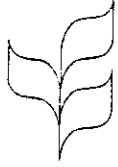




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Third meeting

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1 to 5 September 1997

**EXPLORING BIODIVERSITY INDICATORS AND TARGETS UNDER
THE CONVENTION ON BIOLOGICAL DIVERSITY**

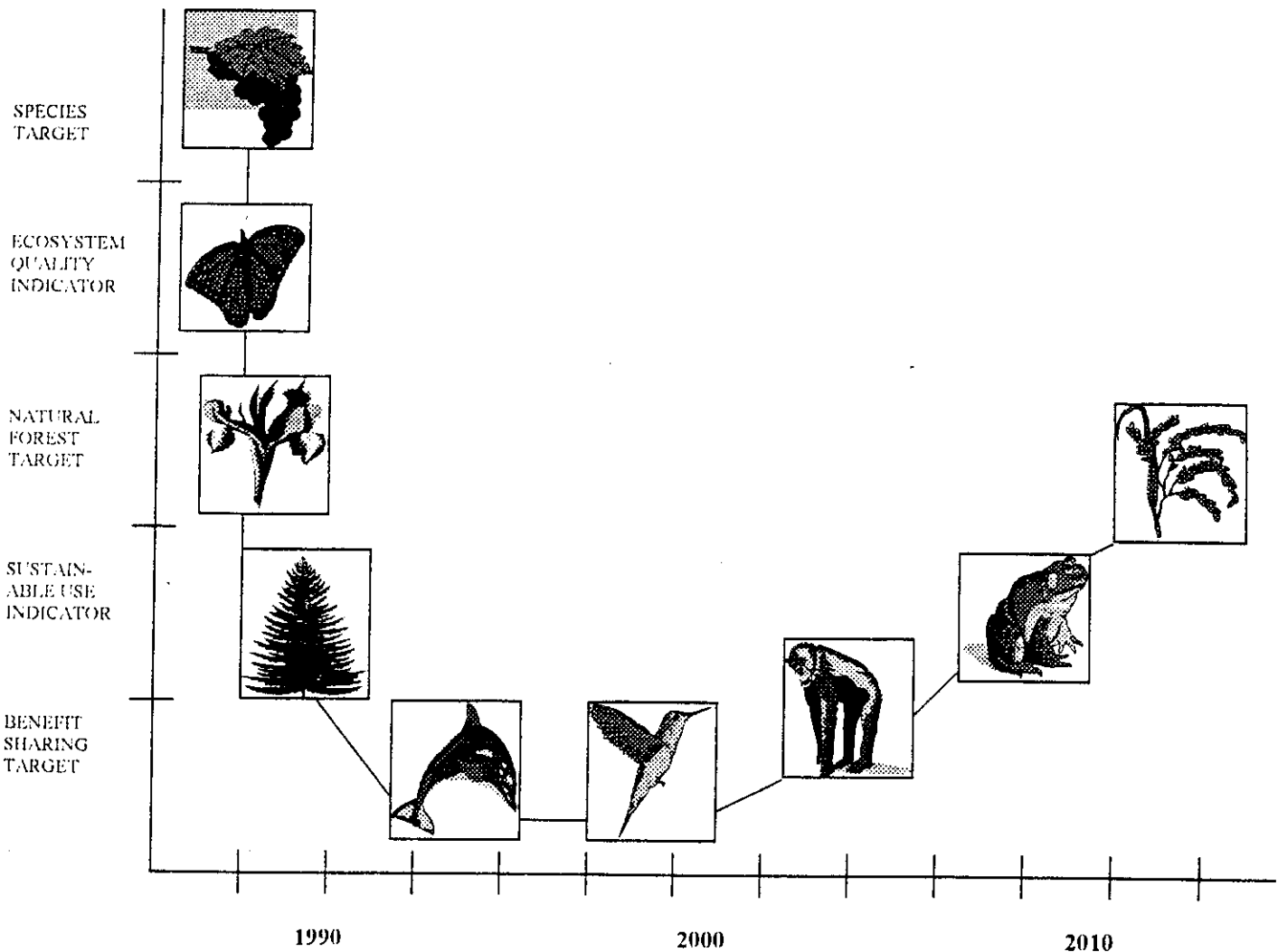
A SYNTHESIS REPORT OF A MEETING OF
THE GLOBAL BIODIVERSITY FORUM

EXPLORING BIODIVERSITY INDICATORS AND TARGETS UNDER THE CONVENTION ON BIOLOGICAL DIVERSITY (CBD)

A synthesis report of a meeting of the Global Biodiversity Forum (GBF)

In April 1997, at U.N. Headquarters in New York, a meeting of the GBF was held to explore the development and application of concrete biodiversity targets and tangible indicators (or measures) of progress as tools for achieving the objectives of the CBD. This report provides a synthesis of the results (including submissions from those unable to attend), and is intended as a contribution to the effective implementation of the CBD worldwide.

(August 21, 1997)



The Global Biodiversity Forum (GBF)

The sixth meeting of the GBF was held at U.N. Headquarters in New York on the topic of biodiversity indicators and targets. The GBF provides for an independent, open and strategic mechanism to foster analysis and unencumbered dialogue and debate among interested parties to address priority ecological, economic, institutional and social issues related to options for action to conserve biodiversity, and use biological resources sustainably and equitably. The GBF is designed to contribute to the further development and implementation of the CBD and other biodiversity-related instruments at the local, national and international levels. Meetings of the GBF are held just prior to intergovernmental meetings under the CBD (e.g., SBSTTA and COP). Additional GBF meetings are held on a regional basis and in conjunction with other international processes (e.g., a session was held around the 1997 meeting under the Convention on International Trade in Endangered Species).

PREFACE

Background. This report provides a synthesis of the results of and inputs into a meeting of the Global Biodiversity Forum (GBF) entitled: "Dialogue on Biodiversity Indicators and Implementation Targets". The meeting, which was held 3 - 4 April 1997 at U.N. Headquarters in New York, was co-sponsored by a broad partnership of ten institutions and governments: IUCN - The World Conservation Union; United Nations Environment Programme (UNEP); World Resources Institute (WRI); the Governments of Costa Rica, Denmark and Sweden; Biodiversity Action Network (BIONET); Center for International Environmental Law (CIEL); World Wide Fund for Nature International (WWF) and Worldwatch Institute.

This report, along with a 'companion' document: *Strengthening National Implementation Reports under the Convention on Biological Diversity*, and planned follow-on activities -- such as a set of in-depth, country-specific case studies of efforts to develop/apply biodiversity indicators and targets -- are elements of the **Biodiversity Indicators and Targets Initiative (BITI)**. The BITI -- organized by Biodiversity Action Network (BIONET) (see box below) -- seeks to support the implementation process under the Convention on Biological Diversity (CBD) by advancing the debate, and catalyzing action and greater coordination among efforts on this topic. *Strengthening National Implementation Reports under the CBD* (available through BIONET) is a Discussion Paper on biodiversity indicators, targets and other types of information that could be included by CBD Parties in their national reports. It presents a possible structure for organizing and summarizing such information, and specific examples of the types of indicators, targets, etc. that could be included in national reports. The Discussion Paper is being made available as an official information document at the SBSTTA-3 meeting under the CBD (UNEP/CBD/SBSTTA/3/Inf.15).

As a first activity in the BITI, the GBF meeting was designed to examine and exchange information on a wide range of *national-level* biodiversity indicators and targets that could be used by CBD Parties (governments) and biodiversity stakeholders as tools to support *tangible* progress toward achieving the objectives of the CBD. More specific objectives of the GBF meeting were:

- to raise awareness of basic concepts, terms, issues and recent developments related to biodiversity indicators and implementation targets;
- to examine a wide range of options for biodiversity indicators and targets (including general approaches and specific indicators/targets), to explore their potential and proven utility, and to identify areas of agreement and disagreement; and
- to develop options and recommendations for a "core set" of national-level biodiversity indicators that could be incorporated by CBD Parties into future national implementation reports.

Participants in the GBF meeting included over 85 leading scientific, technical and policy experts (e.g., representatives of: 25 governments, key NGOs and indigenous groups active in the biodiversity field, the Secretariat to the Biodiversity Convention, The World Bank, UNEP and UNDP). Additionally, many individuals from around the world unable to attend the GBF meeting sent in submissions as input. This report reflects a synthesis of these submissions, full written presentations prepared for the meeting, and ideas and information raised during the meeting itself.

Contents and structure of report. Following a summary of the presentation by Dr. Calestous Juma (Executive Secretary of the CBD) on the current status of CBD implementation, this report includes the following sections:

- Section I:** Introductory information on indicators, targets, and related topics.
- Section II:** Overview of the role of indicators/targets in national planning and reporting.
- Section III:** Preliminary considerations for developing a universal "core set" of national-level biodiversity indicators.
- Section IV:** Options for specific indicators that could be included in a universally applied "core set".
- Section V:** Preliminary considerations for how Parties begin developing/applying country-specific indicators and targets for implementing national biodiversity action plans.
- Section VI:** Possible next steps for advancing widespread development and application of meaningful biodiversity indicators and targets.
- Annexes:** Summaries of presentations delivered at the GBF meeting, a list of participants in the meeting and a bibliography of materials on this topic.

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Biodiversity Action Network (BIONET) -- a network of non-governmental organizations (NGOs) working to promote effective implementation of the Convention on Biological Diversity (CBD). BIONET catalyzes and coordinates joint NGO programs involving its members and partners, and provides a biodiversity information clearinghouse service to its members and contacts.

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EXECUTIVE SUMMARY

1. BACKGROUND

Five years after the signing of the Convention on Biological Diversity (CBD) at the Rio Earth Summit, many fundamental questions have arisen around what is required for its effective implementation -- in *tangible* terms. This is not surprising since biodiversity is an extremely broad and often poorly understood term, the CBD's scope is vast, and most of the obligations in the CBD text are crafted in relatively general language.

Given the above factors, governments and biodiversity stakeholder groups are struggling to develop (i) tools to measure tangible progress (indicators); and (ii) more concrete implementation targets for achieving the CBD's objectives. Recent evidence indicates a growing consensus that such tools and measures are indispensable. For example, at the COP-3 meeting under the CBD (November 1996), governments ("Parties") took two formal decisions that reflect this growing consensus:

- (i) Paragraph 5 of Decision III/9: "Encourages all [CBD] Parties to set **MEASURABLE TARGETS** in order to achieve biodiversity conservation and sustainable use objectives"; and
- (ii) Paragraph 2 of Decision III/10 formally "endorses" work under the CBD to establish a "**CORE SET**" OF BIODIVERSITY INDICATORS to be included by governments in their national implementation reports.

While interest in this topic is rapidly growing, there has been relatively limited in-depth discussion and analysis of the merits and operational utility of various biodiversity indicators and targets. And on a related subject, although the first set of national reports on CBD implementation progress is due 1 January 1998, only the most general guidance on the contents of these reports has been provided by the COP. To help advance debate and understanding, an international dialogue on indicators and targets was launched in April 1997 at a meeting of the Global Biodiversity Forum (GBF) at U.N. Headquarters in New York. The meeting focussed on *national-level* indicators and targets

2. SYNTHESIS OF GBF MEETING RESULTS AND INPUTS

General

- (i) **CBD Parties should incorporate meaningful sets of country-specific, national-level biodiversity indicators and targets into their national biodiversity strategies and action plans (NBSAPs).** Most indicators and targets will need to be country-specific, and should be incorporated, at the earliest possible date, into NBSAPs. Indicators and targets for other geographic levels may also be needed.
- (ii) **Biodiversity indicators and targets should be considered together.** A crucial relationship exists between indicators and targets, suggesting the need to address these topics together. It is difficult for a country to develop the most meaningful and policy-relevant indicators if it is unclear what the future target or goal is. Linking targets and indicators can help to present clear choices for decision-makers on the types of corrections, actions and policy reforms that are needed.
- (iii) **The linkage between biological resources and biological diversity needs to be considered.** In developing biodiversity indicators and targets, it is important to recognize that maintenance of biological *resources* more generally is inseparably linked to maintenance of biological *diversity*. Indeed, some CBD provisions (e.g., Article 10a) explicitly cover biological *resources*, underscoring the importance of the sustainable use of biological resources in achieving CBD objectives.

- (iv). **Inclusion of indicators and targets in CBD national implementation reports is crucial for information sharing, national planning processes, aggregation of data, and CBD compliance.**
- (v) **Financial and other indicators/targets can help to systematically approach the question of adequate funding to achieve CBD objectives at all levels. This area has been largely neglected and could require more rigorous analysis and attention.**

Indicators

- (i) **Natural capital (including biological) indicators need to be developed and applied by Parties to sustainable development planning.** An effective set of sustainable development indicators requires a balance among environmental, economic and social elements. The current lack of "natural capital" indicators (particularly biological indicators) contributes to an undervaluing of a nation's biological wealth. This is a *major* gap that needs to be addressed urgently, in order to complement the use of existing economic and social indicators in planning.
- (ii) **Parties should begin applying feasible biodiversity indicators immediately, rather than wait until the development of highly refined indicators and monitoring systems.** The development and effective application of biodiversity indicators is an iterative, long-term process. Over the short-term, the best available and most feasible indicators should be applied. These, and others, should be tested and refined over time.
- (iii) **In implementing Decision III/10 by the CBD's Conference of the Parties (COP), the COP should consider (at its fourth meeting in May 1998) a universal core set of national-level indicators, which could be included by all Parties in the second set of national implementation reports under the CBD.** A universal core set, which would be demand-driven and applied by all Parties, could help to provide regional and global pictures of biodiversity problems, threats, issues and status, and help in solving critical problems of a regional and global nature.
- (iv) **In their first set of national implementation reports under the CBD, Parties should elaborate a set of indicators of the *effectiveness* of Article 6 implementation.** The first set of national reports under the CBD will focus primarily on implementation of CBD Article 6 (which covers national biodiversity planning and integration of biodiversity into sectors and cross-sectoral areas). To be most effective, these reports should include information demonstrating *qualitative* dimensions of the national biodiversity strategies and actions plans that have been adopted (including measures of the commitment behind them) and tangible steps taken around integration.

