actual behavioural changes of Regulated Community)	Final Outcome (impact on the ambient environment)
Funding	**Inspections**	**Permitting**	**Compliance Promotion Activity**	**Pollution Amount Prevented/Acres Protected**
Total Annual Funding SINAC	Number of inspections/patrols conducted by SINAC Inspectors or officers	Number of applications for Environmental Service Payments (PSA program)	Number of Landowners participating in FONAFIFO Environmental Service Payment Program	Total forest cover (by area or % of total land cover) per unit time, excludes plantation cover.
Total Funding for FONAFIFO compliance promotion (environmental service payment program)	% of Forestry Management Plans audited/evaluated by SINAC		**Compliance rates**	Forest cover lost to illegal logging
Human Resources	Number of SINAC Inspections/patrols conducted at/on: protected areas, highways (targetting transportation), and processing sites.		Total Number of Forestry Violation Prosecutions Initiated	Flora/fauna population levels (species dependent on forest cover)
Total Number of SINAC Employees	**Reported Violations**		Total Number of Convictions resulting from Management Plan Violations (and as a percentage of permits executed legally versus abused), by charge and violator category (engineers, landowners, tiber companies)	
Number of SINAC Enforcement and Compliance Officers, ideally by job title/assignment (i.e. parks, refuges, private lands, etc.)	Total Number of Illegal Logging Public Complaints		Total Convictions resulting Illegal Logging without a permit, by charge and violator category (landowners or timber companies)	
Training	Total Number of Management Plan Violations sent to SINAC by Regents		**Understanding Non-compliance (need to combine some of these)**	
Number of Training Courses offered per year for inspectors	Total Number of Illegal Logging Violations (i.e. charges filed) detected by SINAC Inspectors and nature of violation.		Number of Logging without a permit violations above threshold level (i.e. distinguish major/minor violations)	
Number of MINAE/SINAC Inspectors with University Degree (or average years higher ed per inspector)	% of Illegal Logging violations sent to Prosecutors Office by SINAC that result in prosecution		Number of Management Plan Violations above threshold level.	
Inspector salary comparison, versus per capita for Costa Rica	**Compliance Promotion**		Logging without a permit categorized by location- where permit available, where permit denied, where legal cutting never allowed (i.e. buffer zones or protected areas)	
EXTERNALITIES: The user of this indicator set must consider factors beyond the scope of enforcement efforts that contribute to both regulatee behavior and the resulting environmental impacts.	Outreach activities associated with the FONAFIFO Environmental Service Payment program			

Pilot Project Indicators for the Prosecution Office in Logic Model Format			
Inputs	**Outputs**	**Intermediate Outcomes**	**Final Outcome (impact on the ambient environment)**
Budget	**Complaints/ Prosecution**	**Compliance rates**	**Pollution Amount Prevented/Acres Protected**
Budget for the Public Ministry (Prosecutor's office)	Overall percent of cases reviewed by prosecutor's office compared with number of cases received.	Total Number of Forestry Violation Prosecutions Initiated	Total forest cover (by area or % of total land cover) per unit time, excludes plantation cover.
% Change of Prosecutor's budget over time.	% of complaints received by MINAE (and the Forest Regents) that are sent to the Prosecutor's Office	Total Number of Convictions resulting from Management Plan Violations (and as a percentage of permits executed legally versus abused), nationally and by province or SINAC zone and actual charge	Forest cover lost to illegal logging
Training Investment	% of Citizen Complaints occurring in Protected Areas	Overall percent of fines collected (Regents, Landowners, Loggers)	Flora/fauna population levels (species dependent on forest cover)
Amount spent by the Prosecutor's office to train MINAE and communities to understand the law	Number of enforcement actions by prosecutors office.	**Understanding Non-compliance (need to combine some of these)**	
Number of ECE Employees	**Time**	Management Plan Convictions Categorized: Engineers, Landowners, Timber Companies	
Number of Environmental Prosecutors (who prosecute forestry cases)	Duration of Complaint to Settlement Process	Logging without a permit categorized: Landowners, Timber Companies	
	Violations	Number of Logging without a permit violations above threshold level (i.e. distinguish major/minor violations)	
	Total Number of Illegal Logging Public Complaints, nationally, regionally, and where sent (SINAC, Forestry Engineers, Prosecutor's Office)	Number of Management Plan Violations above threshold level.	
	Types of Prosecution	Logging without a permit categorized by location- where permit available, where permit denied, where legal cutting never allowed (i.e. buffer zones or protected areas)	
	Overall percent of cases that result in a conviction (including the total amount of fine, jail time, community service and reforestation charged).		
	Overall percent of cases settled with reparation actions involved.		

Regent Indicators in Logic Model Format			
Inputs	**Outputs**	**Intermediate Outcome (actual behavioural changes of Regulated Community)**	**Final Outcome (impact on the ambient environment)**
Complaints	**Complaints/ Regents**	**Compliance Promotion Activity**	**Pollution Amount Prevented/Acres Protected**
Number of Complaints received by colleges.	Overall percent of cases reviewed by colleges compared with number of cases received.	Number of Landowners participating in FONAFIFO Environmental Service Payment Program	Total forest cover (by area or % of total land cover) per unit time, excludes plantation cover.
Budget	Percent of cases under administrational review.	**Compliance rates**	Forest cover lost to illegal logging
Annual Budget of colleges.	Percent of cases under judicial review.	Total Number of Forestry Violation Prosecutions Initiated	Flora/fauna population levels (species dependent on forest cover)
Salary indicator for regents (anti-corruption).	% complaints sent to Prosecutor's Office (about regents).	Total Number of Convictions resulting from Management Plan Violations (and as a percentage of permits executed legally versus abused), by charge and violator category (engineers, landowners, tiber companies)	
Training Investment	Number of written warnings.	Total Convictions resulting Illegal Logging without a permit, by charge and violator category (landowners or timber companies)	
Number of Training Days per regent, per year.	**Time**	**Understanding Non-compliance (need to combine some of these)**	
Number of Training Courses offered per year for regents.	Length of case from complaint to settlement or conviction.	Number of Logging without a permit violations above threshold level (i.e. distinguish major/minor violations)	
Number of ECE Employees	Total number of Management Plan Violations Reported to Prosecutor's Office by Forestry Engineers Association (from Forest Regents)	Number of Management Plan Violations above threshold level.	
Number of forestry regents.	**Prosecution**	Logging without a permit categorized by location- where permit available, where permit denied, where legal cutting never allowed (i.e. buffer zones or protected areas)	
Type of Forestry Infraction	Number of enforcement actions taken by the colleges.		
Province Where Forestry Infractions occur.	**Management Plans**		
Type of Forestry Infraction.	# of management plans approved.		
Management Plan Violations detected by regents.	**Management Plans**		
Total Number of Violations detected by regents.	# of regent reports missing.		
Management Plans	**Violation Results**		
# of management plans prepared.	Number of engineers sanctioned, suspended, and not sanctioned.		

Explanations

SINAC INDICATOR SET

Final Outcome Indicators

Forest Cover per unit time, excluding plantation cover

Indicator Sub-category: Pollution Amount Prevented/Acres Protected

Explanation: This indicator provides information regarding the overall project goal, preserving forest cover. The inclusion of Plantation Forest Cover would render this indicator problematic, as the habitat quality of plantation cover is typically less. Thus, **total plantation acreage** should be subtracted from total forest cover if available. Yearly comparison will demonstrate changes in land use. Land cover may be expressed as a percent of total land or as an area value (hectares).

Technical Requirements: This coverage will come from LANDSAT data, supplemented with **total plantation hectares** (coverage may also be available in GIS format).

Contact Information, Data Source: Centro Cientifico Tropical (LANDSAT), FUNDECOR (GIS), SINAC (total permitted plantation hectares)

Spatial Scale: National aggregate, and by conservation zone.

Temporal Scale: Annual or biannual

Forest Cover lost to illegal logging per unit time, excluding plantation cover.

Indicator Sub-category: Pollution Amount Prevented/Acres Protected

Explanation: **Forest cover loss per unit time** (again, this does not include plantation cover) is compared with the **total authorized harvest** and **total area lost to wildfires** to infer the total area lost due to illegal logging.

Technical Requirements: LANDSAT/GIS capability. This coverage will come from LANDSAT data, supplemented with total permitted plantation hectares (coverage may also be available in GIS format). Total authorized harvest (in hectares) data available from SINAC. Total area lost to wildfires - availability unknown (SINAC).

Contact Information, Data Source: Centro Cientifico Tropical (LANDSAT), FUNDECOR (GIS), SINAC (total permitted plantation hectares)

Spatial Scale: National aggregate, and by conservation zone.

Temporal Scale: Annual or biannual

Flora/Fauna Population Levels (species dependent on forest cover)

Indicator Sub-category: Ecosystem/Species Health

Explanation: This indicator could be used where specific species have been identified as threatened or endangered by illegal logging, or where particular species have been identified as indicators of forest health. This indicator would rely on **biological monitoring data**; specific techniques and data requirements are species specific. This indicator is more likely to be useful at a regional level, as the effects of deforestation on ecosystem health will vary geographically.

Technical Requirements: LANDSAT/GIS capability. Species dependent
Contact Information, Data Source: Project specific

Spatial Scale: Likely by Province, Conservation Zone, or smaller; species dependent.

Temporal Scale: This indicator would likely need to be measured over a multi-year period; temporal scale would depend on the "lag time" between changes in forest cover and species response.

Intermediate Outcome Indicators

Total hectares protected in FONAFIFO PSA Program

Indicator Sub-category: Compliance Promotion Activity

Explanation: Measures participation in, and impact of, environmental services payment program; indicates the relative effectiveness of MINAE compliance promotion activity in promoting sustainable forestry practices.
Technical Requirements:
Contact Information, Data Source: FONAFIFO
Spatial Scale: National aggregate, and by conservation zone
Temporal Scale: Annual

Total Number of Forestry Violation Prosecutions Initiated

Indicator Sub-category: Compliance Rates

Explanation: This indicator provides an overall picture of the level of compliance; this indicator (or some indicator of enforcement actions initiated) is needed as the judicial/administrative outcomes may not reflect actual compliance. However, this indicator is limited by the possibility of erroneous prosecutions; thus, it must be paired with actual judicial outcomes. Indicator will require electronic record-keeping by the prosecutor's office. This indicator will aggregate two data sets: **total charges filed by the Prosecutor's Office for management plan violations**, and **total charges filed by the Prosecutor's Office for logging without a permit.**
Technical Requirements: Maintenance of Excel or similar spreadsheets by the Environmental Prosecutor's Office.
Contact Information, Data Source: Environmental Prosecutor's Office
Spatial Scale: National aggregate, and by conservation zone
Temporal Scale: Annual, monthly

Total Number of convictions resulting from Management Plan Violations (and as a percentage of permits executed legally versus abused), by charge and violator category.

Indicator Sub-category: Compliance Rates

Explanation: A critical intermediate outcome indicator, which measures basic compliance with logging permits. The total number of convictions indicates the volume of management plan violations, while comparing the total number of convictions with the **total number of management plans issued** indicates the degree to which management plans are being complied with. However, all management plan violations do not result in federal prosecution - thus, the user must be aware that actual non-compliance may be higher than indicated (see the Regent Indicators for a more accurate understanding of management plan compliance). By documenting the **charges**, **violator status**, and **location** associated with each conviction - SINAC can understand who is violating the management plans, how they are doing it, and where the violations are occurring.

Technical Requirements: Maintenance of Excel or similar spreadsheets by the Environmental Prosecutor's Office.

Contact Information, Data Source: Environmental Prosecutor/SINAC. See Informe Annual 2001, SINAC y estudio de arboles en potrero, FUNDECOR. The Informe Annual states that "percentage of permits executed legally versus abused" have been examined in the past, but do not provide information about the continuing monitoring of this trend.

Spatial Scale: National aggregate and by conservation zone

Temporal Scale of Source Data: Annual, monthly

Total number of Convictions for Illegal Logging Violations without a permit, by charge and violator category.

Indicator Sub-category: Compliance Rates

Explanation: This intermediate outcome indicator measures the second facet of illegal logging, violations occurring outside of the permitting process. As is the case with the permitting-violation indicator, all instances of non-compliance may not be revealed in the outcomes of enforcement actions. As is the case with the previous indicator, by documenting the **charges**, **violator status**, and **location** associated with each conviction - SINAC can understand who is violating the management plans, how they are doing it, and where the violations are occurring.

Technical Requirements: Maintenance of Excel or similar spreadsheets by the Environmental Prosecutor's Office.

Contact Information, Data Source: Environmental Prosecutor/SINAC

Spatial Scale: National aggregate and by conservation zone

Temporal Scale: Annual, monthly

Total Number of Violations above threshold level.

Indicator Sub-category: Understanding Non-compliance

Explanation: This indicator measures the number of violations above a pre-selected threshold level. This level would be set to discern significant violations from non-significant violations (for example, total violations might decrease on an annual basis - yet, if these violations are larger in scale, then the improved compliance may mean little). The indicator incorporates both **management plan violations** and **logging without permit violations** that are above the predetermined level of significance. The threshold may be set in terms of total land area illegally cut or total volume of wood illegally harvested,

Technical Requirements: Maintenance of Excel or similar spreadsheets by the Environmental Prosecutor's Office. Threshold level of significance will likely be determined by SINAC; the level should be constant across conservation zones to allow for comparison. In order to reduce the data recording burden on the Prosecutor's Office, SINAC may wish to identify significant violations prior to sending complaints to the prosecutor's office.
Contact Information, Data Source: Environmental Prosecutor/SINAC
Spatial Scale: National Aggregate, and by conservation zone.
Temporal Scale: Annual, monthly

Logging without a permit categorized: where permit available, where permit denied, where legal cutting never allowed

Indicator Sub-category: Understanding Non-compliance

Explanation: This indicator provides the user with an understanding of non-compliant behavior by recording the circumstances surrounding illegal logging without a permit. For example, SINAC can estimate the number of violations occurring in federally protected areas by maintaining this data.
Technical Requirements:

Contact Information, Data Source: Polex Article "Even CR has Illegal Logging" references CATIE study "Illegal logging in CR, an analysis for discussion". This information was likely estimated from the survey conducted in the "Talia Illegale" document; there is not evidence that measurement of this data has continued.

Spatial Scale: National Aggregate, and by conservation zone.
Temporal Scale: Annual, monthly

Immediate Outcome Indicators

Number of applications for Environmental Service Payments (PSA program)

Indicator Sub-category: Permitting

Explanation: This indicator provides the user with a gauge of landowner awareness and interest in compliance promotion programs, though the number of applications is likely a function of several variables (primarily, the level of payment offered).
Technical Requirements: Maintenance of Spreadsheet by FONAFIFO.
Contact Information, Data Source (Secondary and Primary): FONAFIFO
Spatial Scale: National Aggregate, and by conservation zone.
Temporal Scale: Annual

Output Indicators

Number of inspections/patrols conducted by SINAC Inspectors or Officers

Indicator Sub-category: Inspections

Explanation: This indicator measures the enforcement activities of SINAC officers. The officers included may be park rangers, specialized forestry or environmental investigators, or any agent conducting patrols/inspections of federal lands. This classification includes any lands under any form of federal protection, and excludes private holdings (where regents inspect for compliance). The indicator may prove useful in demonstrating a link between inspection activities and levels of illegal logging on public lands.

Technical Requirements: Enforcement agents must maintain activity logs and record locations of patrols; these logs should be entered into a database on a monthly basis.
Contact Information, Data Source (Secondary and Primary): SINAC
Spatial Scale: National Aggregate, and by conservation zone.

% of Forestry Management Plans audited/evaluated by SINAC

Indicator Sub-category: Inspections

Explanation: This indicator pertains to SINAC's legal obligation to evaluate Forestry Management Plans completely prior to acceptance. The potential usefulness of this indicator centers on the relationship between plan evaluations and forest regent performance. The indicator may demonstrate a relationship between increased review of management plans and fewer sanctions/charges against regents - as a result of this increased oversight.

Technical Requirements: Maintenance of a simple spreadsheet by those tasked with management plan review
Contact Information, Data Source (Secondary and Primary): SINAC
Spatial Scale: National Aggregate, and by conservation zone.
Temporal Scale: Annual

Number of SINAC Inspections/patrols conducted at/on: protected areas, highways (targeting transportation), and processing sites.