Targets

- (i) **In implementing COP Decision III/9, Parties should set concrete and measurable targets covering a wide range of areas. A synthesis of existing, relevant, biodiversity-related targets should be included by all Parties in either the first or second national implementation reports under the CBD.** To meet CBD objectives and obligations under specific provisions, concrete and measurable targets should be set by Parties. Such targets can help to make biodiversity -- and the Convention's implementation -- more tangible and meaningful to policy-makers, various stakeholder groups and the general public.
- (ii) **Parties should consider the relationship between performance targets and capacity targets, and ways to link these.** Capacity targets may be a useful tool for relating resource/capacity needs to specific biodiversity performance targets and objectives. As an example, Parties could consider

what specific target levels for institutional, human resource and financial capacity are needed to achieve performance targets for key ecosystems such as forests.

Possible next steps

- (i) **Advance work through an expert of liaison group under the CBD SBSTTA.** Such a group could develop a core set of biodiversity indicators through pilot projects and testing programs, and pursue work in other areas related to indicators and targets.
- (ii) **Convene official regional and sub-regional meetings.** Workshops and other types of meetings could be held on specific topics (e.g., forest or freshwater indicators/targets, capacity development around indicators, etc.) or more general topics. They could be designed to improve understanding and knowledge among policymakers, experts, practitioners, etc.
- (iii) **Engage network of collaborating centers for GEO-2.** The network of collaborating centers for UNEP's second Global Environmental Outlook could be engaged in work in this area to help pool scarce resources and promote regional capacity, share information, etc.
- (iv) **Conduct a continuing, informal dialogue process and facilitate an international network on biodiversity indicators and targets is needed.** A continuing, informal, global dialogue process is needed to explore in greater depth a wide range of options and issues. To support and complement this dialogue process, an international network of practitioners involved in the preparation of national reports and the development of indicators and targets could be established, to provide an effective, ongoing mechanism for information sharing and dissemination, cooperation and coordination. Existing networks such as IUCN and BIONET could help facilitate such a network. National dialogue processes are also needed.
- (v) **Conduct a set of case studies on country-specific indicators/targets.** A set of case studies could examine actual experiences in developing and applying indicators and targets in developed and developing countries.
- (vi) **Parties could consider the need for a long-term CBD implementation plan containing concrete targets and relevant indicators of progress..** At the COP-4 meeting in May 1998, Parties will review the overall operations of the CBD. This could provide a useful opportunity to examine some type of long-term implementation plan under the CBD.

MESSAGE BY THE EXECUTIVE SECRETARY OF THE CONVENTION ON BIOLOGICAL DIVERSITY

*A summary of the presentation by Dr. Calestous Juma,
CBD Executive Secretary, during the opening session of the GBF meeting**

It has been five years since the signing of the Convention on Biological Diversity (CBD) and three and a half years since it came into legal force. We have now reached a critical moment in the history of the CBD because of the important issues that are starting to be addressed under the Convention and because of the U.N. five-year review of progress since the Rio Earth Summit. This meeting of the GBF, and follow-on efforts to identify and promote effective biodiversity indicators and targets, is a very important contribution to the CBD and Rio follow up processes.

1. THREE CATEGORIES OF CONCERNS ABOUT THE CBD

Recently, we have entered a period of introspection on the viability of the CBD and related institutions. There are two basic categories of concerns that have been widely voiced:

A. The Enormous Scope of the CBD. The CBD addresses -- in effect -- all life on Earth. Some of its institutional characteristics are unlike other international institutions, instruments and processes. It is therefore not surprising that fundamental questions arise such as: What can the *CBD* contribute in the area of biodiversity? What is its "value added"? How can other institutions and conventions help support the implementation of the CBD? Where are the synergies and how can they be realized?

B. The Effectiveness of the CBD. Several concerns regarding the effectiveness of the CBD have been voiced. For example, from a legal standpoint, many have asked whether the provisions of the CBD have 'teeth'. In some respects, the CBD probably has too many teeth. We have known that the CBD *empowers* Parties and institutions to take broad-ranging actions, but now, significantly, there are some indications that the Convention is starting to catalyze tangible and important actions.

From an institutional development and political will standpoint, many have observed that the CBD has been stuck in a period of 'delayed adolescence,' characterized by an anxiety of the international community to see meaningful action to halt biodiversity loss, and a sense of frustration among some with the pace of progress. However, in the past three years, we have seen some encouraging indications that the CBD may be growing out of its adolescence and moving into its operational phase. In this regard, four areas of progress are worth highlighting:

- (i) *Strengthening of the International Implementation "Machinery" of the CBD.* This includes, in particular: the CBD's governing body (Conference of the Parties, or COP), which makes formal decisions; the primary subsidiary body, known as SBSTTA (which provides expert advice on scientific, technical and technological matters); and the clearinghouse mechanism (for exchanging ideas, experiences, expertise and other information to support CBD implementation).
- (ii) *Forging of Partnerships.* We have seen the forging of partnerships and meaningful cooperation between the CBD and, for example, The World Bank, the U.N. Commission on Sustainable Development (including its Intergovernmental Panel on Forests) and the U.N. Food and Agriculture Organization. Cooperation with other biodiversity-related conventions was made a standing item on the agenda of every COP meeting, and memoranda of understanding have now been signed with the RAMSAR Convention (on wetlands of international significance), the

Convention on International Trade in Endangered Species (CITES) and other agreements.

- (iii) *Stimulating Action at the International Level.* As an example, the CBD process has initiated formal negotiations for a legally-binding protocol to the CBD on the safe handling, transfer and use of biotechnology. The *Jakarta Mandate on Marine and Coastal Biodiversity* -- which recommends a strong set of actions in five areas to address biodiversity loss in oceans and along coasts -- was formally adopted at the COP-2 meeting. This is now stimulating reviews within major intergovernmental organizations on ways to strengthen their programs in this area, and has set in motion a long-term experts process under the CBD to help operationalize the *Jakarta Mandate*. On another front, the CBD has helped increase the recognition of the importance of the Global Environment Facility as a financial mechanism to support biodiversity activities in developing countries.
- (iv) *Setting the International Biodiversity Agenda.* The COP has developed a three-year agenda to consider actions needed in four specific ecosystems:
- COP-2 (1995): marine and coastal systems
 - COP-3 (1996): agricultural systems
 - COP-4 (1998): inland aquatic systems and forests

By focussing on one or two specific ecosystems at each COP meeting, this has helped to set the biodiversity agenda for the larger international community, focussing the attention of individual governments, nongovernmental stakeholder groups and intergovernmental agencies.

- (v) *Stimulating Effective National Implementation of the CBD.* The Convention empowers sovereign, national entities to act: e.g., to develop comprehensive national biodiversity strategies and action plans (NBSAPs), to reform existing legislation as necessary, to adopt supportive incentive systems, etc. Some 70 countries have already completed their NBSAPs, and many countries are now adopting new laws and policies, and taking other concrete actions. The national implementation reports required under the CBD will be a major source of information to assess the degree to which national laws and policies are in fact being reformed. GEF-supported enabling activities is playing a central role in helping developing countries get started.

2. HOW DO WE MEASURE PROGRESS?

This brings us to perhaps the key question to be addressed at this GBF meeting: How do we measure tangible progress in achieving the objectives of the CBD? The above actions and examples seem anecdotal, with no obvious pattern per se. The COP, in 1994, adopted a medium-term work program -- in effect, a "pilot phase" of the Convention. This phase will end at the COP-4 meeting in May 1998, with the formulation of a long-term work program for the COP. Part of a long-term program will likely be an agreed-upon system for measuring and assessing tangible progress toward achieving the CBD's objectives.

In light of the above, this GBF meeting could put forward recommendations and ideas to the CBD Secretariat and the COP in the following areas:

- **Long-term CBD work program.** What kind of issues should receive priority attention in such a work program? What specific objectives and timeframes should be considered? What should be the main elements of the modus operandi of the Convention?
- **Assessing achievements and effectiveness of the Convention using indicators and targets.** This is a very difficult and undeveloped area; much of the science is still in its infancy. Still, the COP has formally decided (in Decisions II/17, III/9 and III/10) that national implementation reports by

Parties should include targets and indicators, that Parties should set measurable targets in order to achieve biodiversity conservation and sustainable use objectives, and that a core set of biodiversity indicators should be established and included by governments in their national implementation reports.

In short, CBD Parties must decide on which indicators of progress are the most important, and what types of targets are needed. The CBD Secretariat intends to work closely with the SBSTTA Chairman and a liaison group of experts to assist in the development of indicators and targets, as well as in the area of biodiversity monitoring. I will ensure that any proposals or major recommendations emerging from this GBF meeting and submitted to the Secretariat will be considered carefully by the SBSTTA and the liaison group of experts.

* This is an unofficial summary prepared by the drafters of this report.

SECTION I:

INTRODUCTION TO BIODIVERSITY INDICATORS, TARGETS AND OTHER REFERENCE POINTS

1. HALTING BIODIVERSITY LOSS: THE CHALLENGE OF SETTING CONCRETE TARGETS AND DEFINING MEASURES OF TANGIBLE PROGRESS

A. Introduction. At the Rio Earth Summit in 1992, over 150 heads of state from around the world signed the historic Convention on Biological Diversity (CBD) -- the first comprehensive international agreement committing governments to conserve and sustainably use the Earth's biological resources. Over 165 governments have now ratified the CBD, and as "Parties," have agreed to be legally bound to take a holistic, cross-sectoral and ecosystem-based approach to halting biodiversity loss. For example, Parties are obligated to: (i) establish a system of protected areas, giving special consideration to threatened species/ecosystems; (ii) create economic incentives for conservation and sustainable use of biodiversity; (iii) adopt procedures to assess the biodiversity impacts of proposed projects; and (iv) protect rights of indigenous/local communities (as they relate to biodiversity), and promote customary use of biodiversity.

Five years after Rio, the CBD implementation process is moving forward in countries worldwide, as well as at the intergovernmental level through the CBD's governing body -- Conference of the Parties (COP) -- and its other implementation "machinery". However, many fundamental questions have been raised regarding how to define and measure effective implementation of the CBD in *tangible* terms. This is not surprising since biodiversity is an extremely broad and often poorly understood term, and since the CBD's scope is vast, covering -- in effect -- all life on Earth. Also, while the CBD text contains some broad targets (e.g., establishment of a fair and equitable benefit-sharing regime around the use of genetic resources), most of the obligations are crafted in relatively general language.

Given these factors, governments and biodiversity stakeholder groups are struggling to develop (i) more concrete implementation targets for achieving CBD objectives; and (ii) indicators to measure tangible progress toward achieving these targets and CBD objectives. Recent evidence indicates a consensus that such 'tools' are indispensable. For example, at the COP-3 meeting under the CBD (November 1996), governments took two formal decisions that reflect this consensus:

- (i) Paragraph 5 of Decision III/9: "Encourages all [CBD] Parties to set **MEASURABLE TARGETS** in order to achieve biodiversity conservation and sustainable use objectives"; and
- (ii) Paragraph 2 of Decision III/10 formally "endorses" work under the CBD to establish a "**CORE SET**" OF BIODIVERSITY INDICATORS to be included by governments in their national implementation reports. This core set of indicators is to cover, *inter alia*, the four major ecosystems on the COP agenda (forest, agricultural, marine/coastal, and inland water systems).

As further evidence of the increasing importance being attached to these tools for achieving CBD objectives, a growing number of efforts are underway worldwide -- by individual governments, nongovernmental organizations (NGOs), indigenous groups, intergovernmental organizations and academia -- to develop and apply biodiversity indicators and targets.

2. AN INFORMAL DIALOGUE ON BIODIVERSITY INDICATORS AND TARGETS

While interest in this topic is rapidly growing, to date, there has been relatively limited in-depth discussion and analysis of the merits and operational utility of various biodiversity indicators. Even less attention has been devoted to specific targets for implementing the CBD. Moreover, there has been remarkably little analysis and discussion of specific *capacity* targets that could be established, including ones needed to achieve specific biodiversity *performance* targets. And although the first set of national reports on CBD implementation progress is due 1 January 1998, only the most general guidance on the contents of these reports has been provided by the COP.

Given the above, and the results of wide consultations in recent months with governments and various biodiversity stakeholders, a clear need exists for an ongoing and informal, global dialogue to advance debate on this subject, and to catalyze action leading to the widespread development and application of effective biodiversity indicators and targets for implementing the CBD. To launch this dialogue, a meeting of the Global Biodiversity Forum (GBF) was held in April 1997 at U.N. Headquarters in New York.

3. EXPLANATIONS OF KEY TERMS

As a preliminary step in exploring biodiversity indicators and targets, it is important to clarify key terms. While there are no concise definitions of these terms found in the CBD text or other widely adhered to biodiversity-related agreements, there seems to be general agreement on the following working definitions and explanations of biodiversity indicators, targets and various reference points:

- (i) **Biodiversity indicators** summarize complex and sometimes conflicting information to *indicate* the overall status and trends for (i) the state of biological resources; (ii) biodiversity pressures; (iii) impacts of these pressures; and (iv) responses to these pressures. They document progress toward some desired outcome, and are usually *quantitative* measures against which some aspects of performance can be assessed. Indicators present some limitations and problems which need to be considered. Macro-scale indicators may be too coarse to detect important on-the-ground changes. Cause-and-effect relationships are complex and often difficult to determine definitively.

It is the use of reference points, such as targets or benchmarks (see below), that distinguish indicators from statistics. An example of a statistic would be "total number of endemic plant species in country X". By adding a reference point -- in this case, by relating total number of endemics to total number of species -- an indicator can be derived: "endemics as a percent of total number of plant species". Use of a reference point helps the audience (e.g., decision-makers, the public, etc.) understand the significance of the statistic. (In this case, by indicating if endemics make up a significant percentage of the flora in country X.) While indicators can be developed at many different geographic levels (from local to global), this report is primarily concerned with *national-level* indicators. Most national-level indicators will be country-specific.

- (ii) **Biodiversity index** is an aggregation of multiple indicators providing information on the overall status and trends of biological resources, or related pressures, impacts and responses. For example, an index for forest fragmentation (pressure index) could be derived by aggregating indicators on forest patch size and connectivity of forest patches.
- (iii) **Reference points**, including targets, benchmarks, and thresholds, are an integral part of indicators as they provide a means for observing and gauging the *significance of change*. They can be used, for example, to distinguish significant events that require urgent attention, to help set policy objectives and priorities, and to monitor actual performance.
- (iv) **Targets**, which are often linked to timetables, are *measurable objectives or concrete end-points* set out in the planning process. Targets can be quantitative or qualitative. Realizing such targets can reflect *tangible* progress toward achieving the objectives of the CBD. As an example of a quantitative target, Indonesia's Biodiversity Action Plan includes a target of extending the total marine protected area system to cover 20 million hectares by the year 2000. In the qualitative area, Country X might set a target of the year 2000 for

establishing a comprehensive national system for monitoring the status and trends of priority species and ecosystems. These examples could be referred to as *performance targets*. *Capacity targets* could also be established around such areas as human resources and institutional development. Examples could include establishing X biodiversity research facilities by Year X, or building a nationwide protected area management staff of X. While targets can be developed at many geographic levels, this report primarily addresses *national-level targets*.

- (v) **Baselines** are *particularly important reference points* since they serve as a 'starting line' for measuring change from a certain date or state. For example, if Country X enacted in 1996 the goal of "no net wetlands loss," the baseline for measuring policy performance related to this target would be total extent of wetlands, in hectares, as of 1996. One biodiversity indicator for measuring performance would be total area of wetlands in some future year as a percent of that found in 1996. Given the lack of available data, some baselines may need to be postulated (assumed to be true). In regards to the CBD, two possible baselines that might be considered are: (i) pre-industrial state; and (ii) 1993 state (the year the CBD came into force). Using such baselines, indicators could provide "pictures" of biodiversity change due to human activities in modern times (anthropogenic impacts) and change since the start of the Convention.
- (vi) **Thresholds**, or standards, are usually *limits that serve an 'early warning' function*. Crossing such thresholds generally signals a problem is at hand that requires timely action. Thresholds may be formalized within laws and regulations, or be based on scientific consensus. For example, international and national agencies charged with monitoring capture fisheries use population number thresholds for assessing the status of fish stocks and determining if they are being overfished. One indicator of the status of a country's capture fisheries is the percentage of stocks that are overfished or depleted. As another example, other thresholds have been developed to signal threatened or endangered status of various species and populations.

4. THE RELATIONSHIP BETWEEN BIODIVERSITY INDICATORS AND TARGETS

A particularly important relationship exists between indicators and targets, suggesting the need to address these topics together. One important function of indicators is to help measure progress. But progress toward what desired outcome? Put simply, it is difficult for a country to develop the most meaningful and policy-relevant indicators if it is unclear what the future target or goal is. Furthermore, linking targets and indicators can help to present clear choices for decision-makers on the types of corrections, actions and policy reforms that are needed. Governments and biodiversity stakeholder groups should explore -- in depth -- the relationship between these two important tools.

SECTION II:

THE ROLE OF BIODIVERSITY INDICATORS AND TARGETS IN NATIONAL PLANNING AND REPORTING UNDER THE CBD

1. NATIONAL PLANNING UNDER THE CBD

A. Adaptive national planning process: an overview. An *adaptive, national planning process* is a key element of effectively implementing the CBD. Indicators and targets have a central role to play in this process (see Diagram 1), which includes the following steps:

- (i) Assess/monitor status of existing biodiversity (genetic, species and ecosystem levels) and related policies;
- (ii) Synthesize this information into national reports, thereby providing a basis for evaluating the effectiveness of existing programs and policies;
- (iii) Adopt biodiversity and related strategies and action plans containing concrete targets, including new policies, laws, and other measures where needed;
- (iv) Implement biodiversity strategies and action plans; and
- (v) Monitor and evaluate (Step 1) biodiversity components and policies using indicators as assessment tools.

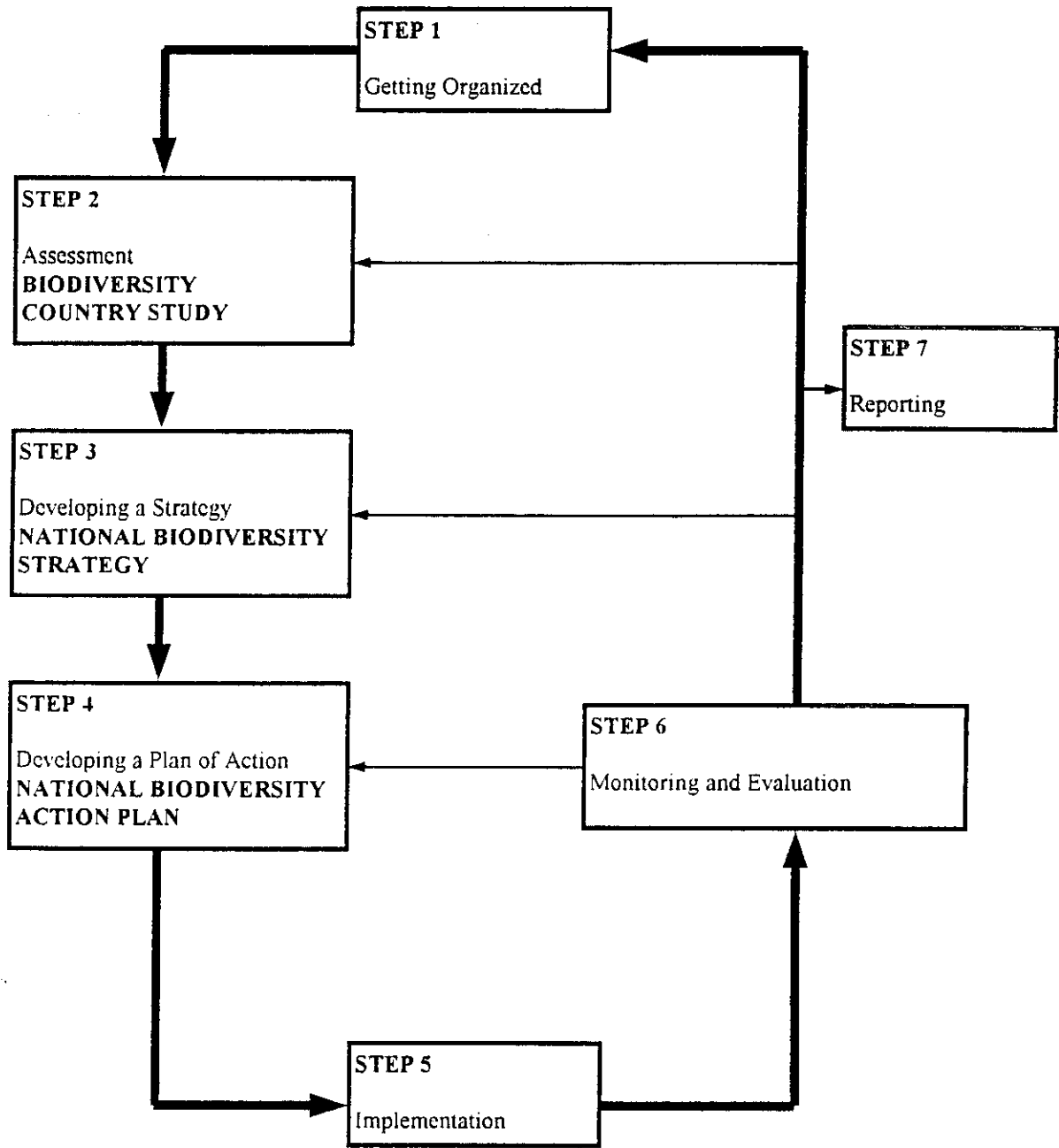
B. The role of indicators in national planning processes. As part of national planning processes, indicators generally answer the following questions:

- (i) Have programs and policies been effectively implemented?
- (ii) Have objectives/targets set out in the planning process been met?
- (iii) Are their sufficient resources (capacity) to implement plans?
- (iv) What is the current status of biodiversity and how has it changed?
- (v) Do policies, laws and other measures seem to be making a difference?
- (vi) Are there new problems or opportunities that must be addressed?

Just as gross national product (GNP) and unemployment rates are used as indicators of economies and *financial capital*, national-level biodiversity indicators can be developed to help assess the status of a nation's *natural capital* and the effectiveness of policies to conserve and sustainably use its biological resources. Indicators synthesize and aggregate raw statistics to make them readily understandable by decision-makers, and can become essential and practical tools in national planning processes for putting in place the necessary policies and taking the necessary actions toward halting biodiversity loss.

C. The role of targets in national planning processes. While the text of the CBD and formal decisions taken by the CBD's governing body (Conference of the Parties, or COP) include some broad targets, individual Parties are responsible for setting more specific implementation targets. As with indicators, targets play a central role in adaptive, national planning processes, and are key elements of effective implementation of the CBD. Of particular importance to planning processes, targets help to define a country's biodiversity priorities and its overall, long-term vision for conserving its biological resources. Furthermore, they provide evidence of the commitment of Parties to fulfill their obligations under the CBD, and provide a solid reference point for measuring progress.

**DIAGRAM 1:
Basic Steps for Biodiversity Planning and its
Relationship to the Planning Tools:
A Cyclic and Adaptive Process ***



* Excerpted from: Miller, Kenton R. and Steven M. Lanou. 1995. *National Biodiversity Planning: Guidelines Based on Early Experiences Around the World*. World Resources Institute, United Nations Environment Programme and The World Conservation Union. Washington D.C; Nairobi; Gland Switzerland.

2. NATIONAL IMPLEMENTATION REPORTS UNDER THE CBD

A. Reporting requirements under the CBD and relevant COP decisions. Article 26 of the CBD requires Parties to prepare periodic reports on (i) measures they have taken to implement the provisions of the Convention; and (ii) the *effectiveness* of these measures in meeting CBD objectives. This is a clear indication that the negotiators of the CBD wanted not only narrative statements in national reports, but also *qualitative* measures of the effectiveness of implementation. Indicators and targets are indispensable tools in this regard. Indeed, in recent decisions taken by the COP, governments have clearly stated the need to include biodiversity indicators and targets in their national implementation reports (see below).

B. The first set of national implementation reports under the CBD. The COP has decided that the first national reports "...should be submitted no later than 1 January 1998..." (Decision III/9), and should focus in so far as possible on measures to implement CBD Article 6 (requiring Parties to adopt national strategies and action plans and integrate biodiversity into sectoral and cross sectoral areas). Furthermore, the COP has provided some general guidelines for the contents of this first report (primarily in Decision II/17). For example:

Goals and objectives section: Determine "the *specific targets* to meet the local, national, and international goals in terms of protecting, assessing, utilizing, and benefiting from biodiversity and its components" (Section d of Annex to II/17);

Schedule section: "Present a *timetable* for the implementation of the various tasks, reflecting the priorities that have been assigned. *Note signposts to help signal progress or delay.*" (Section h of Annex to II/17); and

Monitoring and evaluation section: Give the *indicators* that will be used "...for tracking the results of the [biodiversity] action plan and for monitoring changes in the economy, environment and society." Also, present the individuals and organizations who will carry these responsibilities. (Section j of Annex to Decision II/17).

C. Other COP guidance for future national reports. The COP formally endorsed Recommendation II/1 of SBSTTA, which accorded high priority to the "*development of a core set of indicators for national reports.*" which, "should in the first instance be based on those which are known to be operational". Additionally, the CBD Executive Secretary has been instructed to develop "A list of options for consideration by the SBSTTA for capacity-building in developing countries in the *application of guidelines and indicators for subsequent national reports.*" The COP also decided that at its fourth meeting (May 1998, Bratislava), it will determine the intervals and form of subsequent reports, suggesting perhaps that more detailed guidance on the contents of future reports could be adopted at COP-4.