Indicator Sub-category: Inspections

Explanation: This indicator measures where SINAC enforcement efforts are concentrated, and can determine whether focusing on a specific "link" in the illegal logging chain may be most effective. For example, the indicator may demonstrate a relationship between increased enforcement activity at lumber mills (processing sites) and decreasing illegal logging.

Technical Requirements: Enforcement agents must maintain activity logs and record locations of patrols; these logs should be entered into a database on a monthly basis.
Contact Information, Data Source (Secondary and Primary): SINAC/any agency with officers regularly tasked with enforcing forestry law.
Spatial Scale: National Aggregate, and by conservation zone.
Temporal Scale: Annual, monthly

Total Number of Illegal Logging Public Complaints, nationally and regionally

Indicator Sub-category: Reported Violations

Explanation: This indicator provides an understanding of the number of violations occurring. However, it is critical to note that citizen's complaints may be unfounded - thus, this indicator should be viewed as a rough estimate of the scale of illegal logging violations. Nonetheless, as MINAE/SINAC's enforcement capacity is limited, there are likely many undetected violations - it is thus useful to include another indicator of violations.

Technical Requirements: Agency receiving reports (SINAC, Prosecutor's Office, or Forest Regent's Association) must maintain records of complaints. All data should be sent to a central location, likely SINAC.

Contact Information, Data Source (Secondary and Primary): SINAC (Jose Pablo Gonzales presentation, cites: Estado de la Nacion, 2002, 2003)

Spatial Scale: National Aggregate, and by conservation zone.

Temporal Scale: Annual, monthly

Total Number of Management Plan Violations sent to SINAC/Prosecutor's Office by Regents

Indicator Sub-category: Reported Violations

Explanation: This indicator provides an understanding of the number of management plan violations occurring. Many violations are dealt with directly by the Regent's association, thus, it is expected that those passed to SINAC and/or the Prosecutor's Office will be of a more serious nature. However, as with any indicator of reported violations, this can serve as only a rough estimate of compliance - as the charges may be unfounded.

Technical Requirements: SINAC/Prosecutor's office must maintain records of management plan violations received from Forest Regents.

Contact Information, Data Source (Secondary and Primary): SINAC

Spatial Scale: National Aggregate, and by conservation zone.

Temporal Scale: Annual, monthly

Total Number of Illegal Logging Violations (i.e. charges filed) detected by SINAC Inspectors and nature of violation.

Indicator Sub-category: Reported Violations

Explanation: Similar to the indicator explained above, except that this indicator will also provide an estimate of illegal logging violations without a management plan. Similarly, this indicator serves as only a rough estimate of compliance - the number of charges may not be an accurate indicator of actual violations.

Technical Requirements: SINAC must maintain records of all logging violations detected.

Contact Information, Data Source (Secondary and Primary): SINAC

Spatial Scale: National Aggregate, and by conservation zone.

Temporal Scale: Annual, Monthly

% of Illegal Logging violations sent to Prosecutors Office by SINAC that result in prosecution

Indicator Sub-category: Reported Violations

Explanation: This is an aggregate indicator; ideally, separate datasets would be maintained with respect to **SINAC generated detections resulting in prosecution** and **Regent generated detections resulting in prosecution**. This would allow for separate comparison regarding the accuracy of violation detection. This indicator's usefulness is in providing an estimate of how many violations warrant prosecution. However, the following limitations must be noted: 1. All violations may not be prosecuted (due to various technicalities or simply limited resources) and 2. As with the prior indicators, prosecutorial action may not accurately indicate actual violations. Unless charges result in guilty verdicts, it cannot be assumed that violations occurred.

Technical Requirements: The Prosecutor's Office must maintain records of violations received, and charges filed.

Contact Information, Data Source (Secondary and Primary): Prosecutor's Office

Spatial Scale: National Aggregate, and by conservation zone.
Temporal Scale: Annual, monthly

Outreach activities associated with the FONAFIFO Environmental Service Payment program

Indicator Sub-category: Compliance Promotion

Explanation: This indicator provides an understanding of the scale and effectiveness of FONAFIFO's outreach activities associated with the PSA program. This indicator may demonstrate, for example, that increasing outreach (public workshops, mailings, direct contact, or other announcements) increases landowner's enrollment in the program.

Technical Requirements: FONAFIFO must maintain records of outreach activities.

Contact Information, Data Source (Secondary and Primary): FONAFIFO
Spatial Scale: National Aggregate, and by conservation zone.
Temporal Scale: Annual

Input Indicators

Annual Funding SINAC

Indicator Sub-category: Investments

Explanation: Basic Input Indicator, annual funding to SINAC. Relationships maybe derived between this indicator and many others in the logic model included, as the SINAC budget strongly affects outputs and, thus, outcomes.

Technical Requirements:

Contact Information, Data Source (Secondary and Primary): SINAC (Interview with Sonia Lobo, GERENCIA MANEJO Y USO SOSTENIBLE DE RECURSOS NATURALES)

Contact Information:

Spatial Scale: National Aggregate, and by conservation zone.
Temporal Scale: Annual

Annual Funding for FONAFIFO PSA Program

Indicator Sub-category: Investments

Explanation: This indicator measures the funding available annually for the environmental service payments (known as the PSA program). Analyzed in time series, this indicator will provide information about the stability of the program; ultimately, the program's success hinges on these funds. Carolina Mauri states, "Although there is a legal mandate to allocate one third of the gas tax for payment of environmental services, the money is not getting to FONAFIFO or to landowners."

Technical Requirements: None
Contact Information, Data Source (Secondary and Primary): FONAFIFO
Spatial Scale: National Aggregate, and by conservation zone.
Temporal Scale: Annually

Number of SINAC Employees.

Indicator Sub-category: Human Resources

Explanation: Basic Input indicator, # of employees, measures the human resource input in forestry enforcement. As with annual SINAC funding, it is expected that this indicator may be linked to many others in the logic model.

Technical Requirements:

Contact Information, Data Source (Secondary and Primary): SINAC (Interview with Sonia Lobo, GERENCIA MANEJO Y USO SOSTENIBLE DE RECURSOS NATURALES)

Spatial Scale: National Aggregate, and by conservation zone.
Temporal Scale: Annually

Number of SINAC Enforcement Officers.

Indicator Sub-category: Human Resources

Explanation: This indicator is expected to have a more direct relationship with enforcement outputs (i.e. detected violations) and compliance than the number of total employees. However, this may not prove to be the case. If a positive relationship can be demonstrated between number of enforcement officers and overall compliance - this can serve as budgetary justification for the hiring of more officers.

Technical Requirements:
Contact Information, Data Source (Secondary and Primary): SINAC
Spatial Scale: National Aggregate, and by conservation zone.
Temporal Scale: Annual

Number of Training Courses offered per year for enforcement officers

Indicator Sub-category: Training

Explanation: This indicator may demonstrate a positive relationship with a number of output, and thus outcome, indicators. For example, it is expected that increasing officer training will increase the percentage of SINAC Enforcement Officer generated violation detections that result in prosecution and conviction. In addition, increasing inspector training may result in greater overall detection of violations.

Technical Requirements:
Contact Information, Data Source (Secondary and Primary): SINAC

Spatial Scale: National Aggregate, and by conservation zone.
Temporal Scale: Annual

Number of MINAE/SINAC Inspectors with University Degree (or average years higher ed per inspector)
Indicator Sub-category: Training **Explanation:** See above; this indicator is expected to exhibit positive relationships with desired outputs and outcomes. **Technical Requirements:** **Contact Information, Data Source (Secondary and Primary)**: SINAC **Spatial Scale:** National Aggregate, and by conservation zone. **Temporal Scale**: Annual

Officer salary comparison, versus per capita for Costa Rica
Indicator Sub-category: Training **Explanation**: Again, this indicator is expected to exhibit a positive relationship with desired outputs and outcomes. Corruption has been a historic problem area in forestry enforcement; increased salary is expected to exhibit a negative relationship with corruption. **Technical Requirements:** **Contact Information, Data Source (Secondary and Primary)**: SINAC **Spatial Scale:** National Aggregate, and by conservation zone. **Temporal Scale**: Annual

PROSECUTOR'S OFFICE INDICATOR SET EXPLANATIONS

Final Outcome Indicators

Forest Cover per unit time, excluding plantation cover
Indicator Sub-category: Pollution Amount Prevented/Acres Protected **Explanation**: This indicator provides information regarding the overall project goal, preserving forest cover. The inclusion of Plantation Forest Cover would render this indicator problematic, as the habitat quality of plantation cover is typically less. Thus, **total plantation acreage** should be subtracted from total forest cover if available. Yearly comparison will demonstrate changes in land use. Land cover may be expressed as a percent of total land or as an area value (hectares). **Technical Requirements**: This coverage will come from LANDSAT data, supplemented with **total plantation hectares** (coverage may also be available in GIS format). **Contact Information, Data Source**: Centro Cientifico Tropical (LANDSAT), FUNDECOR (GIS), SINAC (total permitted plantation hectares) **Spatial Scale:** National aggregate, and by conservation zone. **Temporal Scale**: Annual or biannual

Forest Cover lost to illegal logging per unit time, excluding plantation cover.
Indicator Sub-category: Pollution Amount Prevented/Acres Protected

Explanation: **Forest cover loss per unit time** (again, this does not include plantation cover) is compared with the **total authorized harvest** and **total area lost to wildfires** to infer the total area lost due to illegal logging.
Technical Requirements: LANDSAT/GIS capability. This coverage will come from LANDSAT data, supplemented with total permitted plantation hectares (coverage may also be available in GIS format). Total authorized harvest (in hectares) data available from SINAC. Total area lost to wildfires - availability unknown (SINAC).
Contact Information, Data Source: Centro Cientifico Tropical (LANDSAT), FUNDECOR (GIS), SINAC (total permitted plantation hectares)
Spatial Scale: National aggregate, and by conservation zone.
Temporal Scale: Annual or biannual

Flora/Fauna Population Levels (species dependent on forest cover)

Indicator Sub-category: Ecosystem/Species Health
Explanation: This indicator could be used where specific species have been identified as threatened or endangered by illegal logging, or where particular species have been identified as indicators of forest health. This indicator would rely on **biological monitoring data**; specific techniques and data requirements are species specific. This indicator is more likely to be useful at a regional level, as the effects of deforestation on ecosystem health will vary geographically.
Technical Requirements: LANDSAT/GIS capability. Species dependent
Contact Information, Data Source: Project specific
Spatial Scale: Likely by Province, Conservation Zone, or smaller; species dependent.
Temporal Scale: This indicator would likely need to be measured over a multi-year period; temporal scale would depend on the "lag time" between changes in forest cover and species response.

Intermediate Outcome Indicators

Total hectares protected in FONAFIFO PSA Program

Indicator Sub-category: Compliance Promotion Activity
Explanation: Measures participation in, and impact of, environmental services payment program; indicates the relative effectiveness of MINAE compliance promotion activity in promoting sustainable forestry practices.
Technical Requirements:
Contact Information, Data Source: FONAFIFO
Spatial Scale: National aggregate, and by conservation zone
Temporal Scale: Annual

Total Number of Forestry Violation Prosecutions Initiated

Indicator Sub-category: Compliance Rates
Explanation: This indicator provides an overall picture of the level of compliance; this indicator (or some indicator of enforcement actions initiated) is needed as the judicial/administrative outcomes may not reflect actual compliance. However, this indicator is limited by the possibility of erroneous prosecutions; thus, it must be paired with actual judicial outcomes. Indicator will require electronic record-keeping by the prosecutor's office. This indicator will aggregate two data sets: **total charges filed by the Prosecutor's Office for management plan violations**, and **total charges filed by the Prosecutor's Office for logging without a permit.**
Technical Requirements: Maintenance of Excel or similar spreadsheets by the Environmental Prosecutor's Office.
Contact Information, Data Source: Environmental Prosecutor's Office

Spatial Scale: National aggregate, and by conservation zone
Temporal Scale: Annual, monthly

Overall percent of fines collected (Regents, Landowners, Loggers)

Indicator Sub-category: Compliance Rates

Explanation: This indicator will illustrate the effectiveness of the reparations by the prosecutor's office, and the effectiveness of collecting fines. Overall, if this percentage is low then individuals will be more likely to recommit a crime or action.
Technical Requirements: Data collection from Prosecutor's office and SINAC.
Data Source: Environmental Prosecutor and SINAC.
Spatial Scale: National aggregate and by province or conservation zone
Temporal Scale of Source Data: Annual

Management Plan Convictions Categorized

Indicator Sub-category: Understanding Non-compliance

Explanation: To understand what is occurring on the Prosecutor's office; it is essential for the Prosecutor's office to actually monitor the types of convictions. Further investigation could show the prosecution office which convictions are being followed and are the most effective.
Technical Requirements: Data collected from Prosecutor's office, SINAC, and Colleges
Data Source: Prosecution Office
Spatial Scale: National and Regional
Temporal Scale: Annual

Logging without a permit categorized: Landowners, Timber Companies

Indicator Sub-category: Understanding Non-compliance
Explanation: By tracking the amount of logging that is occurring without a permit, it will be easier to understand exactly where the law is being broken. And by understanding whom is breaking the law the Prosecutor's Office, SINAC, and the Regents can create education programs or incentives for them to comply. Or they can focus their efforts on where the law needs better enforcement.
Technical Requirements:
Data Source: Prosecution Office, SINAC and the Regents
Contact Information:
Spatial Scale: Nationally
Temporal Scale: Annual
Web availability:

Number of Logging violations without a permit violations above threshold level (i.e. distinguish major/minor violations)

Indicator Sub-category: Understanding Non-compliance
Explanation: This indicator provides an understanding of who is violating management plans (landowners, timber companies, or regents). This indicator is simply an expansion of the "Total Number of Convictions Resulting from Management Plan Violations indicator". Analysis of both indicators will reveal where violations are occurring, who is committing violations, and what types of violations are being committed. Understanding who is committing the violations is essential for targeting enforcement and compliance promotion strategies.
Technical Requirements: Data collection by Prosecutor's office, SINAC and Regents.

Data Source: Environmental Prosecutor/SINAC
Spatial Scale: National Aggregate, and by province or conservation zone.
Temporal Scale: Annual

Total Number of Violations above threshold level.

Indicator Sub-category: Understanding Non-compliance
Explanation: This indicator measures the number of violations above a pre-selected threshold level. This level would be set to discern significant violations from non-significant violations (for example, total violations might decrease on an annual basis - yet, if these violations are larger in scale, then the improved compliance may mean little). The indicator incorporates both **management plan violations** and **logging without permit violations** that are above the predetermined level of significance. The threshold may be set in terms of total land area illegally cut or total volume of wood illegally harvested,
Technical Requirements: Maintenance of Excel or similar spreadsheets by the Environmental Prosecutor's Office. Threshold level of significance will likely be determined by SINAC; the level should be constant across conservation zones to allow for comparison. In order to reduce the data recording burden on the Prosecutor's Office, SINAC may wish to identify significant violations prior to sending complaints to the prosecutor's office.
Contact Information, Data Source: Environmental Prosecutor/SINAC
Spatial Scale: National Aggregate, and by conservation zone.
Temporal Scale: Annual, monthly

Logging without a permit categorized: where permit available, where permit denied, where legal cutting never allowed

Indicator Sub-category: Understanding Non-compliance
Explanation: This indicator provides the user with an understanding of non-compliant behavior by recording the circumstances surrounding illegal logging without a permit. For example, SINAC can estimate the number of violations occurring in federally protected areas by maintaining this data.
Technical Requirements:
Contact Information, Data Source: Polex Article "Even CR has Illegal Logging" references CATIE study "Illegal logging in CR, an analysis for discussion". This information was likely estimated from the survey conducted in the "Talia Illegale" document; there is not evidence that measurement of this data has continued.
Spatial Scale: National Aggregate, and by conservation zone.
Temporal Scale: Annual, monthly

Outputs

Overall percent of cases reviewed by prosecutor's office compared with number of cases received.

Indicator Sub-category: Complaints/ Prosecution
Explanation: This is an important indicator that will show how much each group, i.e., the public, MINAE, NGOs and the Forestry Offices, knows about ECE. If the prosecutor's office is receiving a lot of complaints, but only prosecuting 10% of them then it could mean two things- one, the prosecutor is not able to handle the work load and more money needs to be spent to increase the number of cases the prosecution office can review, or that there is little information to the public regarding the types of cases that should be send to the prosecutor. This may illustrate that it would be worth the prosecutor's time to increase education to MINAE, the public, and NGOs. Further understanding of this data could reduce the amount of time the prosecution office spends on reviewing cases that don't need to be tried.

Technical Requirements: Reporting from the Prosecution Office.
Data Source (Secondary and Primary): Budget
Temporal Scale: Annually

% of complaints received by MINAE (and the Forest Regents) that are sent to the Prosecutor's Office

Indicator Sub-category: Complaints/ Prosecution

Explanation: This indicator can be compared with the **total number of charges filed by the prosecutor's office** to determine the effectiveness of the SINAC filtering process for frivolous or unfounded complaints or violation detections (by inspectors or cit

Data Source (Secondary and Primary): SINAC and Regents
Temporal Scale:

Percent of Citizen Complaints occurring in Protected Areas

Indicator Sub-category: Complaints/ Prosecution
Explanation: This indicator will allow the enforcement agencies to better understand how well the public understands the law and the differences between protected land and non-protected areas.
Technical Requirements: Reporting from the Prosecution Office, SINAC and the Regents
Data Source (Secondary and Primary): SINAC, Regents
Temporal Scale: Annually

Number of enforcement actions by prosecutor's office.

Indicator Sub-category: Complaints/ Prosecution
Explanation: The Prosecutor office needs to know the total number of enforcement actions to monitor their overall performance. This indicator can be monitored over time to see how effective they are reviewing complaints, and how effective the judiciary process is in regards to forestry ECE.

Technical Requirements: This indicator requires the Prosecution office to track the number of total amount of enforcement actions over a period of time.
Data Source (Secondary and Primary): Prosecution Office and MINAE
Temporal Scale: Annually

Duration of Complaint to Settlement Process

Indicator Sub-category: Time
Explanation: This indicator is rather important because it highlights how long it takes the prosecutor's office to review complaints, and it may be able to illustrate the best use of time of the Prosecutor's office. If this indicator is linked to the amount of money collected through settlements the Prosecutor's Office could link the time of their effort to the amount of fines collected. In addition, this could information could be linked with information about cases that are tried as conciliation (six months or longer) versus suspension in order to see which process is a more effective enforcement effort.

Technical Requirements: The prosecution office must track how long it takes for each case to go through the entire judiciary process.
Data Source (Secondary and Primary): Prosecution Office
Temporal Scale: Annually

Total Number of Illegal Logging Public Complaints, nationally, regionally, and where sent (SINAC, Forestry Engineers, Prosecutor's Office)

Indicator Sub-category: Violations
Explanation: It is essential to know the total number of reported violations. This indicator requires all of the various groups to work together to compile the data. If linked to the amount of complaints prosecuted the Prosecutor's office may be able to figure out where the most viable complaints are coming from, and form a partnership with that group to expand its ECE efforts. Or the Prosecutor's Office could work more closely with the other groups to improver their ability to detect violations. This indicator could also be linked with the total number of violations received and the prosecutor's office would be able to know the percent of management plan violations compared to all violations. The Prosecutor's office would then be able to see how effective Management Plans are to increase compliance to forestry law.
Technical Requirements:
Data Source (Secondary and Primary): Prosecution Office, MINAE, FEA, Citizens, and NGO's
Temporal Scale: Annually

Overall percent of cases that result in a conviction (including the total amount of fine, jail time, community service and reforestation charged).

Indicator Sub-category: Types of Prosecution
Explanation: This indicator will show overall number of convictions and the resulting enforcement actions. This indicator will require the prosecution office to monitor the types of convictions. This indicator will be most useful if the percent of enforcement actions completed successfully is tracked as well. I
Technical Requirements: Tracking of convictions and acquittals for enforcement actions. Types of convictions.
Data Source (Secondary and Primary): Prosecution office.
Contact Information: Prosecution office.
Temporal Scale: Annual (to be effective)

Overall percent of cases settled with reparation actions involved.

Indicator Sub-category: Types of Prosecution
Explanation: This indicator will show how often reparation actions are used to settle violation cases. This indicator needs to be followed up with the amount of reparation actions completed to truly monitor the effectiveness of this indicator**.**
Technical Requirements: Tracking by the Prosecutor's office.
Data Source (Secondary and Primary): Prosecution Office
Temporal Scale: Annually

Inputs

Budget for the Public Ministry (Prosecutor's office)

Indicator Sub-category: Budget
Explanation: In order to understand the ECE efforts and the overall performance of the Prosecutor's office, the budget needs to be monitored. This is a direct input that will change the effectiveness of the prosecutor's office. If the budget is increased dramatically, the amount of cases reviewed could change dramatically. This information is needed in order to understand other indicators, such as compliance rates. If the amount of violations drastically decreases it could just be related to a decrease in the overall budget rather than an increase in compliance.
Technical Requirements: Data collection by the Prosecutor's office

Data Source (Secondary and Primary): Prosecutor's Office
Temporal Scale: Annual (to be effective)

% Change of Prosecutor's budget over time.

Indicator Sub-category: Budget
Explanation: By tracking the change in the budget over time this indicator can be linked with the amount of cases and overall violations to show how the budget is affecting the Prosecution Office's ability to effectively do their job.
Technical Requirements: Data collection by the Prosecutor's office
Data Source (Secondary and Primary): Prosecutor's Office
Temporal Scale: Annually

Amount spent by the Prosecutor's office to train MINAE and communities to understand the law

Indicator Sub-category: Training Investment
Explanation: This indicator will illustrate the percent of the Prosecutor's overall budget that is used to educate the public on forestry compliance and enforcement issues
Technical Requirements: Data collection by the Prosecutor's office
Data Source (Secondary and Primary): Prosecutor's Office
Temporal Scale: Annually

Number of Environmental Prosecutors (who prosecute forestry cases)

Indicator Sub-category: Number of ECE Employees
Explanation: By understanding the resources put towards ECE, the various agencies can begin to understand the effectiveness of their efforts and the points where there may need to be additional resources. By tracking this change over time, the Prosecutor's Office would be able to begin a coloration of input resources with output activities.
Technical Requirements: Data collection by the Prosecutor's office
Data Source (Secondary and Primary): Prosecutor's Office

REGENT INDICATOR SET EXPLANATIONS

Final Outcome Indicators

Forest Cover per unit time, excluding plantation cover

Indicator Sub-category: Pollution Amount Prevented/Acres Protected

Explanation: This indicator provides information regarding the overall project goal, preserving forest cover. The inclusion of Plantation Forest Cover would render this indicator problematic, as the habitat quality of plantation cover is typically less. Thus, **total plantation acreage** should be subtracted from total forest cover if available. Yearly comparison will demonstrate changes in land use. Land cover may be expressed as a percent of total land or as an area value (hectares).

Technical Requirements: This coverage will come from LANDSAT data, supplemented with **total plantation hectares** (coverage may also be available in GIS format).

Contact Information, Data Source: Centro Cientifico Tropical (LANDSAT), FUNDECOR (GIS), SINAC (total permitted plantation hectares)

Spatial Scale: National aggregate, and by conservation zone.

Temporal Scale: Annual or biannual

Forest Cover lost to illegal logging per unit time, excluding plantation cover.

Indicator Sub-category: Pollution Amount Prevented/Acres Protected

Explanation: **Forest cover loss per unit time** (again, this does not include plantation cover) is compared with the **total authorized harvest** and **total area lost to wildfires** to infer the total area lost due to illegal logging.

Technical Requirements: LANDSAT/GIS capability. This coverage will come from LANDSAT data, supplemented with total permitted plantation hectares (coverage may also be available in GIS format). Total authorized harvest (in hectares) data available from SINAC. Total area lost to wildfires - availability unknown (SINAC).

Contact Information, Data Source: Centro Cientifico Tropical (LANDSAT), FUNDECOR (GIS), SINAC (total permitted plantation hectares)

Spatial Scale: National aggregate, and by conservation zone.

Temporal Scale: Annual or biannual

Flora/Fauna Population Levels (species dependent on forest cover)

Indicator Sub-category: Ecosystem/Species Health

Explanation: This indicator could be used where specific species have been identified as threatened or endangered by illegal logging, or where particular species have been identified as indicators of forest health. This indicator would rely on **biological monitoring data**; specific techniques and data requirements are species specific. This indicator is more likely to be useful at a regional level, as the effects of deforestation on ecosystem health will vary geographically.

Technical Requirements: LANDSAT/GIS capability. Species dependent

Contact Information, Data Source: Project specific

Spatial Scale: Likely by Province, Conservation Zone, or smaller; species dependent.

Temporal Scale: This indicator would likely need to be measured over a multi-year period; temporal scale would depend on the "lag time" between changes in forest cover and species response.

Intermediate Outcome Indicators

Total hectares protected in FONAFIFO PSA Program

Indicator Sub-category: Compliance Promotion Activity

Explanation: Measures participation in, and impact of, environmental services payment program; indicates the relative effectiveness of MINAE compliance promotion activity in promoting sustainable forestry practices.

Technical Requirements:

Contact Information, Data Source: FONAFIFO

Spatial Scale: National aggregate, and by conservation zone

Temporal Scale: Annual

Total Number of Forestry Violation Prosecutions Initiated

Indicator Sub-category: Compliance Rates

Explanation: This indicator provides an overall picture of the level of compliance; this indicator (or some indicator of enforcement actions initiated) is needed as the judicial/administrative outcomes may not reflect actual compliance. However, this indicator is limited by the possibility of erroneous prosecutions; thus, it must be paired with actual judicial outcomes. Indicator will require electronic record-keeping by the prosecutor's office. This indicator will aggregate two data sets: **total charges filed by the Prosecutor's Office for management plan violations**, and **total charges filed by the Prosecutor's Office for logging without a permit.**

Technical Requirements: Maintenance of Excel or similar spreadsheets by the Environmental Prosecutor's Office.

Contact Information, Data Source: Environmental Prosecutor's Office

Spatial Scale: National aggregate, and by conservation zone

Temporal Scale: Annual, monthly

Total Number of convictions resulting from Management Plan Violations (and as a percentage of permits executed legally versus abused), by charge and violator category.

Indicator Sub-category: Compliance Rates

Explanation: A critical intermediate outcome indicator, which measures basic compliance with logging permits. The total number of convictions indicates the volume of management plan violations, while comparing the total number of convictions with the **total number of management plans issued** indicates the degree to which management plans are being complied with. However, all management plan violations do not result in federal prosecution - thus, the user must be aware that actual non-compliance may be higher than indicated (see the Regent Indicators for a more accurate understanding of management plan compliance). By documenting the **charges**, **violator status**, and **location** associated with each conviction - SINAC can understand who is violating the management plans, how they are doing it, and where the violations are occurring.

Technical Requirements: Maintenance of Excel or similar spreadsheets by the Environmental Prosecutor's Office.

Contact Information, Data Source: Environmental Prosecutor/SINAC. See Informed Annual 2001, SINAC y studio de arbores en porter, FUNDECOR. The Informed Annual states that "percentage of permits executed legally versus abused" have been examined in the past, but do not provide information about the continuing monitoring of this trend.

Spatial Scale: National aggregate and by conservation zone

Temporal Scale of Source Data: Annual, monthly

Total number of Convictions for Illegal Logging Violations without a permit, by charge and violator category.

Indicator Sub-category: Compliance Rates

Explanation: This intermediate outcome indicator measures the second facet of illegal logging, violations occurring outside of the permitting process. As is the case with the permitting-violation indicator, all instances of non-compliance may not be revealed in the outcomes of enforcement actions. As is the case with the previous indicator, by documenting the **charges**, **violator status**, and **location** associated with each conviction - SINAC can understand who is violating the management plans, how they are doing it, and where the violations are occurring.

Technical Requirements: Maintenance of Excel or similar spreadsheets by the Environmental Prosecutor's Office.

Contact Information, Data Source: Environmental Prosecutor/SINAC

Spatial Scale: National aggregate and by conservation zone

Temporal Scale: Annual, monthly

Total Number of Violations above threshold level.

Indicator Sub-category: Understanding Non-compliance

Explanation: This indicator measures the number of violations above a pre-selected threshold level. This level would be set to discern significant violations from non-significant violations (for example, total violations might decrease on an annual basis - yet, if these violations are larger in scale, then the improved compliance may mean little). The indicator incorporates both **management plan violations** and **logging without permit violations** that are above the predetermined level of significance. The threshold may be set in terms of total land area illegally cut or total volume of wood illegally harvested,

Technical Requirements: Maintenance of Excel or similar spreadsheets by the Environmental Prosecutor's Office. Threshold level of significance will likely be determined by SINAC; the level should be constant across conservation zones to allow for comparison. In order to reduce the data recording burden on the Prosecutor's Office, SINAC may wish to identify significant violations prior to sending complaints to the prosecutor's office.

Contact Information, Data Source: Environmental Prosecutor/SINAC

Spatial Scale: National Aggregate, and by conservation zone.

Temporal Scale: Annual, monthly

Logging without a permit categorized: where permit available, where permit denied, where legal cutting never allowed

Indicator Sub-category: Understanding Non-compliance

Explanation: This indicator provides the user with an understanding of non-compliant behavior by recording the circumstances surrounding illegal logging without a permit. For example, SINAC can estimate the number of violations occurring in federally protected areas by maintaining this data.

Technical Requirements:

Contact Information, Data Source: Polex Article "Even CR has Illegal Logging" references CATIE study "Illegal logging in CR, an analysis for discussion". This information was likely estimated from the survey conducted in the "Talia Illegale" document; there is not evidence that measurement of this data has continued.

Spatial Scale: National Aggregate, and by conservation zone.

Temporal Scale: Annual, monthly

Output Indicators

Overall percent of cases reviewed by colleges compared with number of cases received.

Indicator Sub-category: Complaints/ Regents

Explanation: Basic Input indicator, # of employees, measures the human resource input in forestry compliance. Preferable to have this data by province or conservation zone.

Technical Requirements: Data collection from Colleges.

Data Source (Secondary and Primary): Colleges, Regents.

Spatial Scale: National aggregate, and by province or conservation zone

Temporal Scale of Source Data: Annual

Percent of cases under administrational review.

Indicator Sub-category: Complaints/ Regents

Explanation: Basic Input indicator, # of employees, measures the human resource input in forestry compliance. Preferable to have this data by province or conservation zone.
Technical Requirements: Data collection from SINAC.
Data Source (Secondary and Primary): SINAC
Spatial Scale: National aggregate, and by province or conservation zone
Temporal Scale of Source Data: Annual

Percent of cases under judicial review.
Indicator Sub-category: Complaints/ Regents
Explanation: Basic Input indicator, # of employees, measures the human resource input in forestry compliance. Preferable to have this data by province or conservation zone.
Technical Requirements: Data collection from Prosecutor's office.
Data Source (Secondary and Primary): Prosecutor's Office.
Spatial Scale: National aggregate, and by province or conservation zone
Temporal Scale of Source Data: Annual

% complaints sent to Prosecutor's Office (about regents).
Indicator Sub-category: Complaints/ Regents
Explanation: Basic Input indicator, # of employees, measures the human resource input in forestry compliance. Preferable to have this data by province or conservation zone.
Technical Requirements: Data collection from Regents, SINAC and the Prosecutor's Office.
Data Source (Secondary and Primary): SINAC, Regents, Prosecutor's Office.
Spatial Scale: National aggregate, and by province or conservation zone
Temporal Scale of Source Data: Annual

Number of written warnings.
Indicator Sub-category: Complaints/ Regents
Explanation: Basic Input indicator, # of employees, measures the human resource input in forestry compliance. Preferable to have this data by province or conservation zone.
Technical Requirements: Data collection from Regents and SINAC.
Data Source (Secondary and Primary): SINAC and Regents.
Spatial Scale: National aggregate, and by province or conservation zone
Temporal Scale of Source Data: Annual

Length of case from complaint to settlement or conviction.
Indicator Sub-category: Time
Explanation: Basic Input indicator, # of employees, measures the human resource input in forestry compliance. Preferable to have this data by province or conservation zone.
Technical Requirements: Data collection from SINAC, Prosecutor's office, and Regents.
Data Source (Secondary and Primary): SINAC, Prosecutor's office, and Regents.
Spatial Scale: National aggregate, and by province or conservation zone
Temporal Scale of Source Data: Annual

Total number of Management Plan Violations Reported to Prosecutor's Office by Forestry Engineers Association (from Forest Regents)
Indicator Sub-category: Time
Explanation: Basic Input indicator, # of employees, measures the human resource input in forestry compliance. Preferable to have this data by province or conservation zone.