D. Discussion paper on incorporating indicators and targets into national reports under the CBD. The GBF meeting did not include detailed consideration of which indicators and targets would be most appropriate in CBD national reports, and how such information might be organized. However, as a follow-up to the GBF meeting, several of the co-sponsors collaborated on a 'companion' document to this report, entitled: *Strengthening National Implementation Reports under the Convention on Biological Diversity* (available through BIONET). This Discussion Paper outlines a menu of options for specific biodiversity indicators and targets that could be included by CBD Parties in their national reports. It also presents a possible structure for organizing and summarizing such information.

E. National reports and harmonizing information management. On a related topic, the COP has given a clear instruction on the need for cooperation with other biodiversity-related treaties and the need to

work towards increased harmonization of reporting and information management. Indicators and targets used in implementing and reporting for of one convention should be available to support the implementation of other conventions, which might result in the definition of *a core set of indicators and targets for the major biodiversity-related treaties*, such as the CBD, CITES, Convention on Migratory Species, Convention on Wetlands of International Importance and World Heritage Convention. A core set of indicators for these treaties can help to:

- identify trends and focus reporting;
- minimize reporting burdens on governments;
- improve analysis capacity among governments;
- improve the ability to coordinate work programmes among treaties;
- improve information quality, consistency and transparency; and
- support linkages with international agencies and regional treaties.

SECTION III:

A UNIVERSAL "CORE SET" OF NATIONAL-LEVEL BIODIVERSITY INDICATORS: PRELIMINARY CONSIDERATIONS

1. WHY DO WE NEED A UNIVERSAL CORE SET OF BIODIVERSITY INDICATORS?

Conditions among countries and regions vary greatly, and the bulk of national-level biodiversity indicators will be country-specific. However, a demand-driven, core set of universally applicable biodiversity indicators (measured at the national level) is a critical tool for helping CBD Parties answer questions and address problems that are of regional or global concern.

A. Potential applications of a universally-applied core set of national-level biodiversity indicators:

- (i) *To identify and track biodiversity trends, threats and related phenomena that are regional or global in nature, and to help develop solutions to regional or global problems.*
 - marine biodiversity threats to a large marine ecosystem from transboundary pollution
 - status of species (e.g., pollinators) of regional or global significance
 - coral reef bleaching worldwide
- (ii) *To highlight global or regional resource needs and trends related to CBD and Agenda 21*
 - capacity-building needs for establishing seed banks in Western Africa
 - financial needs for effective management of protected area systems in Southeast Asia
 - global-level financial needs for effective implementation of the CBD in developing countries
 - global trends in donor support for implementation of the CBD
- (iii) *To manage biological and other related resources that cross national borders*
 - highly migratory species such as some neotropical songbirds, marine mammals and commercially valuable fisheries
 - freshwater species in cross-border river and lake systems such as the Amazon and The Great Lakes
- (iv) *To provide information for (a) the CBD SBSTTA, to conduct broad assessments of the status of biodiversity and the effects of types of measures taken in accordance with CBD provisions [Article 25(2)]; and (b) the CBD Secretariat, to produce "Global Biodiversity Outlook" reports, which will periodically summarize major trends covering specific themes.*
 - global assessment of forest biodiversity
 - global assessment of the effectiveness of new management practices in mariculture, as called for in *The Jakarta Mandate on Marine and Coastal Biodiversity*
 - global outlook for inland water biodiversity
- (v) *To provide for some comparability among countries, creating incentives for countries to improve their performance, in such areas as:*

- donor country financial support for biodiversity
- support for technology transfer and development
- domestic financial commitments to implementing the Convention
- commitments to reducing adverse subsidies

(vi) *To assist donors in programming and coordinating international funding*

- addressing nationally-identified and global-level priority areas and biodiversity components
- addressing new and emerging threats and threats requiring special attention

(vii) *To facilitate eco-regional approaches to biodiversity*

- coordination of large marine ecosystem management
- joint research efforts through regional bodies using regionally aggregated data

B. Key questions to be answered through a universally applied core set of national-level biodiversity indicators. A preliminary step toward developing a core set of biodiversity indicators could be to identify the key *questions* that indicators can help to answer for policymakers. Some ideas are outlined below, and are broken down into questions related to four categories: (i) status of biodiversity components; (ii) pressures leading to biodiversity loss; (iii) response measures; and (iv) alerts to problems.

Status

- (i) What are the major trends in the status of biological diversity (genes, species and ecosystems)? Are conditions stable, improving or deteriorating?
- (ii) What is the state of knowledge of biological diversity?
- (iii) To what extent have geographic areas and major ecosystem types been identified, assessed for risk and prioritized in terms of needed action?
- (iv) Is progress being made in achieving major targets and objectives set out in planning processes?

Pressure

- (i) What are the most important direct and indirect threats to biodiversity?
- (ii) Are these primary threats to biodiversity stable, declining or worsening?
- (iii) What are the linkages between these primary threats and changes in biodiversity status?

Response

- (i) Have response programs and policies been implemented, and what effect are they having?
- (ii) Are sufficient resources being allocated to implement biodiversity-related plans?
- (iii) Are underlying as well as direct causes of biodiversity loss being addressed?
- (iv) Are new policy reforms and other actions needed?
- (v) To what extent has biodiversity been integrated into relevant sectoral and cross sectoral plans, programs and policies? How effective has this integration been?
- (vi) To what extent are existing financial and other incentives supporting the objectives of the CBD?
- (vii) To what extent have major biodiversity values and benefits of each country been identified, including socio-economic dimensions, and incorporated into policy actions?
- (viii) Is an effective biodiversity monitoring system in place?

Alerts

- (i) Are there early warning signs of problems that require urgent attention?
- (ii) Are there new opportunities for action requiring attention?

C. A multi-step process for developing and applying a core set of indicators. As discussions under the CBD implementation process begin to address the development and application of a core set of biodiversity indicators, a sequence of general steps, such as those outlined below, might be considered. These steps will need to be refined through further analysis.

- Step 1: Identify key questions to be answered using a core set of biodiversity indicators, and define specific roles of state, pressure, response and capacity indicators
- Step 2: Agree on a framework for a core set
- Step 3: Identify a cost-effective, demand driven, and relatively simple set of indicators that can draw upon readily available data and be developed over the short-term (this should be based on wide input and an effective vetting process)
- Step 4: Adopt a core set of standardized indicators
- Step 5: Identify key information and capacity gaps (i.e., define priorities for research, data collection, capacity development) toward building an effective monitoring program based around the initial core set, and developing other needed indicators over the long-term
- Step 6: Define responsibilities for executing a monitoring system
- Step 7: Test the utility of the initial core set and strengthen and adapt periodically as necessary

SECTION IV:

A UNIVERSAL "CORE SET" OF NATIONAL-LEVEL BIODIVERSITY INDICATORS: SOME SPECIFIC CRITERIA AND OPTIONS

(for possible inclusion by Parties in future national implementation reports under the CBD)

1. CRITERIA FOR ESTABLISHING A FEASIBLE AND EFFECTIVE UNIVERSAL CORE SET OF BIODIVERSITY INDICATORS

A limited number of biodiversity indicators (e.g., 10-20) could be identified as elements of a core set that all CBD Parties would apply and report upon periodically. Each indicator should:

- (i) have available *quantitative data* (i.e., past and present data available or reconstructible);
- (ii) be *policy and ecosystem relevant* (e.g., ecosystems/species of high economic, cultural or ecological interest);
- (iii) be *susceptible to human influence* (e.g., reasonably manageable and predictable, linked to socio-economic and environmental models output);
- (iv) be *accessible to accurate and affordable measurement* (e.g., Are there existing monitoring programs? Is monitoring financially feasible?);
- (v) have *indicative value* (e.g., Does it reflect indirect information about other aspects of biodiversity or uses?);
- (vi) be *stable* (such that human-induced and natural fluctuations can be reasonably distinguished);
- (vii) be *useful for at least a 10-20 year period* (for use with long-term problems); and
- (viii) be *relatively simple to understand* (e.g., for policymakers and the public).

In addition, as a whole, the universal core set of indicators should:

- (i) *provide a representative picture*, through aggregation of data, of the changes in biodiversity, its uses and pressures at the global and regional level (e.g., indicators must reflect a cross-section of entire ecosystems to provide a representative picture);
- (ii) *reflect the effects of the main causes* of biodiversity change;
- (iii) *reflect the effectiveness of response measures* related to the CBD; and
- (iv) be *relatively limited in total number* (for simpler communication to policymakers and the public).

2. OPTIONS FOR A UNIVERSAL CORE SET OF BIODIVERSITY INDICATORS

Given the above criteria for universally applicable biodiversity indicators, and particularly the overriding importance of representativeness and ability to aggregate information on supra-national levels, some options for a core set are provided in Illustration 1 on the following page to help stimulate further discussion on this topic. This set is based on various proposals and ideas presented at the GBF meeting, and the work of a liaison group under the official CBD process. It is important to note that development of a core set of indicators is an iterative process. Early application of a simple set of indicators should be a goal, while work continues on refining methodologies, developing new indicators, filling data gaps, building capacity for more effective monitoring systems, etc. An initial core set of indicators could be formally adopted at the COP-4 meeting in May 1998, and included by all CBD Parties in their second national implementation reports.

Illustration 1. OPTIONS FOR A UNIVERSAL CORE SET OF BIODIVERSITY INDICATORS

Note: The options below cover only pressure and state indicators. In particular, further analysis of appropriate baselines is required.

CORE INDICATORS

STATE INDICATORS

1. Ecosystem quantity indicators: Direct measures of biodiversity loss or gains at the ecosystem level as a result of conversion and fragmentation of natural habitat. Criteria for defining "self-regenerating" and "man-made" areas*, along with size class categories, are subjects for further discussion.

- (i) "Self-regenerating" and "man-made" area as a % of total area
- (ii) Self-regenerating area per ecosystem type as a % of total area
- (iii) Extent of existing self-regenerating area by size class category (e.g., 100- 1,000 ha., 1,000 - 10,000 ha., etc.)

* Self-regenerating ecosystems correspond to natural and semi-natural areas, while man-made ecosystems correspond to heavily modified landscapes.

2. Ecosystem "biodiversity quality" indicators. Direct and indirect measures of biodiversity loss or gains at the species or ecosystem-structure level, based upon "biodiversity quality" measures relating current biodiversity status to pre-industrial and 1993 baseline measurements. Postulated baselines for pre-industrial conditions is an important subject for further discussion.

- (iv) Distribution or abundance of select indicator species or taxonomic groups as a % of postulated baseline
- (v) Number of indigenous species of one or more select taxonomic groups as % of postulated baseline
- (vi) Various "biodiversity quality" variables as a % of postulated baselines (several units possible). Possible variables include:
 - % of total forest area: with intact canopy, intact understory, under sustainable management, in primary forest, in degraded forests, in monoculture tree plantations of various size categories.
 - % of total agro-ecosystem area in natural patches
 - % of total marine/coastal area in vital coral reef, mangroves
 - % of remaining endemic species

CORE INDICATORS

3. Indicators for threatened and extinct species and habitat types. Indicate the species and locations for which the most urgent action is needed. For (viii), criteria for threatened habitat is a subject for further discussion. The number of habitat types for (viii) might be limited to, for example, 10-20.

- (vii) Number of threatened and extinct species as a % of selected taxonomic groups per country
- (viii) Number of threatened habitats as a % of total per country

PRESSURE INDICATORS

1. Habitat loss indicators

- (i) % of self-regenerating areas converted annually into: agricultural production, urban use and other intensively modified land uses
- (ii) % of riversheds significantly impacted by dams or channelization
- (iii) % of coastal zone with population densities exceeding 100 inhabitants/km²

2. Over-exploitation indicators

- (iv) Total amount harvested relative to estimate of sustainable offtake levels
- (v) Average size/weight/age per unit of offtake of a given species or group of species relative to a baseline year
- (vi) Amount of agricultural area lost in 10 years due to erosion as a % of area brought into agricultural production in the same period per country (net erosion rate)

3. Exotic species indicators

- (vii) Total number of exotic species as a % of a particular taxonomic or other group per country
- (viii) Relative abundance/biomass of exotic species as a % of a particular taxonomic or other group per country

4. Pollution indicators

- (ix) Average measures of a particular group of substances of particular harm to biodiversity, compared to the soil, water and air standards for such substances

SECTION V:

COUNTRY-SPECIFIC, NATIONAL-LEVEL BIODIVERSITY INDICATORS AND TARGETS: PRELIMINARY CONSIDERATIONS

While it is very important to develop a *universal* core set of indicators, given the widely varying conditions among countries, most national-level indicators -- and targets -- will be *country specific*. Some preliminary considerations are provided below to help CBD Parties and stakeholder groups identify and apply effective indicators and set appropriate targets within their countries. In the future, it may be useful to develop guidelines in this area to assist CBD Parties, drawing upon case studies of actual experiences in target-setting and indicator development/application.

1. COUNTRY-SPECIFIC BIODIVERSITY INDICATORS: GETTING STARTED

A. **Key criteria for selecting indicators.** Indicators should:

- (i) *quantify* information so that its significance is apparent;
- (ii) *simplify* information in order to help communicate complex phenomena;
- (iii) be *user-driven* (i.e., summarize information of interest to the intended audience);
- (iv) be *policy relevant and based on specific targets or objectives* (to help guide decision-making and measure progress toward such objectives);
- (v) be *scientifically credible*;
- (vi) be *responsive to changes* in time and/or space;
- (vii) be *simple and easily understood* by the target audience; and
- (viii) be based on *information that can be collected within realistic capacity limits*.