Technical Requirements: Data collection from SINAC, Prosecutor's office, and Regents.
Data Source (Secondary and Primary): SINAC, Prosecutor's office, and Regents.
Spatial Scale: National aggregate, and by province or conservation zone
Temporal Scale of Source Data: Annual

Number of enforcement actions taken by the colleges.

Indicator Sub-category: Prosecution

Explanation: This indicator relates information regarding the seriousness of violations detected by the colleges. The number of enforcement actions provides a strong link to overall compliance trends, as enforcement actions are typically pursued in cases the prosecution deems worthwhile.
Technical Requirements: Data collection by colleges.
Data Source (Secondary and Primary): Colleges/ Universities.
Spatial Scale: National aggregate, and by province or conservation zone
Temporal Scale of Source Data: Annual

# of management plans approved.

Indicator Sub-category: Management Plans

Explanation: This indicator relates information regarding the seriousness of violations detected by the colleges. The number of enforcement actions provides a strong link to overall compliance trends, as enforcement actions are typically pursued in cases the prosecution deems worthwhile.
Technical Requirements: Annual review of number of plans approved.
Data Source (Secondary and Primary): Regents and SINAC
Spatial Scale: National aggregate, and by province or conservation zone
Temporal Scale of Source Data: Annual
Contact Information: Prosecution office.
Temporal Scale: Annual (to be effective)

Input Indicators

Number of Complaints received by colleges.

Indicator Sub-category: Complaints

Explanation: Basic Input indicator, # of employees, measures the human resource input in forestry compliance. Preferable to have this data by province or conservation zone.
Technical Requirements: Regent annual information.
Data Source (Secondary and Primary): Regents
Spatial Scale: National aggregate, and by province or conservation zone
Temporal Scale of Source Data: Annual

Annual Budget of Colleges

Indicator Sub-category: Budget

Explanation: Basic Input Indicator, annual funding - measures the financial input in forestry compliance by college (Technical Institute of Costa Rica)
Technical Requirements: Colleges annual information.
Data Source (Secondary and Primary): Colleges
Spatial Scale: National aggregate, and by province or conservation zone
Temporal Scale of Source Data: Annual

Salary indicator for regents (anti-corruption).

Indicator Sub-category: Budget
Explanation: Basic Input Indicator, annual funding - measures the financial input in forestry compliance by college (Technical Institute of Costa Rica)
Technical Requirements: Regent annual information.
Data Source (Secondary and Primary): Regents
Spatial Scale: National aggregate, and by province or conservation zone
Temporal Scale of Source Data: Annual

Number of Training Days per regent, per year.
Indicator Sub-category: Training/ Investment
Explanation: Basic Input Indicator, annual funding - measures the financial input in forestry compliance by college (Technical Institute of Costa Rica)
Technical Requirements: Regent annual information.
Data Source (Secondary and Primary): Regents
Spatial Scale: National aggregate, and by province or conservation zone
Temporal Scale of Source Data: Annual

Number of Training Courses offered per year for regents.
Indicator Sub-category: Training Investment
Explanation: Basic Input Indicator, annual funding - measures the financial input in forestry compliance by college (Technical Institute of Costa Rica)
Technical Requirements: Regent annual information.
Data Source (Secondary and Primary): Regents
Spatial Scale: National aggregate, and by province or conservation zone
Temporal Scale of Source Data: Annual

Number of Regents
Indicator Sub-category: Number of ECE Employees
Explanation: Basic Input indicator, # of employees, measures the human resource input in forestry compliance. Preferable to have this data by province or conservation zone.
Technical Requirements: Regent annual information.
Data Source (Secondary and Primary): Regents
Spatial Scale: National aggregate, and by province or conservation zone
Temporal Scale of Source Data: Annual

Province Where Forestry Infractions occur.
Indicator Sub-category: Type of Forestry Infraction
Explanation: Basic Input indicator, # of employees, measures the human resource input in forestry compliance. Preferable to have this data by province or conservation zone.
Technical Requirements: Monthly and annual collection of data.
Data Source (Secondary and Primary): Regents, Prosecutor's Office
Contact Information:
Spatial Scale: National aggregate, and by province or conservation zone
Temporal Scale of Source Data: Annual

Type of Forestry Infraction.
Indicator Sub-category: Type of Forestry Infraction

Explanation: Basic Input indicator, # of employees, measures the human resource input in forestry compliance. Preferable to have this data by province or conservation zone.
Technical Requirements: Regent annual information.
Data Source (Secondary and Primary): Regents
Spatial Scale: National aggregate, and by province or conservation zone
Temporal Scale of Source Data: Annual

Management Plan Violations detected by regents.

Indicator Sub-category: Type of Forestry Infraction

Explanation: Basic Input indicator, # of employees, measures the human resource input in forestry compliance. Preferable to have this data by province or conservation zone.
Technical Requirements: Regent annual information.
Data Source (Secondary and Primary): Regents
Spatial Scale: National aggregate, and by province or conservation zone
Temporal Scale of Source Data: Annual

Total Number of Violations detected by regents.

Indicator Sub-category: Type of Forestry Infraction

Explanation: Basic Input indicator, # of employees, measures the human resource input in forestry compliance. Preferable to have this data by province or conservation zone.
Technical Requirements: Regent annual information.
Data Source (Secondary and Primary): Regents
Spatial Scale: National aggregate, and by province or conservation zone
Temporal Scale of Source Data: Annual

# of management plans prepared.

Indicator Sub-category: Prosecution

Explanation: Basic Input indicator, # of employees, measures the human resource input in forestry compliance. Preferable to have this data by province or conservation zone.
Technical Requirements: Regent annual information.
Data Source (Secondary and Primary): Regents
Spatial Scale: National aggregate, and by province or conservation zone
Temporal Scale of Source Data: Annual

Appendix G: Enforcement Points in the Law

Law or Article	Date Ratified	Location of Law	Purpose
International Agreements			
Convention on International Trade of Endangered Species of Wild Flora and Fauna, Washington	3 March 1973	http://www.cites.org/	
Convention Concerning the Protection of the World Cultural and Natural Heritage	23 November 1927, 1977	http://whc.unesco.org/world_he.htm	
Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, Cartegna Convention	1983	http://www.cep.unep.org/pubs/legislation/cartxt.html	
Protocol on the Co-operation on the Combat of Oil Spills in the Wider Caribbean Region	1983	http://www.cep.unep.org/pubs/legislation/oilspill.html	
Central American Convention on the Protection of the Environment	1989		
Protocol Concerning Specially Protected Areas and Wildlife to the Convention for the	1990	http://www.cep.unep.org/pubs/legislation/spaw.html	

Protection and Development of the Marine Environment of the Wider Caribbean Region, Cartegna Convention			
Vienna Convention for the Protection of the Ozone Layer	1991	http://www.unep.ch/ozone/vc-text.shtml	
Montreal Protocol on Substances that Deplete the Ozone Layer	1991	http://www.unep.org/ozone/Montreal-Protocol/Montreal-Protocol2000.shtml	
The Ramsar Convention on Wetlands	2 February 1971, 1992	http://www.ramsar.org/	
United Nations Convention on the Law of the Sea (UNCLOS), Bahia de Montego	10 December 1982	http://www.un.org/Depts/los/convention_agreements/texts/unclos/closindx.htm	
Convention for the Conservation of the Biological Diversity and the Protection of Priority Wilderness Areas in Central America	1992		
Regional Agreement on the Transboundary	1992		

Movement of Hazardous Wastes			
Convention on Biological Diversity, Nairobi	22 May 1992, 1994	http://www.biodiv.org/welcome.aspx	
Regional Convention for the Management and Conservation of Natural Forest Ecosystems and the Development of Forest Plantations	1993		
Convention on the Defense of the Archaeological, Historical and Artistic Heritage of the American Nations			
Central American Alliance for Sustainable Development	1994		
United Nations Framework Convention on Climate Change, New York Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Basel	9 May 1992, 1994	http://unfccc.int/2860.php	

United Nations Convention to Combat Desertification, Paris	17 June 1994, 1995		
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Basel	22 March 1989, 1995	http://www.basel.int/text/documents.html	
National Laws			
The Constitution			
The Political Constitution of the Republic of Costa Rica	17 June 1994, 1995		
Article 46 of the Constitution			States that consumers and users have the right to protection of their health, environment, security and economic interests.
Article 50 of the Constitution			States that every inhabitant of Costa Rica has the right to a healthy environment that is in ecological balance.
Constitutional Court, Vote #2233-93	9:36 AM, 28 May 1993		Establishes environmental protection as a right, and as the management plan as the instrument.

Laws that Established Entities			
Law #6084	17 August 1977		Law that created the National Park Service.
Decree #24652-MIRENEM	3 October 1995		The restructuring of the Ministry of Natural Resources, Energy and Mines to The Ministry of Environment and Energy; and the creation of SINAC.
Decree #29084-MINAE		http://www.ing-agronomos.or.cr/fiscalia/documents/Decreto29084-MINAECreaciondelaComisionAgroforestalNacional.doc	Creation of the Agroforestry Commission.
Law #7221	23 April 1991		Established the obligation to form a college of professionals in Forestry Sciences, and that these professionals have more direct contact in the forestry sector.
Decree #22083-MIRENEM			Adjusts Law #7221 to conform to new legislation.
Decree #22084-MIRENEM	25 May 1993		Adjusts Law #7221 to conform to new legislation, and describes the regulations that guide regents.
Decree #30636-MAG	28 August 2002	Gazette #164, pages 9-12	Creation of the Official Registry of Land Use Certifiers.

Decree #22179	25 May 1993		Creation of the Forestry Auditor.
The Forestry Law			
Law #7575, the Forestry Law	5 February 1996	Gazette #72	Prohibits land use changes in forests, established the Certificate of Forest Conservation, and Payment for Environmental Services.
Article 17 of the Forestry Law			Lists the requirements for management plans.
Article 19 of the Forestry Law			Exceptions to cutting bans.
Article 20 of the Forestry Law			Establishes the necessity for management plans.
Article 21 of the Forestry Law			Requires audits of management plans by subregional offices.
Article 22 of the Forestry Law			Establishes that regents are responsible for actual and legal persons that take part in forestry activities (as outlined in article 21 of the same law), and must ensure that everyone is complying with the management plans.
Article 23 of the Forestry Law			Regulations about the functions of the regents.

Article 24 of the Forestry Law			Speaks about secondary forests.
Article 26 of the Forestry Law			Establishes the National Commission on Forestry Certification.
Article 29 of the Forestry Law			
Article 30 of the Forestry Law			
Article 31 of the Forestry Law			Establishes permits for transportation of timber.
Article 33 of the Forestry Law			Establishes protected areas.
Article 35 of the Forestry Law			Outlines the measures for prevention and control of forest fires.
Article 54 of the Forestry Law			
Article 86 of the Forestry Law			Establishes the timeline for document submittal, approval and re-submittal for management plans.

MINAE			
Resolution 204-MINAE			Related to Article 20 and 21 of the Forestry Law.
Decree #29147-MINAE		http://www.ing-agronomos.or.cr/fiscalia/documents/Decreto29147-MINAEModificacionalArt26delReglamentoalaLeyForestal.doc	Modification of article 26 of the Forestry Law.
Decree #30762-MINAE	9 October 2002	Gazette #194, pages 13-14	Modification of articles 3, 38, 39, 40, 41, 42, 47, 55 y 64 in the regulations of the Law Forestry.
Decree #27925-MINAE		http://www.ing-agronomos.or.cr/fiscalia/documents/Decreto27925-MINAEModificacionalArt.89delReglamentoalaLeyForestal.doc	Modification of the Forestry Law.
Decree #31633-MINAE	11-Feb-04	Gazette 29	Modification of article 107 in the regulations of the Forestry Law. Conservation programs for protected forests can be covered in the Payment for Environmental Services program under the protection provision.
Decree 25721-MINAE	23 January 1997		A regulation of the Forestry Law.

Decree #25700-MINAE			Lists the 18 protected species for forestry activities.
Decree #26870-MINAE			Regulations for Forest Regents.
Article 5 of Decree #26870-MINAE	8 May 1998		Regents are responsible for supervising, controlling and overseeing forest activities under Forestry Law 7575, the law of the CIA, and all connected laws and legal provisions.
Articles 14 and 16 of Decree #26870-MINAE			Outlines the requirements for the three required reports of forest regents: the preliminary visit before the execution of the management plan, the progress report, and closing report.
Articles 25 and 27 of Decree #26870-MINAE	10 May 2004		Minimum number of regent visits for reforestation projects.
Decree #27240-MINAE, article 1	28 August 1998		Established a system of plastic licenses to facilitate the control work of approving products that have come from forest permits and management plans.
Decree #31081-MINAE	27 March 2003	Gazette #61, pages 10-11	The allocated budget for the Payment for Environmental Services program in 2003.

Decree #31767-MINAE	4 May 2004	Gazette #84	Payments for Environmental Services, 2004.
Decree #27240-MINAE, article 1	28 August 1998		Established a system of plastic licenses to facilitate the control work of approving products that have come from forest permits and management plans.
Decree #27388-MINAE: Principles, Criteria and Indicators of Sustainable Management of Forests and Certification in Costa Rica, Gazette #212	2 November 1998	http://www.ing-agronomos.or.cr/fiscalia/reglamentos/Decreto 27388-MINAE Principals, Criteria e Indicators de Sustainability 1998.doc	
Decree #27998-MINAE: Principles, Criteria and Indicators of Sustainable Management for Secondary Forests and Forestry Certification in Costa Rica, Gazette #147	29 July 1999		
Decree #27695-MINAE: Principles, Criteria and Indicators for Sustainable Management of Forests	17 March 1999		A manual on the procedures for the accreditation and certification of forest certificates.
Decree #30763-MINAE: Principles, Criteria, and Indicators	9 October 2002	Gazette #194, pages 14-18	

for Old Growth Forests and their Certification			
Decree #31215-MINAE	26 June 2003	Gazette #120	Suspension on permit approvals for forest development in the future Parque Nacional Maquenque.
SINAC, MINAE/SINAC			
Resolution #023-MINAE-SINAC	13 April 1999	Gazette #70	SINAC officials must perform at least one visit a month to each primary industry center to collect transportation permit stubs, and to effect other controls over the material. Manual on the control of payment on forest taxes.
Resolution R-SINAC-5	18 July 2002	Gazette #138, pages 26-31	Manual of procedures for forestry tax payments.
Resolution SINAC	14 March 2003	Gazette #52, page 29	Contains the list of species that can have a certificate of origin in the Osa Conservation Area.
Notice MINAE SINAC	23 October 2002	Gazette #204, pages 27-39	Requirements for MINAE and SINAC.
MISCELANEOUS			
Pronouncement DAJF-908-94, General Forest Leadership			Speaks about the scope of article 47 in the Forestry Law.

Law #7609, reform of the Forestry Law	5-Jul-96		
Project #15.708	25 October 2004	Gazette #208	Modification of articles 3, 46, 47 y 48 of Forestry Law 7575.
Decree #31844-MAG	21 June 2004	Gazette #120	Payment schedule for the forestry regents.
List of suspended professionals from the College of Agricultural Engineers for infractions of the rules	30 June 2004	Gazette #127	
Pronouncement DAJF-654-93, General Forest Leadership			Speaks about the approval and authorization for management plans, and the general forestry tax.
Notice from the College of Agricultural Engineers Gazette #184	25 September 2002	Gazette #184	Outlined the requirements for college procedures.
Requirements for the procedures before the College of Agricultural Engineers.	25 September 2002	Gazette #184, pages 44-49	
Decree #22688-MAG-MIRENEM	13 December 1993		Regulation to the General Organic Law of the College of Agricultural Engineers.

Resolution R-SINAC-5	18 July 2002	Gazette #138, pages 26-31	Manual of procedures for forestry tax payments.
Decree #30918-MINAE-MOPT-SP	15 January 2003	Gazette #10, scope #2	
Law #8355	20 May 1993	Gazette #118	Financial cooperation Treaty between Germany and Costa Rica for the Huetar Norte Forestry Project.
Resolution SINAC-DG-012	27 September 2002	Gazette #186, pages 3-4	Transfer value of timber in the market, to fix a minimum taxable base for the forestry tax payment.
Manual of procedures for Payments for Environmental Services	5 March 2004	Gazette #46	
Resolution SINAC-ACLA-P	9 September 2004	Gazette #177	Forestry species covered in agroforestry systems under a certificate of origin.
Article 28, of Law #7554			Establishes the importance of ordering the national territory in order to achieve harmony between the well-being of the population, the utilization of natural resources, and conservation of the environment.

Law #5395, the General Law on Health	30 October		There is a discussion on how this law interacts with the environment and the provisions in it.
Law #7317, Conservation of Wildlife Law	30 October 1992		
Executive Decree #23671, National System of Sustainable Development (SINADES)			A system that lays out the actions and strategies required for the promotion of sustainable development.
Law #7779, Law of Use, Management and Conservation of Land			
Law #7788 Biodiversity Law			
Decree #31849-MINAE-S-MOPT-MAG-MEIC	28 June 2004	Gazette #125	General regulations about the procedures for writing environmental impact statements.
Law #7554, Organic Law of the Environment	13 November 1995		Established the requirement for environmental impact statements.
Decree #29412-MAG			Assessed fines.

Appendix H: Enforcement Limitations

SINAC

WEAKNESS 1

Description	The permit review process will often take place in the sub-regional office where no field visit will be performed even when officials know that maps do not contain all required elements.
Cause	No institutional policy exists that establishes how and when a preliminary visit will occur. SINAC officials decide to perform preliminary visits based upon past experiences and instinct – not based on written directives.
Impact	SINAC cannot verify that management plans and maps correspond to reality on the ground. SINAC and the regents lose the ability to plan for contingencies such as wildlife corridors and critical tree corridors which could affect the sustainability of the forests. *Examples:* In 1999, in the sub-regional offices of Pital and Cutris, only 31% of management plans were subject to a preliminary visit. In the sub-regional offices of Sarapiqui and Tortuguero, most maps checked were incorrect.
Legal Requirement	Article 20 of the Forestry Law does not require a preliminary visit by SINAC unless the sub-regional office has supported evidence that a visit is necessary.

WEAKNESS 2

Description	No information sharing system exists that would allow rapid and timely access to sub-regional management plans for future reference in order to make available new scientific and technical information that is required in an evaluation to support a cycle of cutting.
Cause	Lack of institutional capacity.
Impact	An increased risk that plans which work against forest structure and biodiversity will be approved. SINAC officials cannot apply lessons learned in guiding forestry

	activities. Regional strategies cannot be formulated.
Legal Requirement	Decree 27388-MINAE: Principles, Criteria, and Indicators of Sustainability states that every cycle of cutting must incorporate evaluation results, new scientific and technical information that responds to technological, environmental, social and economic circumstances. A different provision of the decree is that all supervised forests must have a 15 year fallow period.

WEAKNESS 3

Description	SINAC does not always ensure that proper permitting and implementation of management plans is occurring.
Cause	Open area permits are much easier to attain (there are less restrictions and less expenses). SINAC is overwhelmed with the volume of permit applications for all land types and the small size of the land involved - they lack the resources to ensure that proper management is occurring.
Impact	SINAC cannot acquire institutional knowledge to establish consistent operation plans between sub-regional offices and Conservation Areas. Institutional control of forest resources is not exercised. Officials cannot know if the technical provisions of the management plans are being enacted. Corrective actions cannot be performed at opportune moments. There is an increased risk that the forest structure will be altered and biodiversity will be impacted. There is an increased risk of illegal activities taking place. SINAC cannot know the true extent of timber extraction in areas covered by management plans.
Legal Requirement	Article 20 of the Forestry Law states that the sub-regional office must ensure that the requirements laid out in article 17, of the same law, are being followed. Article 21 requires that the sub-regional offices perform an audit of management plans during the use period or time of wood extraction.

WEAKNESS 4

Description	SINAC lacks a control strategy for management plans coupled with weak documentation of regent activities (the main form of forestry supervision from SINAC).
Cause	There are no directives on when and how SINAC inspections should occur. There are no designated SINAC officials in the sub-regional offices to organize and analyze regent reports.
Impact	SINAC does not have sufficient information about: • Extracting actions realized under each plan; • If conformity to stipulations in the implementation plans have occurred; • And what the real impacts are on forest resources.
Legal Requirement	Article 17 of the Forest Law requires the presentation of a ground map or plan that catalogues and locates trees marked for extraction, and also includes the provisions established in Decree # 27388-MINAE (Criteria, Principles and Indicators for Forest Management).

WEAKNESS 5

Description	SINAC performs minimal inspections and monitoring actions.
Cause	SINAC officials decide to perform preliminary visits based on past experiences and instinct – not based on written directives. For follow-up visits, complaints or reports of infractions are needed before they can respond. There are no directives on when and how SINAC inspections should occur.
Impact	SINAC cannot acquire institutional knowledge to establish consistent operation plans between Sub-regional Offices and Conservation Areas. Institutional control of forest resources is not exercised. Officials cannot know if the technical provisions of the management plans are being enacted. Corrective actions cannot be performed at opportune moments. Increased risk that the forest structure will be altered and

	biodiversity will be impacted. An increased risk of illegal activities taking place. SINAC cannot know the true extent of timber extraction in areas covered by management plans.
Legal Requirement	Article 20 of the Forestry Law states that the sub-regional office must ensure that the requirements laid out in article 17, of the same law, are being followed. Article 21 requires that the sub-regional offices perform an audit of management plans during the use period or time of wood extraction.

WEAKNESS 6

Description	SINAC has not enforced the reporting requirement for the regents.
Cause	There is no registry system in the sub-regional offices that monitors which reports have been submitted by the regents. By 1999, SINAC had not taken any corrective actions. There are no designated SINAC officials in the sub-regional offices to organize and analyze regent reports. *Examples:* • In the Pital sub-region, out of 5 files for management plans that ended in 1999, none contained closing reports, and only one contained 2 reports. There were no written requests for these reports by SINAC officials.(fiscal, 10) • In the Sarapiqui sub-region, in 1999, 40% of management plan files lacked any regent reports. • In the Arenal Huetar Norte sub-region, there were no written requests by SINAC officials asking for these required documents. • The same issues were faced in the Central Volcanic Range sub-region.
Impact	SINAC loses control of a tool that allows them to supervise forestry activities without expending their own resources.

Legal Requirement	Articles 14, 16, and 27 of Decree # 26870-MINAE, outlines the report requirements for each management plan that is approved and executed: a preliminary visit report, a progress report, and a closing report.

WEAKNESS 7

Description	SINAC does not monitor licenses and permits on the legislatively prescribed schedule.
Cause	Lack of institutional capacity (CENIGA has 6 to 7 people now; the National Center for Environmental Information has ~3 people). There are also no designated SINAC officials in the sub-regional offices to organize and analyze transportation permits.
Impact	Increases the risk that permits will be used to transport illegal wood. It is difficult for the responsible officials to know how to proceed in issuing new permits. *Example:* In the Sarapiqui sub-region, in 1999, not one file contained all copies of permits (used and not used). The destination of 77.8% authorized permits was unknown.
Legal Requirement	Under Resolution # 023-MINAE-SINAC, SINAC officials must perform, at least, one visit a month to each primary industry center to collect permit stubs. Article 62 of the Forestry Law regulates the officials who manage roadways and transportation.

WEAKNESS 8

Description	SINAC does not periodically evaluate the instructions and dispositions related to the transportation element of management plans in sub-regional offices.
Cause	Lack of institutional capacity.
Impact	Compliance to regulations is not ensured.
Legal Requirement	Article 1 of Decree 27240-MINAE, establishes a system of licenses to facilitate the control work of approving products that

	have come from forest permits and management plans.

WEAKNESS 9

Description	Few visits are performed by SINAC officials during the implementation stage.
Cause	There is a lack of personnel to perform regular inspections; although through the conferring of Public Faith on the regents, much of the responsibility of control has been delegated to these professionals, SINAC officials are still ultimately responsible for enforcement of this requirement. However, there are no directives on when and how SINAC inspections should occur or what the inspection reports should contain. There is also no formula to guide inspection site selection that could apply across all sub-regions.
Impact	There is little information to base an assessment that explores the impacts of forest use. A lack of standardization in inspection selection means that management plan assessments cannot be compared across sub-regions. *Examples:* • In the sub-regional offices of Pital and Cutris, only 12% of cases were subject to a visit during the implementation stage. • In the area of ARENAL Huetar Norte, there are 54 personnel to monitor 660,000 hectares; and in the last two years, 10 personnel have been sent to other sub-regions and the main SINAC office.
Legal Requirement	Article 20 of the Forestry Law establishes the management plans, the technical requirements of logging such as the 60/40 ratio of conservation to logging, and tree felling directions, and lists several of SINAC's responsibilities in this area.

WEAKNESS 10

Description	SINAC does not monitor licenses and permits on the legislatively

	prescribed schedule for transportation of forestry products.
Cause	Many SINAC officials do not know about resolution 054-SINAC.
Impact	There is no way to process the liquidation of these permits. It is almost impossible to monitor the activities of industry to ensure that they are complying with all pertinent laws. Increases the risk that permits will be used for transportation of timber from illegal logging. *Example:* In 95% of cases in Cutris and Pital sub-regions, regents did not provide records of transportation permits, used and unused.
Legal Requirement	Resolution 054-SINAC refers to the operation and return of permits for transportation permits and licenses and to requirement to report irregularities in order to overcome them. Article 5 of Decree # 26870-MINAE, states that regents are responsible for supervising, controlling and overseeing forest activities under Forestry Law 7575, the law of the College of Agricultural Engineers, and all connected laws and legal provisions.

WEAKNESS 11

Description	SINAC officials often do not require the proper procedures for permits before issuing new ones.
Cause	Many SINAC officials do not know about resolution 054-SINAC. There is also a lack of institutional capacity.
Impact	It is almost impossible to monitor the activities of industry to ensure that they are complying with all pertinent laws. Increases the risk that permits will be used for transportation of timber from illegal logging. SINAC cannot know the true extent of timber extraction in areas covered by management plans. *Example:* Control points have fees that are often times paid so that illegal timber can make it through the check point alongside

	legal timber.
Legal Requirement	Resolution 054-SINAC refers to the operation and return of permits for transportation permits and licenses and to requirement to report irregularities in order to overcome them. Article 63 of the Forestry Law regulates illegal logging and transportation of timber.

WEAKNESS 12

Description	SINAC officials often do not enforce he official schedule (6am-5pm) to transport timber.
Cause	Lack of institutional capacity.
Impact	It is almost impossible to monitor the activities of industry to ensure that they are complying with all pertinent laws. SINAC cannot know the true extent of timber extraction in areas covered by management plans.
Legal Requirement	Article 63 of the Forestry Law regulates illegal logging and transportation of timber.

WEAKNESS 13

Description	SINAC officials often have a hard time assessing and collecting the timber tax assessed against small and large loggers in the countryside.
Cause	The specifics in the law are not very clear and lead to the small collection rate.
Impact	Money earmarked to support SINAC initiatives is often not collected, and affects the overall budget available for monitoring forestry activities.
Legal Requirement	Article 6 of the Forestry Law creates this pre-logging tax to pay for funding of forestry initiatives in SINAC.

FORESTRY PROFESSIONALS

WEAKNESS 1

Description	Regents do not always submit closing reports or they lack the necessary details like conformity or non-conformity on approved extractive activities.
Cause	There are no directives on the report format, and regents assume that fieldwork will also be performed by SINAC.
Impact	SINAC cannot make decisions over such activities as starting penal proceedings.
Legal Requirement	Articles 14 and 16 27 of Decree # 26870-MINAE, outlines the report requirements for each management plan that is approved and executed: a preliminary visit report, a progress report, and a closing report.

WEAKNESS 2

Description	Not all reports submitted by regents are legible.
Cause	There are no designated SINAC officials in the sub-regional offices to organize and analyze regent reports.
Impact	Illegible or incomplete reports make the decision making process of the personnel in charge of permits and licenses difficult.
Legal Requirement	Submitted reports must be legible in order to be accepted by sub-regional offices and be approved by the engineer supervising the management plan.

WEAKNESS 3

Description	Irregular situations are not reported and allowed to occur if regents believe the activities will not be detrimental to the forest.
Cause	Actors harvesting forests and plantations early under the belief that it's better to harvest while you can; while tenuous land rights

	and complicated and conflicting laws confuse the situation.
Impact	Increased risk of open area and forest degradation and fragmentation. Increased risk that the forest structure will be altered and biodiversity will be impacted.
Legal Requirement	Article 21 of the Forestry Law states that a written warning will be given to the landowner and regent for this infraction of the law.

WEAKNESS 4

Description	Irregular situations are not reported and allowed to occur even if regents believe the activities will harm the forest structure or composition.
Cause	Actors harvesting forests and plantations early under the belief that it's better to harvest while you can; while tenuous land rights and complicated and conflicting laws confuse the situation.
Impact	Increased risk of open area and forest degradation and fragmentation. Increased risk that the forest structure will be altered and biodiversity will be impacted.
Legal Requirement	The regent can initiate penal proceedings, and quickly contact SINAC to initiate the corresponding proceedings under article 21 of the Forestry Law.

WEAKNESS 5

Description	Plans are often not submitted and many are of poor quality.
Cause	SINAC will not report the omission of reports to the College of Agricultural Engineers so that they may take corrective actions. The college will also not perform its own audits of the reports in order to discipline the regents.
Impact	The lack of regent reports means that an important tool in the

	control and advancement of management plans is lost. SINAC and the regents lose the ability to plan for contingencies such as wildlife corridors and critical tree corridors which could affect the sustainability of the forests.
Legal Requirement	Articles 14 and 16 27 of Decree # 26870-MINAE, outlines the requirements for the three required reports: the preliminary visit before the execution of the MP, the progress report and closing report. Article 5 of Decree # 26870-MINAE, states that regents are responsible for supervising, controlling and overseeing forest activities under Forestry Law 7575, the law of the CIA, and all connected laws and legal provisions.

Industry and Landowners

WEAKNESS 1

Description	Illegal logging (logging not approved under a management plan, or logging without a management plan).
Cause	Actors harvesting forests and plantations early under the belief that it's better to harvest while you can; while tenuous land rights and complicated and conflicting laws confuse the situation.
Impact	Increased risk of deforestation and land degradation. Undermines the sustainability of the forest and open areas.
Legal Requirement	Article 34 of the forestry law prohibits cutting on protected lands.

WEAKNESS 2

Description	Landowners can have their land listed as a protected area without compensation. Since the areas now have protection status, a management plan is not sufficient for forestry activity approval. Landowners must produce an environmental impact statement – a complicated and expensive procedure.
Cause	Tenuous land rights. Complicated and conflicting laws.
Impact	This policy encourages illegal logging, poor forestry management practices, and land use change.
Legal Requirement	Biodiversity Law, article 37 states that protected areas can be set aside without compensation to the landowner if they are allowed to remain on the land.

PROSECUTOR

WEAKNESS 1

Description	It is difficult to sanction Illegal loggers on public and private lands.
Cause	It is difficult for judges to find proof against the defendant in these types of cases.
Impact	Increased risk of deforestation and land degradation. The credibility of the administrative and legal bodies is put in question.
Legal Requirement	Articles 58b and 61a of the Forestry Law outline sanctions placed on individuals who engage in these illegal activities.