B. **A framework for biodiversity indicators: pressure-state-response.** Frameworks provide a means for organizing indicators so that, collectively, they paint a broad picture of what is happening in relation to biodiversity within a country. The pressure-state-response framework is by far the most widely recognized and used. Put simply, it relates three categories of indicators:

- (i) **Pressure indicators:** provide measures of human activities that adversely impact biodiversity (e.g., the intensity of coastal ecosystem development, rates of natural forest conversion to large-scale monoculture)
- (ii) **Status indicators:** provide direct and indirect measures of the current status of biodiversity, and changes in status, covering genes, species and ecosystems (e.g., natural forest cover as a % of total land area, measured over time; population of indicator species X over time)
- (iii) **Response indicators:** provide measures of the actions being taken to mitigate pressures and causes of biodiversity loss (e.g., establishment of key components of a national biodiversity monitoring system, numbers of community gene banks established over time, and the level of reduction -- over time -- of perverse subsidies adversely impacting biodiversity).

C. **Specific types of information that indicators should measure.** A number of CBD provisions and past COP decisions provide some guidance to Parties on what information indicators should measure. In lieu of a more comprehensive analysis, as a starting point, it is particularly useful to examine CBD Articles 7, 8(l) and 26, and COP Decision III/10.

Article 7 requires Parties to:

- identify and monitor "components of biodiversity important for conservation and sustainable use" [In providing further guidance, Article 7 (a) refers Parties to Annex I of the CBD, which lists categories to help define 'important;' and (b) stipulates that special attention be paid to those components requiring urgent conservation measures and offering the greatest potential for sustainable use); and
- identify processes and activities which have -- or are likely to have -- significant, adverse impacts on biodiversity, and monitor their effects.

Article 8(l) requires Parties to:

- regulate or manage processes and categories of activities identified as having a significant adverse effect on biodiversity (as determined under Article 7).

Article 26 requires Parties to:

- report on measures being taken to implement the provisions of the Convention,, including the effectiveness of these measures in meeting the objectives of the Convention. (This suggests the need for national reports to incorporate sets of state, pressure and response indicators around major provisions).

COP Decision III/10 calls upon Parties to:

- include in their national reports a "core set" of indicators covering: forests, marine/coastal systems, inland waters and agro-ecosystems. The decision also emphasizes pressure indicators.

In summary, the guidance contained in the CBD itself, along with formal decisions adopted by the COP, suggest that Parties develop and apply the following types of indicators for forests, marine/coastal systems, inland waters and agro-ecosystems:

- (i) **state** indicators which identify and track a wide range of domesticated and wild genes, species and ecosystems of important biological value, especially those under urgent threat and those offering the greatest potential for sustainable use, but also those listed in Annex I -- such as ecosystems and habitats which are representative and contain high diversity;
- (ii) **pressure** indicators which measure the primary threats (direct and indirect) to important biodiversity components.
- (iii) **response** indicators which measure the level and effectiveness of responses to the primary pressures identified, and to the commitments contained in major provisions of the CBD.

2. COUNTRY-SPECIFIC BIODIVERSITY TARGETS: GETTING STARTED

A. Key considerations in target-setting. In general, analysis and development of indicators is more advanced than for biodiversity targets. As a preliminary step toward the eventual adoption of appropriate targets, Parties may want to conduct consultations to discuss some of the key considerations such as:

- (i) **Two overarching categories: performance and capacity targets.** Both types of targets could serve useful functions in the context of CBD implementation. In general, *performance* targets could be thought of as action-oriented objectives geared around improving the status of biodiversity components, mitigating major threats to biodiversity, and implementing direct response measures. *Capacity* targets -- which could be thought of as objectives for resources and the overall enabling environment -- could be built around the primary capacity building areas such as financial

and human resources and institutional development. In linking these two concepts, Parties could correlate performance targets with financial, institutional, human resource and other capacity needs. For example, targets for achieving sufficient institutional capabilities could be linked to specific performance targets for protected areas or sustainable use of specific species or ecosystems. The distinction and relationship between performance and capacity targets seems like a particularly fruitful area for more in-depth analysis.

- (ii) **Geographic level.** Some targets may be appropriate at the national level, while others may be more appropriate for consideration at the sub-national level. In general, national-level targets may be the most widely appropriate in the context of CBD implementation, since the Parties are national governments.
- (iii) **Timetables.** Some targets could be linked to different types of timetables, which may require built-in flexibility and may vary according to relevant parameters such as capacity levels. Some targets are phased in *incrementally*, according to realistic schedules. Timetables could be used to help lay out a sequence of capacity and performance targets.
- (iv) **Qualitative and quantitative targets.** Both types of targets could serve useful functions in the context of CBD implementation. Quantitative targets would need to be developed around parameters that are relatively easy and cost-effective to measure. For qualitative targets, identifying effective indicators of progress is more difficult than for quantitative targets. Qualitative targets -- such as establishing a network of community gene banks -- might be more effective if linked to timetables.
- (v) **Existing targets within the CBD text.** Parties are already obligated to meet some general targets contained in the CBD text, which would need to be carefully analyzed (e.g., establishing an effective monitoring system and a system of protected areas).

B. Frameworks for target-setting. Compared to indicators, there has been very little discussion or agreement on appropriate frameworks for target-setting. A number of different frameworks may be useful to consider in preliminary discussions on targets, and in the more advanced stages of identifying options for specific targets. Some examples include:

- (i) **Major programmatic areas or specific articles contained in the CBD:** e.g., *in-situ* and *ex-situ* conservation; inventorying, monitoring and assessment; protected areas; impact assessment; benefit sharing.
- (ii) **Thematic areas:** e.g., legal/policy; economic/financial; environmental; and social.
- (iii) **Major ecosystems:** e.g., forests; marine/coastal systems; freshwater; and agro-ecosystems.
- (iv) **Three objectives of the CBD:** i.e., conservation of biodiversity; sustainable use of its components; and fair and equitable sharing of benefits.
- (v) **Capacity and performance targets** (see above)
- (vi) **Three biological levels referred to in CBD:** i.e., genetic, species and ecosystem.

C. Specific types of targets that might be considered. Compared with indicators, possible guidance in the CBD text itself or in COP decisions on what specific types of targets might be required -- or most appropriate -- is much more indirect. Some CBD provisions and COP decisions that might be considered for possible guidance include:

- **COP Decision II/17** (Section d of the Annex): This states that the first national report should include "...specific *targets* to meet the local, national and international goals in terms of protecting, assessing, utilizing and benefiting from biodiversity and its components".
- **CBD Articles 7, 8(l) and 26, and COP Decision III/10:** As noted above, these are key provisions/decisions providing guidance on what specific indicators should be developed. In light

of the critical relationship between indicators and targets, it may be useful to apply this guidance to targets as well.

- **Broad targets in CBD text:** A number of broad targets are already mandated in the CBD text. More in-depth analysis could be undertaken to identify these broad targets, and more specific (and quantitative if possible) targets might be elaborated in these areas. Some examples of the broad targets already mandated in the CBD text include:
 - establishment of a comprehensive biodiversity monitoring system [Article 7];
 - establishment of a system of protected areas [Article 8(a)];
 - development of legislation and/or regulatory provisions for the protection of threatened species and populations [Article 8(k)];
 - establishment and maintenance of facilities for *ex-situ* conservation of and research on plants, animals and micro-organisms [Article 9(b)];
 - adoption of measures to avoid or minimize adverse biodiversity impacts from the use of biological resources [Article 10(b)]
 - adoption of a set of economically and socially sound measures that act as incentives for conservation and sustainable use of biodiversity [Article 11];
 - establishment and maintenance of programs for scientific and technical education and training [Article 12(a)]
 - establishment of procedures requiring environmental impact assessment of proposed projects that are likely to have significant adverse biodiversity impacts [Article 14(1)]
 - establishment of a regime to help ensure fair and equitable sharing of benefits from the use of genetic resources [Article 15(7)]
 - establishment of joint research programs and joint ventures for development of relevant technologies to support the objectives of the CBD [Article 18(5)]; and
 - provision, by developed countries, of new and additional financial resources [Article 20(2)]

3. OPTIONS FOR COUNTRY-SPECIFIC INDICATORS AND TARGETS

Drawing on the above considerations and the many ideas presented at the GBF meeting itself, and in submissions from those unable to attend, a wide range of options for country-specific indicators and targets (qualitative and quantitative) are listed in Tables 1-3 below. These tables provide *indicative* lists of examples, and are merely intended to help advance debate on how individual CBD Parties can approach target-setting and indicator development. The lists are not meant to be comprehensive or prescriptive.

The tables demonstrate the use of three different frameworks: options in Table 1 are organized around several important articles of the CBD. Under each article are some examples of specific targets that might be considered. Relevant indicators are then typically listed under each target. The first section of Table 1 covers performance-related targets and indicators. The second covers capacity-related targets and indicators.

Table 2 is organized around the four major ecosystem areas identified by the COP. Under each ecosystem area are a few options for specific targets that might be considered. Relevant indicators are then typically listed under each target. Some additional indicators for each ecosystem type are also provided. Table 3 provides a fairly comprehensive list of *categories* of biodiversity indicators that were explicitly referenced in the presentations to the GBF meeting, organized around the pressure-state-response framework.

As the pressure-state-response framework is the most widely recognized for indicators, some explanations concerning the structures of Tables 1 and 2 may be useful:

- **Using the CBD articles and the four ecosystems identified by the COP as "demonstration frameworks".** As noted above, there are many possible frameworks for indicators and targets. Using the structure of the CBD text (i.e., its major operative articles that contain legally-binding obligations) may be one particularly useful demonstration framework, since all Parties clearly share these commitments and since some broad targets are already contained in some CBD provisions. The four ecosystem types identified by the COP may be another particularly useful demonstration framework, since the COP has already agreed that a core set of indicators should cover these four areas. Most of the proposed targets and indicators provided as input into the GBF meeting were linked to these two frameworks. Other frameworks, however, should also be considered carefully.
- **Linking indicators and targets.** Given the important relationship between biodiversity indicators and targets, they are directly linked in both tables.
- **Starting with targets.** Indicators in themselves have only limited value, but have significantly greater value when used to gauge progress toward desired end results. Therefore, the tables list targets first, with associated indicators under each target.

**Table 1: Indicative List of Options for
Country-specific Biodiversity Targets and Associated Indicators
Organized around CBD Articles**

[Performance-related targets and indicators]

ARTICLE 6 (general measures for conservation and sustainable use)

- Target Integration by Year X of a 'core set' of specific biodiversity objectives into the major national plans and policies related to: fisheries, forests, agriculture, mining, trade, urban development and economic development.
- Target Completion by Year X of a comprehensive and detailed budget for implementing all major elements of the national biodiversity action plan

ARTICLE 7 (identification and monitoring)

- Target Establishment by Year X of a *national biodiversity information system* -- based around a CBD clearinghouse mechanism web site and related internet tools -- for identifying and monitoring priority biodiversity components and pressures, and other purposes.
- Target Completion by Year X of a list of *priority biodiversity components* (genes, species, habitats and ecosystems) and *priority threats* that will receive special attention.

ARTICLE 8 (*in-situ* conservation)

- Target Stabilization by Year X of the rate of annual loss of natural forests
Indicator: Annual natural forest conversion rate as a % of previous year's rate.
- Target X million hectares nationwide of targeted priority ecoregions brought under 'ecosystem management' (based on agreed criteria for the ecosystem approach).
Indicator: Total extent (ha.) of targeted priority ecoregions brought under ecosystem management as a % of target
- Target Development of recovery plans for all species officially designated as threatened
Indicator: # of threatened species with recovery plans as a % of total
- Target X million hectares of significantly degraded wetland areas 'restored' (drawing on biodiversity and other criteria)
Indicator: Total extent (ha.) of areas restored as % of target
- Target Establishment by Year X of an ecologically representative system of protected areas, based on agreed classification systems and definitions of representativeness
- Target Establishment by Year X of an effective legislative/regulatory regime to protect threatened species and populations.
- Target Establishment of a national mechanism to facilitate the equitable sharing of benefits arising from the utilization of knowledge, innovations and practices of indigenous and local communities.