Appendix I: Key Indicator Literature

Key Indicator Literature

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Appendix J: Forestry Benchmarking Discussion and Benchmarking Forestry Best Management Practices Table

Benchmarking General Forestry Best Management Practices

To better examine the best practices in general forestry management, Table 1 is a compilation of best practices. The best practices are derived recommendations from forestry programs and discussion papers on forestry management and illegal logging. The goal of compiling these best practices is to better understand the practices and guidelines that have been recommended and instituted by forestry programs around the world, as well as the various trends and themes of forestry management. Benchmarking management practices from successful programs can be useful and can reveal which best practices are prevalent and commonly recommended for forestry programs in developing countries. By doing so, practices can be identified that can be applied generally to forest management in any developing country. The best practices in Table 1 may be considered the start of a process from which a benchmark for forestry best management practices can be developed. This section continues the Forward-looking General Forestry Management Section 6.3. The best practices discussed throughout this section and in Table 1 are organized by the following categories, and they are further discussed in the best practices discussion section below:

- Capacity Building and Governance
- Sustainable Forestry Management Policies
- Certification Processes
- Public and Private Sector Interfaces
- Partnerships, Alliances, and International Cooperation
- Financing Tools
- Demand Reduction – Procurement Policies and Trade Measures
- Conservation, Resource Planning, and Research and Development

FORESTRY MANAGEMENT PROGRAMS: BACKGROUND AND GENERAL APPROACHES AND TRENDS

Recommendations prior to the 1990's focus on capacity building and governance; forest protection and restoration; and financing tools, yet forestry literature after 2000 shifted focus to a myriad of newer concepts and mechanisms relating to sustainable development. These methods are collectively referred to as sustainable forestry management (SFM) approaches; SFM approaches highlight:

- Partnerships and trade networks
- Demand reduction tools such as procurement policies
- Certification
- Private sector involvement in forestry management
- Cross-sectoral policies and investment
- Incentive based mechanisms, such as agro-forestry

This transformation to a newer, innovative approach often dominates the current agendas of forestry groups. For example, in 2000, World Bank's operational policy on Forestry Strategy continued their effort to reduce deforestation and increase forest preservation; it was comprehensive in its range of forestry solutions and praised for its conservation-based measures. In many other areas, the report was received with contention; in fact, it had "a

chilling effect" on forest investment in forest producing countries (World Bank, 2004). Subsequently, in the 2004 update of the Forest Strategy, the World Bank focused on encouraging a market-based approach and addressed primarily SFM approaches. These approaches emphasized the newer innovative process solutions discussed above. In this updated Forest Strategy and the subsequent white papers, the World Bank highlights the following themes: the nexus of socio-economic and environmental goals of sustainable forestry in addressing poverty, "integrating forests in sustainable economic development, and protecting vital local and global environmental services and values." (World Bank, 2004, pg.2)

Issues of capacity and governance, problems of financing, and conservation measures in developing countries are less discussed in the World Bank's 2004 strategy, *Sustaining Forests: a Development Strategy*. These same issues are addressed by additional sources, including various discussion papers issued by the World Bank and other groups. Other comprehensive policy initiatives, such as those by the EU, the U.S, and the United Nations Forum on Forests (UNFF) also address these issues. The EU is a source of strong, developed forestry policy and good practices, which are included in the Action Plan for its FLEGT program. The objectives for this Action Plan include: capacity building and governance; private sector involvement and corporate social responsibility; international voluntary partnership agreements; and mechanisms to reduce the demand for and consumption of illegal logging. Moreover, while most programs target timber-production, FLEGT is a consumer-based initiative which highlights approaches such as public procurement policies and certification by consumer countries to reduce the demand and consumption of illegal wood.

The U.S. State Department's effort includes a $19 million illegal logging initiative, which stresses capacity and governance. It consists of four key approaches: building good governance systems and strengthening environmental law enforcement; community-based actions; technology transfers; and market-based good practices.

The UNFF, which was originally formed in 1992 as a result of the United Nations Conference on Environment and Development (UNCED or Rio Summit), introduced two Proposals of Action of Forestry Principles by 2000. They resulted from work between 1995 – 2000 by two intergovernmental groups under the Commission of Sustainable Development - the Intergovernmental Panel on Forests (IPF) and the Intergovernmental Forum on Forests (IFF) (UNFF, nd). These Proposals build on the Forest Principles established by the Rio Summit; they are comprehensive and cover most of the categories of best practices identified above. Notably, the IPF/IFF Proposals for Action include sections on scientific research; forest assessment; and criteria development, which includes a sub-section on implementation, use of criteria, and indicators as best practices for sustainable forest management.

In addition, conservation interest groups such as the WWF, CIFOR, and Conservation International still perform extensive and necessary research to develop best practices in conservation; resource planning; and research and development. Developed forestry strategies and best practices have also been derived from studies by the Inter-American Development Bank (IDB) and collaborative work by the United Nations Food and Agricultural Organization (FAO), Global Witness, and the Royal Institute for International Affairs (RIAA) Program in association with the World Bank, the Canadian International Development Agency, and the United Kingdoms Department for International Development.

BEST PRACTICES DISCUSSION

Capacity Building and Governance

Best practices to increase capacity building and improve governance are the most commonly recommended in forestry management programs. This can be attributed to the lack of capacity and adequate governance structures, which is one of the largest concerns of environmental enforcement for developing countries. Many of the EU's FLEGT program's recommendations are in this category. The World Bank also issues a number of papers which addresses the problem of capacity, governance, and reform. The U.S. illegal logging initiative, the UN FAO in conjunction with Global Witness and RIAA, Conservation International, the UNFF, and CIFOR also have a strong body of recommendations for specific actions to achieve better governance.

The Capacity Building and Governance recommendations have been divided into sub-categories, which relate to their function, in table at the end of this paper; they are:

- Government accountability, performance, and reform
- Capacity support and technology transfers
- Stakeholder participation
- Improving practical enforcement tools
- Information sharing

Best practices in the subcategory of government accountability, performance, and reform describe established principles of governance systems that are lacking in weaker governance systems. These make up a substantial proportion of the recommended best practices; they incorporate general objectives, such as, strengthening legal and enforcement systems (US Department of State, 2004) and gathering support for capacity building in forest-producing countries (European Union, *What is FLEGT?*, 2004). Policy recommendations such as the precautionary policy (Lele et al, 2000), which encourages preventative environmental measures to threats to the environmental or human health (Kriebel et al, 2001) are also relevant. Specific practices are also recommended to reform the existing institutional structure, include improving performance standards and higher accountability.

The need for capacity support, technology transfers, and measures to improve practical enforcement tools stem from resource-related constraints. In order to reduce these constraints, programs recommended enforcement tools, which range from simple, non-capital intensive measures, such as defining illegal logging and training, to costly and complex measures, such as the establishment of monitoring and case tracking systems. Stakeholder participation and information sharing are also widely recommended by forestry groups. The forestry programs also strongly recommended the following: inclusion of stakeholders throughout the decision-making process, which include non-traditional actors such as NGO's and the local population and indigenous groups, and increased awareness and education of the public and decision-makers.

Financing Tools

Forestry investment is a critical tool of forestry management. This can be attributed to the untapped financing potential of forestry, the high costs of preserving forests, and the problems

with forestry resource valuation. Overall, developing countries face an economic disadvantage with forestry financing. Even with overseas development assistance, current financing flows to developing countries cover a fraction of their needed investment to cover costs of deforestation and implementing Agenda 21 (Landell-Mills, 1999).

Forest resources are not always valued adequately due to its complexity as a commodity and a level of risk associated with property rights problems. Forest preservation is a long-term investment which means that forest revenues and benefits may not be realized within the same generation (Simula, Salmi, Puustajarvi, 2002). It is particularly difficult to collect on the environmental services provided by the forests, which include non-market benefits and public goods. Forest investments are also seen to be high-risk due to property rights problems and conflicts, such as land tenure and indigenous property rights (Simula et al, 2002).

Currently, forests are financed through the support of governments, NGO's, and the private sector. Yet, due to the above inadequacies and the lack of resources, non-governmental support has become a growing source of forestry investment; especially in developing countries (Landell-Mills,1999 and Simula et al, 2002).

Basic financing instruments commonly used by the public sector range from economic instruments such as taxes, royalties, fees, project loans, grants, subsidies, debt instruments and environmental funds (Simula et al, 2002). Market-based instruments, which may have private sources and incorporate the dynamics of the market, have the potential to grow; thus, it is recommended that these instruments are implemented as best practices. Some examples of market development instruments are: carbon sequestration payments, water resource use charges, tradable development rights, and tradable protection right payments.

Costa Rica is a good example of a country that has implemented market based instruments. They have a well-developed payment of service system, which was established in 1996 in Forestry Law 7575 (Chomitz, Brenes, Constantino, 1998). In addition, Costa Rica has been successfully developed eco-tourism and carbon sequestration, and it has developed markets for forest genetic resources and domestic watershed rights. In addition, Costa Rica also employs reforestation incentives and conservation to farmers (Landell-Mills, 1999).

SUSTAINABLE FORESTRY MANAGEMENT (SFM)

General Policies and Regulation

Best Management Practices of sustainable development strive to balance economic development interests with environmental protection. The general concept of Sustainable Development and forestry management originated from the Rio Earth Summit in 1992 (Tacconi, Boscolo, Brack, 2003). Other general principles that are related included concerns of social and economic equity, economic efficiency, and cost internalization. Moreover, general equity principles need to be met, and they include the need for cost internalization (which also applies to benefits) and undistorted private sector benefits. Inevitably, issues of land tenure, indigenous rights, and poverty alleviation are related to these issues, and are addressed by these best practices.

The general economic concern is that forest resources are often under-valued, and the private costs and benefits do not reflect its social value. As noted in the previous section, this is the result of inadequate information and valuation of forest system services For example, it has been proven that in Costa Rica forest landowners receive only 18% of the total economic value of Costa Rican forests (or 28% of the per hectare value of productive forests) (DeCamino, 1999)[10]. In addition, certain policies employed in the past, such as quotas, tariffs, log export bans, and taxes, create market inefficiencies (Lele, Kumar, Husain, Syed, Zazueta, 2000).

Since indigenous populations and local communities are often economically dependent on forest resources, they are particularly concerned with inequitable allocations of forest revenues. The World Bank indicates that the rural poor are generally disproportionately negatively impacted by illegal forest activities as "most of the population that lives in and around forests is among the poorest and often includes indigenous minorities (Lele et al, 2000)," and are therefore dependent on forests for their livelihoods. In addition, there are considerations of property rights, other traditional customs, and gender which do not receive proper attention (Lele et al, 2000). In many cases indigenous property rights are not even recognized, and their interests are marginalized (DeCamino, 1999). Thus, forest management plans should ensure an equitable benefit of forest revenues for these communities.

In order to better manage forest system services, SFM measures include many innovative market-based measures, such as agroforestry, cash crop tree farming (plantations) and integrated policy making. Policy making now incorporates forestry provisions in other sectors' policies (such as agriculture). The specific best practices are in the table following the text, and they seek to address the following general principles and objectives:

- An adequate economic and policy framework, balanced with environmental protection.
- Proper valuation of forest resources, such as developing government policies to encourage efficient development of forest resources that reflect the value of forest resources. This may involve the assessment of total economic value.
- Internalization of costs and benefits. This concept includes the right of private forestry companies to receive profits which result from the difference between the product's market price and their cost of product (DeCamino, 1999).
- Equitable distribution of costs and benefits to society; the costs from forestry goods and services should be allocated to those who receive the benefits (revenues) (DeCamino, 1999).
- Address poverty and other social issues.
- Recognition of traditional property rights (DeCamino, 1999) and the indigenous population's participation should be encouraged (UNFF, 2000).

[10] The Total Economic Value is defined as "the sum of use and non-use values with due consideration of any trade-offs or mutually exclusive uses or functions of the resource/habitat in question." As retrieved 2/11/05 from the European Community Biodiversity Clearinghouse Mechanism's website at http://biodiversity-chm.eea.eu.int/CHMIndexTerms/Glossary/T/total_economic_value

In addition to the best practice strategies which relate to the formulation of forestry principles and industry regulations, sustainable forestry management is a concept that is a driver of other best practices discussed in later sections. Incentive financing tools, private sector involvement in forestry management, and certification processes are measures employed by timber-producing countries. Measures targeted at timber-consuming countries affect the demand of forest products. These measures include: procurement policies, the use of certification by importing countries, and socially responsible investment and socially responsible corporate citizenship. International initiatives also have a sustainable development perspective.

Private-Public Interfaces and Private Investment

Private sector involvement in forestry management is an objective of sustainable forestry management. There are two ways for private industry to become involved: through the investment of private capital markets and through public private collaborations in forestry management projects, and private investment opportunities includes debt financing, venture capital funds, securitization, and guarantees (Simula et al, 2002). The most common sources of private financing are donations through private philanthropy and NGOs (Simula et al, 2002).

In an effort to increase efficiencies, public-private partnerships are combination of the public sector's experience in long-term risk-bearing public projects with private sector financing resources and management (Simula et al, 2002). Examples of these collaborations include contracting out functions previously performed by the public sector; joint ventures through combined financing sources; leasing through Build-Operate-Transfers (BOT) and Build-Own-Operate (BOO) transfers (Simula et al, 2002).

According to the World Bank the benefits of using private-public partnerships are economic, technological, social, and political (Simula et al, 2002). Costa Rica's has a track record of developing public-private partnerships; its payments of services program is a very good example of private involvement in forestry management.

Certification

Forest certification is a system of standards, which incorporates monitoring, timber product tracking, and labeling processes (WWF, 2002). It is a process used by private market interests and forest management groups to balance economic and environmental interests of forestry, and is related to ideas of sustainable development. It is used as a tool to improve forestry policy, governance, and sustainable forest management by timber consumers and producers. Certification also addresses social concerns, such as, equity problems, which impact local forest communities (Richards, 2004). The IDB states that certification, "Is a promising sustainability tool that contributes to internalizing social and environmental costs" (Simula et al, 2002, pg. ii). It can also secure tenure rights, increase income, and working conditions for local communities (Richards, 2004). In addition, certification reinforces sustainable development of forests through emphasizing the market value of legal wood (WWF, 2002). It can be linked with the improvement of procurement policies that reduce demand and consumption of logging. Although forestry certification process can not be directly linked to improved overall forestry management standards, certification is promoted as an adaptive, innovative tool with the potential to expand the forest management framework and to strengthen the market for legal wood.

Certification began when environmental NGOs, such as Friends of the Earth, WWF, and Greenpeace put pressure on the International Tropical Timber Organization to establish a program of international labeling to certify the origin of timber (Gray, 2004). The Forest Stewardship Council (FSC) is the most recognized certification program around the World.

Overall, the program provides two certification services: forest management certification for forest landowners and chain of custody certification for companies that trade and produce timber products. For forest management certification, a third-party certifier evaluates the management activities of the landowner according to FSC guidelines and criteria. By granting certification, FSC ensures that good management practices are being observed (Forest Stewardship Council, 2005). Chain of Custody certification tracks the wood from the forest floor to the sale of the product (FSC, 2005). It is a significant tool for consumers to determine the origin of wood products.

There are a number of other certification systems that have been developed since the FSC certification system came about in 1993:

- ISO14001
- Pan European Forest Certification Framework (PECFC)
- Finland's Certification Program
- The Canadian Standards Association
- CERFLOR (Brazil)
- Malaysia's National Timber Certification Council
- Cameroon's Forest Stewardship Council working Group
- Indonesia's program (Gray, 2004)

Yet right now the FSC program is the only one endorsed by the WWF because of their stringent requirements and criteria. These requirements ensure sustainable development principles, legal compliance, land use rights, and traditional rights; it also classifies High Conservation Value Forests (HCVF). Overall, the PECFC program has a higher percentage of certified forested areas worldwide under its program at 38% (compared to the FSC program's 23%), yet the PECFC standards lack of the requirements stated above (Richards, 2004). Thus, organizations, such as the WWF, do not recognize the PECFC certification (WWF, 2001).

One major issue with the FSC program derives from Principle 1; it is the "legality" provision that requires certified timber to attain legal compliance, yet this certification is hard to obtain through a voluntary compliance program (Richards, 2004). Since there is an increasing interest in incorporating legal compliance in certification, there have been efforts from countries including Bolivia, Brazil, South Africa, Guatemala, Russia, and Indonesia to pass legislation to make legal compliance mandatory in certification programs (Richards, 2004). Currently, stepwise certification and the Societe Generale de Surveillance (SGS) sustainable timber labeling system also incorporate a certificate of legal compliance to verify legal compliance with national forestry laws (Richards, 2004). And even though, stepwise certification allows tropical countries, who could otherwise not afford certification, to participate, both of these programs are still criticized for having lower certification standards.

Overall, the impacts of the use of certification on areas of forestry management have been mixed. It is believed that certified programs are just identifying forests that already have high

forest management standards, yet certification processes have had impact on forestry governance and policy (Richards, 2004). There has been an increase in stakeholder participation in Bolivia, Brazil, and South Africa, public awareness, and transparency of forestry production systems (Richards, 2004).

International Coordination

International coordination and agreements are measures that are under-utilized by developing countries that produce timber. International agreements provide consensus and clarification of common goals and guidelines for SFM. They are also used to strengthen efforts at the national level (Tacconi et al, 2003). The Rio Conference Principles of Forest and Chapter 11 of Agenda 21 are the foundation of all international forestry agreements (Tacconi et al, 2003). Other multilateral environmental agreements that pertain to forestry include: the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the Convention to Combat Desertification (CCD), the Convention on Biological Diversity (CBD), and the Framework Convention on Climate Change (FCCC) (Tacconi et al, 2003). The IPF/IFF Proposal for action also urges countries to rely on relevant international laws and policies, which include the UNCED Forest Principles and the Convention on Biological Diversity (UNFF, 2000).

More specifically, the CCD and the FCCC funding provisions and transferable payment mechanisms aid compliance, which is carried out through the Global Environment Facility (GEF). The GEF funds projects in developing countries from contributions received by developed countries (Tacconi, 2003). The FCCC promotes market-based incentive mechanisms, such as carbon-offset trading (Tacconi, 2003).

Another best practice would be that national agencies refer to international and regional forestry plans when they already exist in evaluating and implementing forestry management programs. Such forestry framework plans include: the Tropical Forestry Action Plan sponsored by FAO; Forest Master Plans by the Asian Development Bank; Forest Sector Reviews promoted by the World Bank, and National Conservation Strategies, National Environmental Action Plans, and National Sustainable Development Strategies (DeCamino, 1999).

Reducing Demand and Consumption of Logging (Public Procurement Policies and Trade Measures)

In contrast to most approaches, procurement policies are a demand-side management technique. They target timber consumers and timber consuming countries, such as the G8 member states, which are large timber consumers (WWF, 2002). Procurement policies can be combined with an existing certification system to ensure that only legal and sustainable timber products are purchased. They are most effective when processes such as certification and HCVF designations are already established (White and Sarshar, 2004). The principles of corporate and public social responsibility are relevant to the approach.

Procurement policies have been developed by the WWF and the EU. The WWF highlights a Responsible Purchasing program among its Global Forest Trade and Network, which is a national and regional network of forest producing countries. The EU's FLEGT Action Plan features procurement policies as a prominent feature; it sets legislation to establish directives

and guidelines for the use of procurement policies through a Handbook of Green Procurement (Commission of the European Communities, 2003).

Conservation, Resource Planning, Research and Development

The basic tools of environmental protection of forests, such as conservation, resource planning, research, and technology development, are still core to the best practices of forest management.

Even though the World Bank's 2004 revised strategy does not focus on these issues, they are still relevant, and recommended by various other conservation-oriented groups such as CIFOR, WWF, and UNFF. They include measures of: environmental protection and preservation, conservation/restoration, basic forestry research, environmental resource assessment, and technological improvements.

Two processing innovations in this area are the classification of Reduced Impact Logging (RIL) and HCVF. RIL, which is well-studied by CIFOR and other groups, is a method to improve the efficiency of harvesting timber and lessen the environmental effects. It is a forestry engineering process that incorporates educational training and planning, such as re-harvest planning, technical supervision, and post-harvest assessments (Enters, Durst, Applegate, Kho, and Man, 2002). Under the FSC, HCVF classification identifies areas of forests with high environmental, socio-economic, biodiversity or landscape values. Cited examples of HCVFs range from old-growth forests, sensitive biodiversity habitat, and sacred areas of indigenous people. WWF is working to further expand this tool (WWF, *HCVF*, 2002).

Another developed best practice is the use of criteria and indicators for SFM, which are recommended by the EU and UNFF. The European Commission stated:

> Criteria and indicators, adapted to local conditions and harmonised internationally, are important tools in conceptualising, evaluating and implementing sustainable forest management. There is scope to develop and improve these tools and to make them indispensable for sustainable management of forest resources (European Union, 1996).

The EU recommends the wide use of indicators by forest managers, forest operators, and decision makers.

Further best practices in this area are proposed in the IPF/IFF Proposals for Action, which includes a section on scientific research, forest assessment, and the development of criteria. It includes six measures, which for example, promote, "the use of internationally, regionally, sub-regionally, and nationally agreed criteria and indicators as a framework for promoting best forest practices and in facilitating sustainable forest management (UNFF, 2000, item 115b).[11] The

[11] The conference was titled the "International Conference on the Contribution of Criteria and Indicators for Sustainable Forest Management: The Way Forward" and was hosted by the National Forest Service of Guatemala (Instituto Nacional de Bosques, INAB) in Guatemala City, 3-7 February 2003. 109 participants from 51 countries, 10 international organizations, and 3 private sector/NGO groups attended the workshops.

measurements also encourage the FAO and UNEP as potential participants. Developing countries and economies in transition are urged to develop indicator programs with adequate technical and financial assistance.

In 2003, UNFF considerably expanded on these best practices in a workshop held in Guatemala City (INAB, ITTO and FAO, 2003). The stated objectives of the workshop were to:

1. Strengthen the elaboration and application of criteria and indicators for sustainable forest management.
2. Promote political commitment for the use of criteria and indicators as tools for sustainable forest management.
3. Strengthen institutional capacity and stakeholder partnerships for implementing criteria and indicators and to facilitate the exchange of information among all stakeholders.
4. Contribute to the work of the UNFF and to international initiatives on indicators related to sustainable development (UNAB, ITTO and FAO, 2003).

The workshop produced several recommendations that all stressed increasing the use of indicators in sustainable forestry management; these recommendations are included in the best practices table.

Indicator implementation was also discussed to meet the workshop's expanded vision of indicator use, which includes implementing indicators on all levels. Also, countries need to make a political commitment to monitor indicators for trends on SFM and to collect sufficient data (INAB, ITTO and FAO, 2003).

In conclusion, benchmarking best practices is a difficult task that has been attempted by many organizations all over the world. The best practices listed above are just some of the potential ways in monitor forestry practices and reduce illegal logging. Hopefully, the Costa Rica examples have proved some context regarding the use of best practices, and in addition to the information provided in this section best practices have been integrated in to all aspects of this document. Overall, the continuing development of this area is essential in understanding the future of forestry management. Benchmarking is a way for countries to compare its management practices against the tools that are used around the world to increase enforcement and compliance within the forestry sector.

Table

Category I: Capacity Building and Governance	
Capacity Support and Technology Transfers	
Provide funding and technical assistance for developing countries	UNFF
Provide funding for forest conservation and management	World Bank
Provide assistance to communities, NGO's, policy research Institutions	World Bank; UNFF; US
Aid and technical assistance should address root causes of forest crime	WWF
Identify Coordinating Agency for Overseas Development Assistance (ODA)	UNFF
Provide employment opportunities and training to forest communities	CIFOR
Government Accountability, Performance and Reform	
Provide long-term political commitment to Sustainable Forest Management (SFM)	CIFOR
Ensure the law is consistent, understandable, enforceable	EU
Implement national forest programs based on consensus-building principles and strong national coordination of agencies and stakeholders	UNFF
Develop, implement, monitor, and evaluate forest programs	UNFF
Address forest related issues such as the financing of violent conflict	EU and World Bank
Ensure compliance with local and national laws	CIFOR and UNFF
Ensure compliance with international agreements	CIFOR and UNFF
Enact legislative and institutional reforms to improve forest law enforcement	World Bank; CI; US; FAO-Global Witness-RIAA
Support transparency in government and the prosecution of forest crimes	World Bank and WWF
Decentralize forest ownership and management, with appropriate safeguards	World Bank and IDB
Create and Strengthen Positive Incentives for Enforcement Agents; Promote meritocracy; Staff Remuneration	CI , World Bank, CIFOR, and FAO-Global Witness-RIAA
Provide adequate training for staff	CIFOR
Ensure transparency in forest concessions awards in the harvest and trade of timber	EU, World Bank, IDB
Provide for transparency of the information of forest ownership and conditions, in addition to legislation	EU
Reduce the discretionary power of government	FAO-Global Witness-RIAA and World Bank
Reform disclosure rules and strengthen oversight mechanisms	FAO-Global Witness-RIAA
Simplify rules and reducing the number of regulations when appropriate	FAO-Global Witness-RIAA and World Bank
Improve enforcement agency coordination between regulators, police, customs, and the judiciary	EU
Depoliticize forest administration	FAO-Global Witness-RIAA

Information Sharing	
Support information sharing of lessons learned in forest enforcement	CIFOR and World Bank
Increase public awareness, public participation and political pressure	FAO-Global Witness-RIAA and World Bank and WWF
Educate decision-makers of SFM opportunities and potential	IDB
Provide public information on illegal forest products and activities	UNFF
Provide public information on forest degradation and SFM (i.e. multiple roles of forests)	UNFF
Provide public information regarding enforcement activities (i.e. as monitoring and management plans)	CIFOR
Establish electronic means of disseminating SFM information (i.e. databases)	UNFF
Participate in media campaigns which raise awareness of corporate responsibility	World Bank

Practical Enforcement Tools	
Establish appropriate incentives for legal forest management	EU
Establish appropriate penalties for forest crime	World Bank and EU and FAO-Global Witness-RIAA
Apply criminal legislation	EU
Designate illegal logging as a crime (i.e. EC Directive 97/2001 on money laundering)	EU
Issue realistic norms	FAO-Global Witness-RIAA
Analyze government regulatory systems and their effectiveness	World Bank
Audit and identify weaknesses in governance; identify priority areas for action.	World Bank
Promote community-based action	World Bank
Use watchdog monitoring and reporting	World Bank and FAO-Global Witness-RIAA
Whistle blowing and publicizing irresponsible private companies	World Bank
Develop guidelines, criteria, and indicators for SFM	EU and U.S.
Develop enforcement tools: guidance for auditors; define illegal logging; case tracking system; monitoring and evaluation.	CIFOR and CI
Develop systems to monitor logging and track timber	EU and World Bank and CIFOR
Develop verification systems for legal versus illegal timber	EU
Enforce management plan revisions	CIFOR
Enforce payments of charges, fees, and royalties.	CIFOR
Initiate collaborative partnerships among stakeholders to monitor and control forest use	World Bank
Map concessions and ownership (who is doing what, where)	World Bank
Monitor concessionaires' activities to detect illegal logging roads and forest degradation.	World Bank
Monitor environmental, financial, and social impacts of forest operations.	CIFOR and EU

Provide public hearings	World Bank
Research Best Practices and provide policy training	World Bank
Agency training recommendations	CI and U.S.
Stakeholder Participation	
Develop and implement policy through open participation	UNFF and FAO-Global Witness-RIAA
Involve community participation regarding law enforcement and the allocation of timber concessions	World Bank
Promote indigenous community participation	UNFF, EU and CI
Use collaborative process to achieve an international common understanding of concepts, terms, and definitions in developing SFM criteria and indicators.	UNFF
Wide use of stakeholder participation in multiple decision-making phases: policy diagnosis, design, evaluation, and implementation.	IDB
Use stakeholder process to develop National Standards for SFM.	World Bank
Increase industry involvement in Implementation	CIFOR
Category 2: Financing Tools	
Financing Tools	
Use Financial tools	CIFOR
Develop new financing instruments	IDB
Adopt environmentally responsible credit practices	World Bank
Use incentive contracts and performance bonds	World Bank
Encourage financial institutions to incorporate social and environmental factors in forestry investments	EU
Reinvest financial benefits from forest management in maintaining resources	CIFOR
Encourage financing of programs with the Bank	IDB
Use community financing to promote SFM; facilitate local investments in SFM by indigenous groups and forest owners.	UNFF
Foster evolving markets for Ecological Goods: international public goods (carbon and biodiversity) and environmental services	World Bank
Promote Payments for Environmental Services	WWF
Category 3: Certification	
Certification	
Promote “the best use of existing tools” such as Certification and Timber Tracking Techniques	WWF
Promote Independent certification of SFM according to internationally accepted social, environmental and economic principles and criteria.	World Bank, FAO-Global Witness-RIAA, UNFF
Collaborate with independent certification bodies	World Bank
Establish efficient wood product tracking systems	World Bank
Use independent monitoring to build checks and balances into the tracking and licensing system	EU

Use chain of custody analysis and transparent logging tracking procedures	World Bank and WWF
Establish and monitor the effectiveness of different log tracking and chain of custody analysis systems	World Bank and WWF
Strengthen market signals to expand certification	CIFOR
Increase supply of certified wood products	CIFOR
Use voluntary licensing of exports	EU
Implement of systems for verification of compliance (esp. where certification will take time to develop)	WWF
Category 4: Consumption and Demand Reduction	
Consumption and Demand Reduction	
Commitment to purchase certified timber from forests managed in a social, environmental, and economically sustainable manner	World Bank
Establish and engage in public procurement policies that ensure timber is legal and are from a "sustainable"-managed forests (especially focusing on the G8 member states, large timber consumers i.e. EU)	WWF
Refer to public procurement policies; for EU members EC Directives which are being modified are 97/52/EC and 98/4/EC) from Directives 92/50/EEC, 93/36/EEC 93/37/EEC, 93/38/EEC.	EU
Use Handbook on Green Procurement that accompanies Public Procurement Directives (for EU timber consumer countries) in establishing and maintaining a responsible timber purchasing program.	EU
Ensure responsible investments that do not support forest crime	WWF and CIFOR
Blacklist offending companies who participate in illegal operations. Support responsible companies.	FAO-Global Witness-RIAA
In extreme cases, support import bans and boycotts of companies heavily engaged in corrupt practices.	World Bank
Research the link between overall timber supply and demand and illegal logging	World Bank
Consider the related social, economic and environmental implications and costs and benefits, when considering non-wood substitutes or imports of forest products	UNFF
Use market based instruments (such as civil society consumer pressure) to ensure that private sector corporations practice sound forest management and adhere to codes of conduct	World Bank
Use Voluntary Partnership Agreements (VPA) between wood consumer countries (such as those used by the EU with timber producers) and producing countries to develop a mechanism to distinguish illegal logging and prevent imports of illegal wood.	EU
Work with the Global Forest and Trade Networks (GFTNs) which links buyers and sellers of certified wood	WWF
Category 5: International Cooperation	
International Cooperation	

Participate in national and International forestry management planning: plan and re-evaluate as necessary national forestry framework and management practices. Coordinate with international forestry plans, and coordinate with international agencies and multilateral banks for financial and technical support.	IDB
Mobilize the support of the international financial and environmental communities in issues of forest law enforcement (i.e. global initiatives relating to illegal logging, such as those being pursued by the G8, OECD, FLEG and various NGO coalitions).	World Bank
Mobilize international support for the adequate provision of ODA and/or the Global Environment Facility (GEF), or other sources of funding.	UNFF
Undertake a wide, international effort of strategic analyses of political, legal and institutional policies that have contributed to deforestation and forest degradation, and policies that have had a positive effect developed countries. Involve the United Nations Development Programme (UNDP) and other organizations such as regional development banks in assisting developing countries and countries with economies in transition	UNFF
Involve the United Nations Development Programme (UNDP) and other organizations such as regional development banks in assisting developing countries and countries with economies in transition	UNFF
Coordinate with bilateral, multilateral donors and international institutions related to forests (i.e. the Convention on Biological Diversity, the United Nations Framework Convention on Climate Change, the Convention to Combat Desertification and the International Tropical Timber Agreement)	UNFF
Ensure compliance and consistency with international agreements	UNFF
Use international cooperation and multilateral approaches	EU
Strengthen strategic alliances through involving interested parties in partnerships and participatory mechanisms	IDB, UNFF, and CIFOR
Establish and support NGO Partnerships (i.e. WWF-World Bank Alliance) or Alliances between NGO's and Private Companies (i.e. the Global Forest and Trade Network)	WWF and World Bank
Support partnership agreements between EC and wood-producing countries	EU
Partnerships with National Stakeholders and Donor Networks	World Bank
Ensure indicators consistent with the Convention on Biological Diversity re: developing and implementing biodiversity indicators	UNFF
Look at international forest policy processes “in meeting the needs for assistance of Bank members”	IDB
Support and develop an International Plan of Action and Agreement for containment of forest corruption.	World Bank
Use voluntary bilateral trade agreements	WWF
Apply CITES against forest crime	WWF
Category 6: Private-Public Sector Interface	
Private-Public Sector Interface	
Engage Private sector of timber producing countries in efforts to combat illegal logging	EU
Explore mechanisms for private sector re: sustainable forest management to invest financial resources generated from forest-based activities	UNFF