ARTICLE 9 (*ex-situ* conservation)

- Target X number of community gene banks established by Year X
Indicator: Number of community gene banks established as a % of target
- Target X number of *ex situ* accessions related to specific objectives
Indicator: Number of accessions as a % of target

Target Establishment by Year X of a national network of institutions coordinating *ex-situ* efforts to recover threatened species for reintroduction into natural habitats

ARTICLE 10 (sustainable use of components of biological diversity)

Target Sustainable forest management (SFM) achieved for all commercial logging operations by Year X [SFM to include new biodiversity criteria]

Indicator: % of total area commercially logged under sustainable forest management

Target Designation or establishment by Year X of an institution to support customary use of biological resources in accordance with traditional cultural practices

Target X% of farms using sustainable agriculture practices for reducing soil degradation by Year X [based on core set of agreed sustainable agriculture practices]

Indicator: % of farms using sustainable agriculture practices for reducing soil degradation compared to target

Target X prosecuted court cases per year to enforce timber concession contracts

Indicator: # of prosecuted court cases as a percentage of target

Target Establishment by Year X of sustainable tourism guidelines (including criteria for meeting biodiversity objectives)

Target X% reduction by Year X in total annual amount of poison chemical and dynamite use in coral reef fisheries

Indicator: Annual amount as a % of target

ARTICLE 11 (incentive measures)

Target Completion by Year X of a comprehensive diagnostic review of incentives within the existing legal and regulatory regime, and a biodiversity incentives action plan outlining needed reforms

Target X% reduction in subsidies in the agriculture, fisheries, and forest sectors identified as having a particularly adverse impact on biodiversity (using a baseline year)

Indicator: Current level of subsidies as a % of subsidies for baseline year

Target Adoption of \$X million of targeted tax breaks to support biodiversity

Target Completion of land tenure reforms to support more secure and equitable land tenure arrangements

Indicator: % of population holding various categories of land-size holdings

ARTICLE 14 (impact assessment and minimizing adverse impacts)

Target Completion of impact assessments of all existing and currently proposed mariculture operations by Year X, including assessments of alternatives

Indicator: % of mariculture operations for which impact assessments have been completed

Target Enactment of legislation that integrates biodiversity criteria into mandated environmental assessment procedures

ARTICLE 15 (access to genetic resources)

Target X% of commercialization profits from genetic resources use directed toward a benefit sharing compensation fund

Indicator: % of profits being directed to compensation fund compared to target

Target Establishment by Year X of an effective benefits sharing regime around the use of genetic resources, including a benefit sharing fund capitalized at \$X million.

Indicator: Capitalization of fund as % of target

ARTICLE 16 (access to and transfer of technology)

- Target For developed country: \$X million to be invested in transfer and development of 'biodiversity technologies', such as: geographic information systems (GIS), biodiversity information management technologies, low-impact timber and fish harvesting technologies, etc.
Indicator: Level of current funding as a percentage of target
- Target Establishment by Year X of a center for environmental technology transfer

ARTICLE 20 (financial resources)

- Target For developed country: X% increase over baseline year in overseas development assistance (ODA) supporting biodiversity (based on agreed criteria)
Indicator: Amount of qualifying ODA as a % of baseline
- Target \$X million in domestic budgetary allocations toward implementation of National Biodiversity Action Plans, including establishment of a national biodiversity trust fund capitalized at an initial level of \$X million.

[Capacity-related targets and indicators]

(Note: Most of these are cross-cutting, covering several CBD articles)

- Target \$X million in external assistance for CBD implementation activities
Indicator: Amount of external assistance for CBD implementation activities as a % of target
- Target X taxonomic institutions, X biodiversity monitoring centers and X biological research laboratories established by Year X
- Target Data sets covering threatened species, general species status/ranges, land uses and biodiversity priority areas incorporated into widely accessible biodiversity information management system
- Target Biodiversity sections incorporated into all public high school curricula
- Target X number of professionally trained taxonomists working in relevant government agencies, museums, botanical gardens, etc. by Year X
Indicator: Number of professionally trained taxonomists compared with target
- Target X number of trained parataxonomists collecting data at the local level for incorporation into national biodiversity information system
Indicator: Number of trained parataxonomists compared with target
- Target X% of general public with a basic understanding of the term and importance of biodiversity
Indicator: % of general public with a basic understanding compared with target
- Target Clarification of mandates of different organizations and agencies to address specific aspects of biodiversity action plan; and measurable improvements in communication between these entities and in their degree of cooperation.
- Target \$X million for annual operating budget for Nature Management Agency Y
- Target By Year X, 'focal points' within each national biodiversity commission agency with Internet access and training
- Target Biodiversity skills training courses completed by X officials in the following agencies...
Indicator: # of officials having completed training courses as a % of target
- Target X% of customs officials having completed training course on illegal wildlife trade
Indicator: # of customs officials having completed training course as a % of target

**Table 2: Indicative List of Options for
Country-specific Biodiversity Targets and Associated Indicators
Organized around Four Ecosystem Types**

FOREST ECOSYSTEMS

Target	Maintenance of X million ha. of natural forest estate <i>Indicator:</i> Extent (ha.) of natural forest estate as a % of target
Target	X million ha. of forest estate brought under sustainable forest management (SFM) by Year X <i>Indicator:</i> Extent (ha.) of forest estate under SFM as a % of target
Target	Designation of protected status for X million ha. of forest estate <i>Indicator:</i> Extent (ha.) of protected forest as a % of target
Target	Protection of X% of remaining primary/old growth forest <i>Indicator:</i> % of remaining primary/old growth forest protected compared with target
Target	All major forest types included in protected area network by Year X <i>Indicator:</i> % of major forest types included in protected area network
Target	X% increase (using baseline year) in efficient wood stoves (to reduce fuelwood cutting) <i>Indicator:</i> % increase in efficient wood stoves compared with target
Target	All new large-scale mines/energy development projects impacting forests subject to revised environmental impact assessment procedures by Year X

Some Additional Indicators:

- Extent (ha.) of significant degraded forest as a % of total forest estate
- Annual rate of conversion of natural forest to agriculture and other land uses
- Extent (ha.) of primary/old growth forest commercially logged using 'sustainable practices' as a % of total primary/old growth estate
- Extent of area cut annually for fuelwood use as a % of baseline measurement, or total biomass cut annually for fuelwood as a ratio of mean annual increment
- Extent of forest area illegally logged as a % of baseline measurement

AGRO-ECOSYSTEMS

Target	Stabilization of annual rate of conversion of 'natural' and 'semi-natural' lands to agricultural land use <i>Indicator:</i> Annual rate of conversion compared with previous year's rate
Target	Annual conversion of existing 'primary agricultural lands' to urban and other land uses limited to X% of total 'primary agricultural lands' <i>Indicator:</i> Annual conversion compared with target
Target	X% of farms using polycultural practices <i>Indicator:</i> % of farms using polycultural practices compared with target
Target	X% of farms using 'sustainable agriculture' practices for reducing soil degradation by Year X <i>Indicator:</i> % of farms using 'sustainable agriculture' practices for reducing soil degradation compared with target
Target	X million ha. of rangeland under 'sustainable management' <i>Indicator:</i> Extent (ha.) of total rangeland under 'sustainable management' as a % of target
Target	X% reduction (from baseline year) in total annual agrochemical use (tons) by Year X

Indicator: Current reduction as a % of target

Target On-farm crop diversity targets for various crops

Target Protected area designation for representative samples of all identified 'centers of plant genetic diversity'

Some Additional Indicators:

- Extent of land under intensive monocultural production as a % of total area under agricultural production
- Annual rate of soil erosion on agricultural lands
- Average livestock densities (livestock per km²)

INLAND WATER ECOSYSTEMS

Target No net wetlands loss (using baseline year)

Indicator: Current extent of wetlands (ha.) compared with baseline year

Target Maintain X ha. of wetlands nationally

Indicator: Current extent of wetlands (ha) as a % of target

Target X% reductions (using baseline measurement) in discharge of specific categories of substances having particularly adverse effects on inland water biodiversity

Indicator: Reductions in discharge compared with targets

Target By Year X, X% of inland waterways classified as swimmable and X% as fishable

Indicator: % of inland waterways classified as swimmable and fishable compared with targets

Target X% of farms using 'sustainable agriculture' practices that help reduce soil erosion and agrochemical runoff impacts on inland waters

Indicator: % of farms using 'sustainable agriculture' practices compared with target

Target Implement major elements of exotic species action plan by Year X

Indicator: Annual biomass/population levels of key impacted native species compared with pre-introduction levels (baseline)

Target All proposed large dam projects subject to revised environmental impact assessment procedures

Target Biodiversity impact mitigation studies completed by Year X for all existing large dams

Some Additional Indicators:

- Length of river heavily modified as a % of baseline
- Extent of inland aquatic areas designated as protected areas as a % of total inland aquatic areas
- Extent of inland aquatic areas heavily modified by human activities as a % of total inland aquatic areas

MARINE/COASTAL ECOSYSTEMS

Target Stabilization of annual mangrove conversion rate by Year X

Indicator: Annual rate of conversion compared with target

Target Rehabilitation of X ha. of converted mangrove systems identified as 'critical'

Indicator: Extent of 'critical' mangrove areas rehabilitated compared with target

Target X% (or less) of sea bottom being subject to bottom trawling per year

Indicator: % of available sea bottom trawled per year compared with target

Target X% reduction (using baseline year) in amount of poison chemicals and dynamite used in reef fisheries by Year X

Indicator: % reductions compared with targets

Target X% reduction in total untreated sewage discharged around coastal areas

Indicator: % reduction compared with target

Target Implement major elements of exotic species action plan by Year X

Indicator: Annual biomass/population levels of key impacted native species compared with pre-introduction levels (baseline)

Some Additional Indicators:

- # of large-scale bottom trawling vessels per 1,000 km. of coastal area
- E. coli counts and nutrient levels as a % of baseline measurements
- Estimated total shipping tonnage per year likely to be discharging ballast water compared to baseline

**Table 3: List of *Categories* of Biodiversity Indicators
explicitly referenced in presentations to the GBF Meeting
(organized by pressure-state-response framework)**

[Note: Under each of these categories, specific indicators could be developed.
Some of the points below fall into more than one P-S-R category]

PRESSURE INDICATORS

- habitat fragmentation
- urbanization (growth)
- transport: density of road network
- agriculture: farming structure, practice and land use (e.g., livestock, use of fertilizers)
- forest fires
- rural development
- use of atmospheric resources
- use of soil resources
- use of water resources
- water abstraction/use of pesticides
- degree of eutrophication of water bodies
- # of introduced species and genomes
- quantity of specimens or species of economic/scientific interest removed from the environment
- erosion/loss of genetic diversity patrimony
- threat categories for specific species or other taxa
- extraction and tourism for Ramsar sites

STATE INDICATORS

Habitat/Ecosystem:

- ecosystem diversity
- mapped distributions of natural habitats
- mapped distributions of non-protected land uses
- land use
- maintenance of basic ecological processes
- integrity of habitat
- percentage of native vegetation cover
- proportion of protected area to converted/utilized area
- quality of water resources
- quality of atmospheric resources
- quality of soil resources
- presence of taxa indicators of environmental integrity
- degree of connectivity of food webs
- comparison of representative sites for various habitats/ecosystems (grasslands, wetlands, forests, sand dunes, coastal saltmarshes, etc.) according to protection, management problems and stresses
- forest ecosystem authenticity (includes composition, pattern, function, process)
- forest health (includes health of trees, health of flora and fauna, robustness to changing conditions)
- forest environmental benefits (include biodiversity conservation, soil and watershed protection, impacts on other natural and semi-natural habitats, climate stabilization)
- forest social and economic values (includes wood products, non-timber forest products, employment, recreation, homeland, historic value, educational and research value, cultural and aesthetic value, spiritual and religious value, local distinctiveness)

Species:

- species diversity
- recorded species present
- indigenous species present
- non-indigenous species present
- endemic species
- threatened species: lists, mapped distributions
- presence of keystone species
- proportion of exotic to native species
- change in # of species (species richness) over time (increase/decrease)
- change in composition of species over time
- structure of diversity of plant communities
- re-colonization by plants, animals and microorganisms
- species groups: total number versus threatened species
- species: distribution trends of key species in selected regions
- species with small population size vs. larger population size
- spatial differences in the # of rare vs. common species
- spatial differences in the # of restricted vs. wide-range species
- representativeness of intraspecific variability of endangered and economically important species

Genes:

- genetic diversity
- in situ genetic resources: medicinal plants, wild ancestors of domestic varieties

RESPONSE INDICATORS**Immediate Measures/Research:**

- incentives for the promotion of privately managed protected areas
- biological corridors between protected areas.
- reorientation of non-sustainable processes identified as causes of biodiversity loss
- mapped distributions of protected areas
- # of protected areas per biome, ecoregion and ecosystem type
- size and distribution of protected areas, and percentage of surface coverage
- representativeness and distribution of protected areas
- ecosystem restoration
- incorporation of sustainable indigenous practices in productive processes
- establishment of agroforestry programs
- land ownership for indigenous and local communities in reserves
- development of technologies for management of endemic species
- national economic sectors deriving benefits from biodiversity bioprospecting research
- national biodiversity inventory
- research on forest fragmentation, agrobiodiversity, etc.
- endangered ecosystems research
- reduction of human impacts
- restoration of natural processes
- ex situ resources: accessions of crops and livestock in storage, microbial cultures
- ex situ conservation programs for endangered species
- representativeness of different biomes, ecoregions and ecosystems in genebanks
- number of accessions of native species and varieties
- rate of loss/exhaustion of accessions in genebanks
- degree/rate of exchange between genebanks
- degree of utilization of genebank collections

Capacity:

- # of taxonomists/systematists
- # of specialists
- extent to which skills and tasks are matched
- regularity and seriousness of performance monitoring and review
- adequacy of physical environment, resources, materials within government agencies
- interest among university applicants to study biodiversity
- existence of data and specimen collections
- existence of universities and other training programs and courses
- existence of biodiversity libraries, bibliographies
- existence of biodiversity reports, assessments, syntheses
- existence of patents
- effectiveness of communication between organizations and agencies
- degree of cooperation between organizations dealing with biodiversity
- clarity of organizational mission statement
- clarity in lines of accountability
- cross-sectoral and inter-institutional plan addressing prevention activities
- legislation of genetic material use and information exchange
- national accounting adjustment for inclusion of biodiversity

Legislative/Regulatory:

- current legal regime as it relates to general legal targets that are clearly evident in the CBD's text itself
- meaningful public participation in review and development of laws
- integration of precautionary approach into laws
- capacity to apply and enforce laws (e.g., staffing of enforcement agencies, training of enforcement personnel)
- effectiveness in monitoring and enforcing biodiversity-related laws
- effectiveness of CITES provisions
- effectiveness of controls of species traffic and quarantine
- effectiveness of biosafety norms
- consideration of biodiversity conservation priorities
- how recently the national laws on access to ownership of genetic materials were revised
- importance assigned to biodiversity in National Environmental Action/Management Plans
- clarity of mandates to different organizations to deal with particular aspects of biodiversity
- extent to which subsidies encourage or discourage biodiversity considerations in economic decision making

Awareness:

- extent to which information about biodiversity-related laws have been made accessible to the public
- understanding of the meaning and value of biodiversity
- adoption of conservation and sustainable practices
- # of visitors to protected natural ecosystems versus # of visitors to recreational areas within PAs
- extent to which the general public understands the term "biodiversity"
- number, size and age of NGOs dealing specifically with biodiversity
- level of use of biodiversity themes in product advertising

Funding:

- existence of domestic funding sources
- comparative levels of budgetary commitments to biodiversity institutions
- existence of development agency legislative/mission statement
- formal policy statement by donor countries
- government investment in protected areas
- volume of aid for biodiversity

- target-setting for funded projects
- effectiveness of bilaterally-funded biodiversity projects and their impact on biodiversity

SECTION VI:

ADVANCING THE WIDESPREAD DEVELOPMENT AND APPLICATION OF BIODIVERSITY INDICATORS AND TARGETS: OPTIONS FOR NEXT STEPS

A number of options for how to advance application of biodiversity indicators and targets were discussed in the final session of the GBF. The session included a presentation by Edgar Gutierrez on possible future work under the official CBD intergovernmental process (see Annex I) and a wide ranging discussion. A synthesis of the ideas raised is provided below:

1. ACTIVITIES UNDER CBD INTERGOVERNMENTAL PROCESS

- (i) **Expert Group under SBSTTA.** An expert group on indicators, monitoring, targets, etc. under the CBD SBSTTA could play an important role in assisting the implementation of Decision III/10 by the CBD's Conference of the Parties (COP). In particular, such an expert group could help develop a universal core set of indicators at the national level for consideration by the COP at its fourth meeting in May 1998. A core set of indicators -- if adopted by the COP -- could be included by all Parties in the second set of national implementation reports under the CBD. A core set, which would be demand-driven and applied by all Parties, could help to provide regional and global pictures of biodiversity problems, threats, issues and status, and help in solving critical regional and global problems.
- (ii) **Regional and sub-regional meetings and pilot projects.** Regional and subregional meetings could be held to improve understanding of the usefulness of these tools for planning and evaluation. Meetings could cover specific or broad topics in this area. Pilot projects could be developed for testing a proposed core set of indicators.
- (iii) **Long-term implementation plan under CBD containing targets and indicators.** Parties could consider the need for a long-term CBD implementation plan containing concrete targets and relevant indicators of progress. At the COP-4 meeting in May 1998, Parties will review the overall operations of the CBD. This could provide a useful opportunity to examine some type of long-term implementation plan.
- (iv) **Focus on capacity development.** It may be useful for the COP to focus, in particular, on capacity development for indicator development and target-setting.
- (v) **Network of collaborating centers for GEO-2 (UNEP's Global Environmental Outlook)** could be used at the regional level to advance work in this area. CBD and UNEP could pool scarce resources to promote regional capacity building, to share information, etc.

2. ACTIVITIES WITHIN COUNTRIES

- (i) **First national reports by Parties.** In their first set of national implementation reports under the CBD, Parties should elaborate a set of indicators of the *effectiveness* of Article 6 implementation. (The first set of national reports under the CBD will focus primarily on implementation of CBD Article 6 -- requiring adoption of national biodiversity strategies/action plans and integration of

biodiversity into sectors and cross-sectoral areas.) To be most effective, these first reports should include information demonstrating *qualitative* dimensions of the national biodiversity strategies and actions plans that have been adopted (including measures of the commitment behind them) and tangible evidence of integration of biodiversity into sectors and cross-sectoral areas.

- (ii) **National-level exercises in target-setting and indicator development.** National governments and biodiversity stakeholders could cooperate around national-level exercises, drawing upon local input, to set specific targets and develop relevant indicators to support implementation of the CBD.

3. OTHER ACTIVITIES BY THE NON-GOVERNMENTAL COMMUNITY

The NGO community could play a valuable role in catalyzing further dialogue and action in this area, and helping to support official efforts. NGO activities would need to be closely coordinated with official activities, to reduce redundancies and maximize synergies.

- (i) **Continuing informal dialogue and international network.** A continuing, informal, global dialogue process is needed to explore in greater depth a wide range of options for biodiversity indicators and targets. Such an informal process should seek to contribute to/complement official processes under the CBD and other relevant fora and institutions. To support and complement this dialogue process, an international network of practitioners involved in the preparation of national reports and the development of indicators and targets could be established, to provide an effective, ongoing mechanism for information sharing and dissemination, cooperation and coordination. Existing networks such as IUCN and BIONET could help facilitate such a network. National dialogue processes are also needed.
- (ii) **Set of country-specific case studies.** NGOs might be able to catalyze or conduct a set of case studies of actual experiences in developing and applying country-specific biodiversity indicators and targets, including their practical utility, obstacles, etc.
- (iii) **Additional workshops/conferences.** Informal, follow-on meetings to the GBF could be held on more specific topics (e.g., forest biodiversity indicators/targets, freshwater biodiversity indicators/targets, capacity building around indicators, etc.) or on a regional basis.

ANNEX 1: RECOMMENDATION FOR POSSIBLE FUTURE WORK ON INDICATORS AND TARGETS UNDER THE CBD INTERGOVERNMENTAL PROCESS

(by Dr. Edgar E. Gutiérrez-Espeleta, Universidad de Costa Rica, Observatorio del Desarrollo)

In light of our two-day discussions on biodiversity indicators and targets, it seems to me that the importance governments and the CBD have attached to these issues is widely recognized. Governments need to know what has been accomplished on biodiversity matters. Societies need to know the trends on how biotic and abiotic resources are being used.

Both governments and societies need to know how well they are performing to guarantee a better world for future generations. In order to achieve that, reference points (benchmarks, thresholds and targets) must be defined. However, these reference points have to emerge as a result of a societal process. Each nation has the right, and duty, of defining the path which present and future generations must follow. Societies, through a participatory process, are the ones upon to undertake this task. This is the only way societies will understand and feel a sense of ownership of sustainable development; they must take on responsibilities inherent in open and accountable processes.

In addition to these national responsibilities, the CBD's Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) has a mandate from Parties (that cannot be avoided) to conduct work in this area. How can this mandate to provide information be fulfilled without violating sovereignty rights of individual countries?

I believe that the CBD intergovernmental process needs to recommend **guidelines on how to establish a 'core set' of biodiversity indicators for which reference points can be defined**. Such indicators can provide insights on the effectiveness of CBD implementation at the national level (policy, trade, legal, financial, etc.), and on sustainable use and conservation of land, forests, freshwater, and marine/coastal resources at regional and global levels.

In order to do this, I propose -- as I did at the SBSTTA-2 meeting -- **to establish an expert group, under SBSTTA, to look at both indicators/monitoring/assessment and targets or thresholds**. This group can take a global perspective, which I consider very risky, or take a stepwise procedure. First, a proposed core set can be developed and tested in a few countries on a voluntary basis -- preferably, at least one from the North, one from the South and one with an intermediate information development capacity. The results from this exercise will help define a recommendation to the COP-4 meeting in May 1998. This testing process must be undertaken quickly, so that the COP can benefit from the concrete results.

Once results are known by Parties, some additional countries (voluntarily) could participate in development and testing programs around the proposed core set. Before countries begin implementing the guidelines for establishing a core set of indicators, an evaluation of requirements must be done. This is why it is so important to have the three stage scenario outlined above.

In the meantime, **subregional workshops on indicators and targets** might be held with high level staff members of governments, to increase awareness and understanding of the usefulness of these tools for biodiversity planning and evaluation.

At the regional level, the CBD process might draw upon the **network of Collaborating Centres for GEO-2** (UNEP's second Global Environmental Outlook Report) that was recently established in Groningen (The

Netherlands) by UNEP. By doing so, the CBD and UNEP might pool scarce resources to promote regional capacity building and promote a strong and supportive regional network dedicated to sharing information and expertise on biodiversity indicators, monitoring, targets, etc., and to improving reporting and promoting sustainable development more generally.

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ANNEX 2: SUMMARIES OF PRESENTATIONS AT GBF MEETING

I. NATIONAL, REGIONAL AND GLOBAL CASE STUDIES OF INDICATORS AND TARGETS PRESENTED AT GBF MEETING

CASE STUDY: COLOMBIA

by Maria Elfi Chaves, von Humboldt Institute, Government of Colombia;
Coordinator of the National Biodiversity Study

The Government of Colombia is currently in the process of developing indicators and targets.

1. Colombia's National Biodiversity Policy (CNBP)

The CNBP was recently approved by the National Environmental Council. The Policy involved: the Ministry of the Environment, the von Humboldt Institute, and the participation of over 100 individuals from governmental institutions, NGOs, and universities. It will form the basis for defining the national and regional action plans and establishing specific targets.

The main objectives are: (i) in situ conservation; (ii) knowledge; and (iii) use. Specific objectives and actions under each of these three categories will be assessed by 10 specialized planning teams to develop a National Biodiversity Action Plan and establish targets, including a timetable and list of technical and administrative needs for implementation. The action plan is to be completed by December 1997.

The National Action Plan will then become the basis for the development of *regional* action plans, directly implemented by Regional Corporations taking into account the regional/local priorities, needs and characteristics together with the regional plans already defined by the environmental NGO Association - Ecofondo.

The CNBP outlines *implementation tools*, including: education, training, and information dissemination; civil society participation; legislative development; institutional development; incentives; technology transfer; information management systems; and funding and financing mechanisms.

The CNBP does contain some broad objectives and actions, as outlined below from which targets and indicators can be derived:

In situ Conservation

- (i) Consolidate a National Protected Areas System including the National Parks System, and public and private protected areas. Actions include:
 - review of the existing categories for protected areas,
 - establishment of incentives for the promotion of privately managed protected areas
 - design of biological corridors between protected areas.
- (ii) Reduce activities causing biodiversity degradation and loss. Actions include:
 - cross-sectoral and inter-institutional plan addressing prevention activities
 - reorientation of non-sustainable processes identified as causes of biodiversity loss

- (iii) Promote restoration of degraded ecosystems and endangered species populations. Actions include:
 - ex situ conservation programs for endangered species
 - development of ecosystem restoration methodologies

Knowledge

- (i) Characterize biodiversity components through research and compilation of existing information (using all research institutes, universities, regional organizations, etc.). Actions include:
 - National biodiversity inventory
 - Research on forest fragmentation, agrobiodiversity, etc.
 - Endangered ecosystems research
- (ii) Rescue and disseminate traditional knowledge and practices (through the Ministries of the Environment and Home, and the National Anthropology Institute). Actions include:
 - study of indigenous groups' biodiversity management strategies
 - incorporation of sustainable indigenous practices in productive processes

Use

- (i) Promote sustainable use systems for biological resources. Actions include:
 - establishment of agroforestry programs
 - land ownership for indigenous and afro-Colombian communities in reserves
- (ii) Strengthen and promote the establishment of genetic banks and biotechnology programs. Actions include:
 - legislation of genetic material use and information exchange
 - development of technologies for management of endemic species
- (iii) Design and implement mechanisms for multi-criteria bioprospecting and equitable distribution of derived benefits. Actions include:
 - National Accounting adjustment for inclusion of biodiversity
 - Implementation of Andean Decision 391
- (iv) Sustainably develop the economic potential of biodiversity. Actions include:
 - Evaluation of the national economic sectors deriving benefits from biodiversity bioprospecting research

2. Colombia's Biodiversity Country Study (BCS)

The Biodiversity Country Study was initiated in December 1996 and will focus on defining biodiversity indicators, leading to the establishment of a biodiversity monitoring program. The study, which will be completed by September 1997, is being coordinated by the von Humboldt Institute, with support from GEF-UNEP and the UNDP Office in Bogota. The main objective is to collect and analyze the information required for the implementation of the Colombian National Biodiversity Policy and its Action Plan.

The indicators that are defined will be used in:

- (i) the first national implementation report required under the CBD;
- (ii) the construction of a long-term biodiversity monitoring program in Colombia; and
- (iii) the development of future plans and programs in conservation.

The BCS will have three main sections covering:

- (i) Biodiversity conservation status, at ecosystems, species and genetic levels
- (i) Direct and indirect causes of biodiversity loss

- (iii) National conservation and sustainable use capacity

The projected results of the BCS include:

- (i) definition of biodiversity conditions, trends and benchmarks (e.g., total number of hectares of paramos, number and training levels of professionals working in biodiversity, and the deforestation rates in the Andean region);
- (ii) identification of information gaps;
- (iii) definition of information priorities;
- (iv) definition of biodiversity indicators for long term monitoring of biodiversity (starting with two workshops in April 1997).