Promote private sector initiatives: codes of conduct, transparency, and independent monitoring	EU
Formulate and create incentives to attract domestic and foreign private sectors and local community investment for SFM projects.	UNFF
Foster codes of conduct by private sector industry	World Bank
Private sector voluntary codes of conduct aimed at promoting sustainable forest management through private-sector actions: technology transfer, education and investment	UNFF
Corporate social and environmental responsibility (i.e. Tropical Forest Trust Approach)	EU
Private Sector Links	World Bank
Foster producers and buyers groups.	World Bank
Encourage private sector technical and financial assistance in ensuring legality of supply chain	EU
Category 7: Sustainable Forestry Management (SFM)	
General Policies and Principles	
Endorse public and internationally acceptable principles, criteria and national standards for Sustainable Forestry Management (SFM)	World Bank
Provide commitment to ensure applicable forest law supportive of SFM	EU
Balance the need between industrial demand and the protection of forest resources	World Bank and FAO-Global Witness-RIAA
Ensure equitable distribution of costs and benefits which: benefit society, consider the traditional communities, internalize costs and benefits; benefits to the private sector should be undistorted	IDB
Develop legislation which ensure governments receive a fair and regularly adjusted economic rental value for timber derived from state forest lands	World Bank
Assess long-term trends in supply and demand for wood; consider actions to promote the sustainability of wood supply in regards to the means for meeting demand. Emphasize investment in sustainable forest management.	UNFF
Develop policy, and institutional and legal frameworks (i.e. intellectual property rights) and/or other protection for Traditional Forest Related Knowledge	UNFF
Foster Linkage between Forests and Climate Change (role of forests in in reducing vulnerability from natural disasters, carbon sequestration)	World Bank
Foster Linkage between Poverty Reduction and Conservation Strategy	World Bank
Foster linkages between forest industry and rural poor (access to credit, extension, and skills development)	World Bank
Apply the Rio Declaration on Environment and Development and relevant chapters of Agenda 21, as well as paragraph 10 of the Forest Principles, which states that new and additional financial resources should be provided to developing countries	UNFF
Undertake management planning at appropriate levels	CIFOR
Use internationally, regionally, sub-regionally and nationally agreed criteria and indicators as a framework for promoting best forest practices and in facilitating sustainable forest management	UNFF

Equity and Poverty Alleviation	
Provide legal arrangements for equitable benefit sharing with local communities.	World Bank and CIFOR
Analyse links between regulatory systems and poverty and the extra-sectoral aspects of some of these issues.	World Bank
Provide equitable benefit which do not disadvantage rural poor and benefit powerful players	EU
Consult and encourage participation of people and groups affected by forest operations	CIFOR
Empower women, the poor, and marginalized groups in formulating and implementing rural forest policies and programs	World Bank
Promote forest based livelihood opportunities for local communities within concession areas i.e. Expand support to small scale forest product enterprises to help rural poor engage in processing and trading	World Bank
With WCMC monitor the management of biodiversity " hot spots". Report situations of illegal logging and corruption	World Bank
Develop new instruments and mechanisms that enhance the security of forest-dependent groups	UNFF
Property Rights	
Clarify property rights and develop mechanisms for conflict resolution over forest land rights	World Bank and FAO-Global Witness-RIAA
Formulate policies to secure land tenure for local communities and indigenous people, and include the fair and equitable sharing of forest benefits	UNFF and EU
Provide for long-term rights to manage forest resources	CIFOR
Provide secure land tenure arrangements	UNFF
Traditional Rights and Forest Knowledge	
Establish national, regional and international efforts that will enhance the capacity of indigenous people, forest-dependent people who possess TFRK and appropriate forest owners to participate.	UNFF
Promote policy, institutional, and legal frameworks that ensure indigenous rights and other forest-dependent peoples and communities	World Bank, CIFOR, UNFF
Recognize traditional rights	World Bank
Recognize and uphold legal and customary rights of local and indigenous, including property	CIFOR
Compensate indigenous peoples for the application of their traditional knowledge	CIFOR
Establish strong linkages between traditional and emerging national sustainable forest management systems	UNFF
Market Mechanisms	
Ensure full cost internalization of wood and non-wood substitutes	UNFF
Enable adequate provision and valuation of forest goods and services	UNFF

Design contracts with private sector to encourage competition	FAO-Global Witness-RIAA
Encourage private sector involvement	IDB
Privatize selected functions of forest management	FAO-Global Witness-RIAA
Promote markets and competition	World Bank
Develop and implement Codes of Conduct for social environmental and economically sustainable and responsible forest harvesting and management	World Bank, FAO-Global Witness-RIAA
Promote corporate social responsibility. Convince corporate shareholders of the positive influence on corporate profitability and shareholder dividends of corporate commitment to adoption of environmentally responsible practices.	World Bank
Formulate and implement criteria and indicators on a cross-sectoral basis	UNFF
Provide holistic, intersectoral, and iterative approach	UNFF
Apply integrated policymaking. For example, incorporate forestry components into cross-sector policies (i.e. agricultural or livestock production policy).	IDB
Work with local groups, NGOs, the private sector, and other partners to integrate forest and agroforestry farming systems into rural development strategies	World Bank
Include forest components in loan programs for other sectors (rural development, infrastructure, etc)	IDB
Undertake market and economic studies of wood and non-wood substitutes(i.e. substitution effects, and the overall impact on the management, conservation and SFM)	UNFF
Provide for market transparency for trade in forest products and services	UNFF; US
Category 8: Conservation, Resource Planning, Technology, and Research	
Conservation	
Conserve diversity at genetic, species and ecosystem levels	CIFOR
Ensure safeguards exist to protect rare, threatened and endangered species and habitats	CIFOR
Protect forest from activities that are incompatible with SFM (illegal harvesting, encroachment)	CIFOR
Apply ecosystem approaches that integrate the conservation of biological diversity and the sustainable use of biological resources	UNFF
Genetically modified organisms must not be used	CIFOR
Maintain processes of forest regeneration, succession and natural cycles	CIFOR
Primary forests and well-developed secondary forests must not be replaced by plantations or other land use	CIFOR
Take measures to avoid possible negative social impacts	CIFOR
Trees planted in natural forests must not significantly alter the natural ecosystem	CIFOR
Establish or expand networks of protected areas,buffer zones and ecological corridors, where possible, in order to conserve biodiversity	CIFOR and UNFF

Promote the regeneration and restoration of degraded forest areas, including by involving indigenous people, local communities, forest dwellers and forest owners	UNFF
Promote lesser used forest species in domestic and international markets, where consistent with SFM	UNFF
Reforestation and in appropriate situations support compensatory plantation establishment by local communities	World Bank
Designate High Conservation Value Forests (HCVF)	WWF
Avoid harvesting and illegal logging within concession areas in HCVF	World Bank and CIFOR
Use harvest volumes that are sustainable	World Bank and CIFOR
Use forest landscape restoration	WWF
Resource Planning	
Adopt a reliable method of controlling yield (AAC). Where data are unreliable, set production levels conservatively.	CIFOR
Carry out social impact assessment and incorporate results into management planning	CIFOR
Apply guidelines for the identification and protection of sensitive soil and water resources	CIFOR
Prepare and implement written guidelines for road construction and use	CIFOR
Properly supervise all harvesting operations and silvicultural prescriptions	CIFOR
Revise timber concession periods as necessary	FAO-Global Witness-RIAA
Prepare information on the available forest valuation methods and data-sets required for the evaluation of forest goods and services	UNFF
Use reliable evaluations and periodic assessments to make timely decisions	UNFF
Use environmental Impact Assessments	UNFF and CIFOR
Use resource assessments and monitoring systems	World Bank
Use national forest assessments	UNFF
Require forest management plans	World Bank
Use survey diagnostic tools	World Bank
Evaluate park management effectiveness	WWF
Establish parks and protected areas	WWF
Indicators	
Develop simple indicators for village level monitoring of health and quality of forest resources	World Bank
Countries should consider using criteria and indicators as an essential tool to report on progress towards sustainable forest management to UNFF.	FAO-ITTO
Use existing mechanisms (i.e. Regional Forestry Commissions, the CPF Task Force and existing expert groups) to enhance collaboration and coordination among the criteria and indicator processes	FAO-ITTO
Countries should develop cost-efficient data collection strategies for criteria and indicators and incorporate criteria and indicators in national forest assessments and inventories.	FAO-ITTO

Use existing forest expert groups and networks to support development and implementation of criteria and indicators.	FAO-ITTO and UNFF
Strengthen international cooperation, i.e. South-South and North-South cooperation, by sharing of experiences and knowledge on criteria and indicator processes and their (i.e. joint meetings, workshops, ministerial conferences, e-mail networks)	FAO-ITTO
Countries currently not members of any regional or international criteria and indicator process consider joining one.	FAO-ITTO
Voluntary approaches, such as certification schemes are encouraged to use criteria and indicators for monitoring sustainable forest management.	FAO-ITTO
Use national and international institutions' research on criteria and indicators that are difficult to assess: i.e. biological diversity, non-timber forest products, non-market values, soil and water conservation, carbon sequestration and social and cultural aspects and values. Coordinate with IUFRO, CGIAR centers, CBD, UNCCD and UNFCCC.	FAO-ITTO
FAO's use of the thematic areas based on existing sets of criteria common to regional and international criteria and indicator processes in t overall framework for the Global Forest Resources Assessment; help ensure that specific national or regional aspects are incorporated in the assessment process.	FAO-ITTO
Support international and national cooperation on the collection of data for criteria and indicators and improve compatibility of information from different sources.	FAO-ITTO
Countries should develop and incorporate criteria and indicators into policy frameworks and processes related to sustainable development. Cross-sectoral cooperation and coordination is essential.	FAO-ITTO and UNFF
Take into account existing work on criteria and indicators in its streamlining efforts, make specific recommendations to governing bodies of respective CPF members, and invite representatives of criteria and indicator processes to participate in the work of the Task Force. Task Force should also promote the use of forest criteria and indicators in other processes dealing with indicators.	FAO-ITTO
Countries and international organizations, including FAO and UNEP, should coordinate to achieve a common understanding on concepts and definitions, methods, and data collecting for criteria and indicators of forestry management	FAO-ITTO and UNFF
Use regional or national indicators to inform and increase awareness of decision makers and the public on the status of, and important changes in, forests and their impacts other sectors.	FAO-ITTO
Promote participation of all relevant stakeholders in a transparent, ongoing process for the development, implementation and monitoring of criteria and indicators; Use innovative mechanisms as needed in order to strengthen political commitment and develop capacity for such work	FAO-ITTO
Establish communication networks for criteria and indicators; should consider the perceptions, needs and capability of different stakeholder groups (forest owners, industry, forest dependent communities, urban dwellers, indigenous groups, etc.).	FAO-ITTO
Identify or establish as needed national and sub-national bodies to promote and monitor implementation of criteria and indicators.	FAO-ITTO

Countries with limited capacity should consider staring with an easily measured and understood core set of indicators, and expand to cover other indicators of sustainble forest management. Local and forest management unit level indicators should address the specific needs of communities, small landowners and forest managers.	FAO-ITTO
Universities and other educational institutions can incorporate the latest information on sustainable forest management in their curricula and provide skills for developing and implementing criteria and indicators including stakeholder participation, conflict management and public outreach.	FAO-ITTO
Engage related sectors such as water, energy, health, agriculture and biological diversity in SFM and criteria and indicators, to increase awareness of the forest sector's work on criteria and indicators and the potential application of this work to other sectors and maintain forests on international and national policy agendas	FAO-ITTO
Seek support for work on criteria and indicators through FAO, ITTO, the Global Environment Facility (GEF) and other relevant organizations and mechanisms.	FAO-ITTO
Developing countries should create an environment to attract domestic and foreign investment in the forest sector, including for implementation of criteria and indicators	FAO-ITTO
Integrate criteria and indicators for sustainable forest management, into the overall process of the formulation, implementation, monitoring and evaluation of national forest programs	UNFF
Apply national level criteria and indicators for SFM in national forest assessment	UNFF
Establish and clarify links between criteria and indicators employed at the national level and at the subnational or at the forest management unit/operational levels	FAO-ITTO and UNFF
Indicator programs for national-level criteria and indicators should consider specific country conditions, as well as international and regional implications. Countries and administrators of the indicator programs should recognize the need to further refine and develop indicators, which may require further data research and field testing.	UNFF
Use transparent methods for the measurement of indicators and the collection, assembly, storage and dissemination of data	UNFF
Research	
Collect data defining sustainable production levels	CIFOR
Investigate importance of illegal logging in international trade	EU
Collect and organize baseline data on forest resources and their uses	FAO-Global Witness-RIAA
Gather data and provide analysis so as to enable monitoring of forest resources.	UNFF
Promote research to further develop forest valuation methodologies, in particular those related to deforestation and forest degradation, erosion, and criteria and indicators	UNFF
Improve statistical systems and generate baseline data and information	World Bank

Research methodologies for low cost monitoring of the health and quality of forest resources.	World Bank
Technology	
Develop and implement reduced impact harvesting and extraction guidelines	CIFOR
Use Reduced Impact Logging (RIL)	CIFOR
Assess and identify national technological requirements and capabilities	UNFF
Perform technological research into low cost log tracking systems and options for effective chain of custody analysis	World Bank

Costa Rica Biodiversity Measures
Source: (WO CHING Sancho, August 2001)
Capacity Building and Governance
Strengthen national capacity re: ex situ conservation: MINAE proposal to Japan to build a public wildlife rescue center.
Develop capacity for preventing social, economic, and environmental risks: Biosafety Commission needs to be strengthened, and a legal framework needs to be created.
Strengthening Mechanisms: SETENA needs to have more technical capacity and better guidelines for environmental impact evaluations and monitoring..
Strengthen Public Awareness on Biodiversity: INBIO Park demonstrates 3 ecosystems w/exhibitions and classrooms (Obando, 2001) **Define national strategy for protection and development of marine and coastal resources:** Needs to have legal framework and program re-assessment.
Introduce environmental issues in formal education: MINAE uses TV and radio campaigns.
Establish formal and informal mechanisms to provide public information for conservation and sustainable production re: biodiversity: INBIO/SINAC publish biodiversity issues. 10 publications available (Obando, pers. Comm, 2001)
Conservation, Resource Planning, Technology, and Research
Strengthen land use planning (national and regional): planning needs to incorporate conservation and development goals. Implementation needs to be addressed.
Strengthen research activities on sustainable use and conservation of biodiversity: Every Conservation Area has an independent research strategy, which should be adaptable to one . Guanacaste has research as a main activity. Also, as part of INBIO-SINAC agreement 26 studies in since Cons. Areas pursuant to National Biodiversity Strategy (citing Obando, 2001)
SFM
Establish mechanisms for access to biodiversity resources and ensure fair and equitable benefit sharing (i.e. indigenous peoples' rights, intellectual property, legal framework, training, and strengthen National Commission on Biodiversity Management.

Strengthen actions to internalize costs of environmental services and incentives for sustainable use of biodiversity: PPSA environmental services payment program needs to be strengthened. Other mechanisms can be created.
Consolidate national efforts re: in situ conservation: Pay for private lands in different protected areas. National parks and reserves are protected already, where there are less than 10% private land.
Strengthen national capacity for sustainable management of biodiversity in public and private sectors: Needs involvement of all stakeholders, not just government.
Establish cross-institutional and cross-sectoral coordination re: biodiversity: Government has made efforts with civil society, but needs to strengthen environmental agencies and coordinate. It is stated that the National Commission on Biodiversity Management needs to have its management capacity developed to realize its responsibilities.

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