The two workshops on biodiversity indicators will focus on five general areas:

- (i) raising awareness of basic concepts, terms, issues and needs related to definition of biodiversity indicators;
- (ii) defining the most relevant parameters to monitor, taking into account the types of information and resources required and available;
- (iii) defining the biodiversity indicators (pressure, state, impact of pressures and response to action) for each of the parameters identified, considering: available/required information;
- (iv) methodology and timescales for data gathering;
- (v) management of the information;
- (vi) priorities and responsibilities;
- (vii) output specifications; and
- (viii) resources involved.

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CASE STUDY: NETHERLANDS

by Mr. Ben ten Brink, Netherlands National Institute for Public Health & Environment (RIVM)
Government of the Netherlands

1. NETHERLAND'S WATER MANAGEMENT PLAN (WMP)

Mr. ten Brink was the nature/conservation project leader in the multi-agency process of developing Netherland's Water Management Plan (WMP) aimed at integrated water management, balancing all major interests (e.g., shipping, industry, nature conservation, recreation, etc.).

- A. Initial steps.** As a first step, an evaluation was made of the role of nature conservation in former WMP processes. Because the ecosystem *quality* was never described and assessed in a quantitative manner:
- problems and options for solutions were formulated in a narrative and intangible way; they were not underpinned with quantitative information;
 - nature interests were no match for economic interests in the policy making process; and
 - the Minister asked for concrete information this time (i.e., no figures, no policy).

It was acknowledged that a comprehensive quantitative description of ecosystem quality was not possible, and that choices has to be made on a core set of indicators. Thirty ecosystem quality variables -- mostly

species, with some habitat variables -- were selected for the marine ecosystem and each major river. The intention was to provide a representative picture of the entire ecosystem: e.g., algae, seagrass, musselbeds, shrimp, herring, cod, sturgeon, oyster-catcher, seal and bottlenose dolphin. Ten criteria were used to select these variables:

(i) Each indicator should:

- have available quantitative data
- be policy and ecosystem relevant
- be susceptible to human influence
- be affordable to measure
- be stable
- have indicative value
- be useful for at least 20 years

(ii) Sets of indicators should:

- provide a representative picture of the entire ecosystem
- reflect the effects of the main causes of biodiversity change and conservation programs
- be as small as possible.

B. Developing ecological profiles. As a next step, *ecological profiles* were drafted for indicator species by various institutes. These profiles covered:

- the *baseline* status in terms of abundance and/or distribution (the baseline -- or starting point for reference purposes -- used was the status in pre-industrial times at the beginning of the century);
- the *current* status in terms of abundance and/or distribution;
- ecology (habitat needs, food, population dynamics); and
- doses-effect relationships (human interventions and effects on variables).

The figures on baseline and current status were presented in a radial diagram. Confronted with shocking data documenting dramatic declines in nearly all indicator species and nearly complete ecological collapse of river systems, the Minister asked for solutions, which were presented through various scenarios using 'effect radial-diagrams' and ecosystem quality indices. The various scenarios presented ranged from maintaining the status quo to 90% recovery rates for indicator species. **The final policy objective agreed to was a restoration of the North Sea and major river ecosystems at, respectively, 75% and 50% levels of the (pre-industrial) baseline state. A corresponding, 10-year package of measures was chosen and has been implemented over the last 7 years.**

2. NATURAL CAPITAL INDEX (NCI) FOR THE NETHERLANDS

Recently, a Natural Capital Index (NCI) has been developed as an equivalent to economic and social capital indices. First, a distinction has been made between the NCI in domesticated and non-domesticated areas because of their different character. Non-domesticated areas are assessed by their 'naturalness', using the pre-industrial state as the baseline. Nature in domesticated areas, especially agricultural areas, is assessed by comparing it with the state of traditional (pre-industrial) agriculture. For each habitat type (e.g., forest, marshes, fresh water, marine, heath, dunes, agricultural land), a representative core set of quality variables (target species) was chosen. Their baseline state and current state were determined through ecological profiles as described above. The overall ecosystem quality index is expressed as the average % of the baseline state. The Natural Capital per ecosystem is defined as the product between (i) the remaining area as a % of the total country area; and (ii) its quality. In other words:

Quantity x Quality = Natural Capital Index

To facilitate communication to policy-makers, ecosystem quantity and quality are aggregated into one overall 'Natural Capital Index' (NCI) for both non-domesticated area and domesticated area (see figure 2). This overall NCI varies from 0-100%, and reflects “% remaining non-domesticated area of 100% quality” and “% domesticated area of 100% quality”. The formula for calculating NCI is:

$$NCI_{non-dom} = \% \text{ area } \times \% \text{ quality}$$
$$NCI_{dom} = \% \text{ area } \times \% \text{ quality}$$

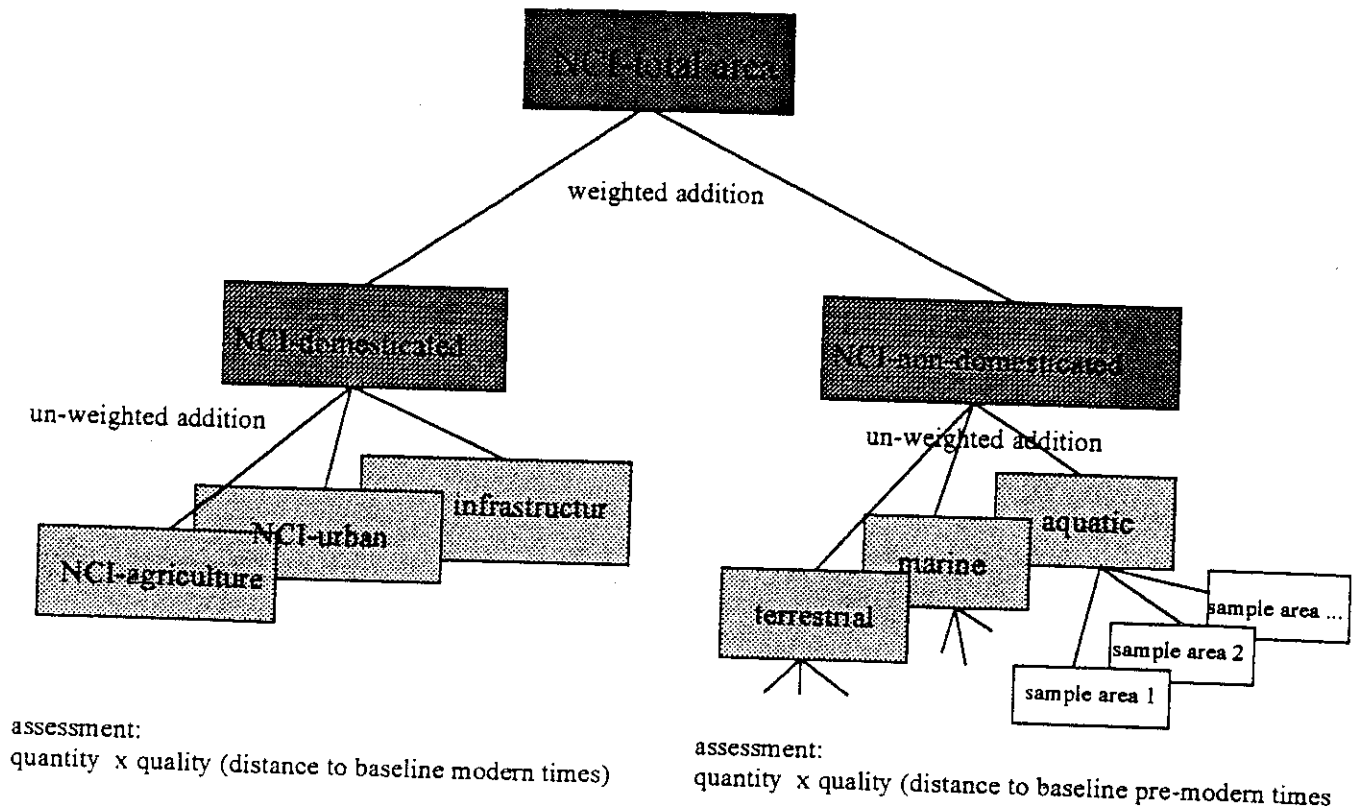
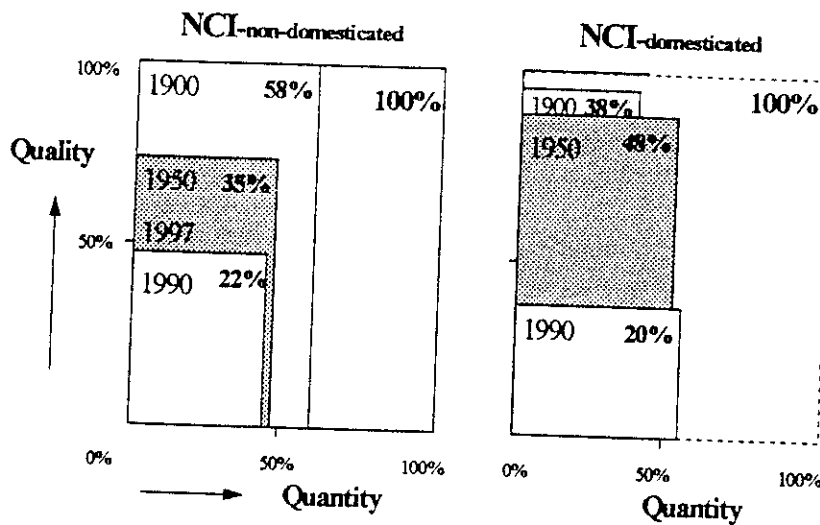


Figure 2: Natural Capital Index consists of two components: $NCI_{non-dom}$ and NCI_{dom} . They cannot simply be added because of their different character

concept 20/6/97

Natural Capital Index The Netherlands



1. Figure 3: An illustration of the preliminary results on ecosystem quantity and ecosystem quality indicators and the combined Natural Capital Index for The Netherlands.

3. DEVELOPING AND APPLYING BIODIVERSITY INDICATORS: MAJOR LESSONS FROM THE DUTCH EXPERIENCE

- Keep it simple and understandable for policy-makers ('KISS' principle);
- Quantify ecosystem state, problems and solutions in the same tangible way as other sectors;
- The choice of a baseline is essential for ecosystem assessment;
- Distinguish the assessment of non-domesticated and domesticated areas: use different baselines and assessment principles for each;
- The ecosystem quantity and quality indices are universally applicable;
- Underlying quality variables are ecosystem-specific;
- Measuring the entire ecosystem is impossible: choices on which quality variables and sample areas to use have to be made;
- Keep the total number of indicators as small as possible;
- Preliminary, biodiversity pressure indicators could be a good substitute for state indicators;
- Once chosen, indicators (quality variables) help programming for monitoring and research

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CASE STUDY: UNITED STATES

by Dr. Mike Ruggiero, U.S. Department of the Interior, Government of the United States

1. REQUIREMENTS FOR AN EFFECTIVE BIODIVERSITY MONITORING SYSTEM

- (i) **Index of leading ecological indicators** to summarize ecological status;
- (ii) **Synthesis report of existing biological information** (e.g., surveys, species status, museum and other collections, etc.) to establish a synoptic picture of biodiversity status and trends at the national level;
- (iii) **Ecosystem, community, and habitat maps** based on coordinated, spatially referenced data sets (ecosystem mapping through the use of remote sensing and GIS can establish baseline references for monitoring changes in ecological structure over time);
- (iv) **Comprehensive program of inventory and status reporting** for ecosystem, species, and genetic resources and an assessment of their condition based upon standard ecological indicators and measurements; and
- (v) **Mutually agreeable suite of meaningful core indicators** for which standard methods can be provided and comparable statistics can be reported, and which are non-technical, scientifically relevant, and indicative of progress toward biodiversity goals.

2. FOUR NATIONAL ACTIVITIES OF PARTICULAR RELEVANCE TO INDICATORS AND TARGETS

The U.S. Government (USG) has undertaken 4 national activities consistent with the CBD's goals, which are applicable to the development of biodiversity indicators and targets, (thereby providing a good starting point from which to derive a core set of indicators). These include:

- (i) **National Report Card on the Nation's Ecosystems.** A first report card, scheduled for release in 2001, will report on the goods and services provided by the nation's major ecosystem types.

Topics such as ecosystem extent, productivity, condition, recreation and aesthetics, and ecosystem services will be addressed.

- (ii) **National Environmental Monitoring and Research Initiative.** This provides a framework for integrating environmental monitoring and related research on the Nation's ecological systems and resources. It will link systematic observations and monitoring of ecological systems and resources with predictive modeling and research. The linkage will provide the information needed to improve understanding, detection, and prediction of the status and trends in the ecosystems and natural resources of the United States so as to ensure their sustainability.
- (iii) **Sustainable Development Indicators Project.** As called for by the President's Council on Sustainable Development this project will develop a list of economic, environmental, and social indicators that will track the Nation's progress toward achieving sustainability.
- (iv) **Environmental Goals for America Project.** This project will establish national environmental goals and milestones for the nation for improving personal health, national economy, and quality of life.

3. NATIONAL BIOLOGICAL INFORMATION INFRASTRUCTURE (NBII)

A NBII -- a "virtual" national reporting system -- has been established in the United States. Among other things, it provides the infrastructure for which to manage and link the vast amounts of biological diversity information that is produced. Examples of major biodiversity components, measures, and supporting data programs are listed below.

Major Elements of NBII:

- (i) **Biosystematics and Nomenclature**
 - Taxonomic Authorities
 - Vegetation Classification
- (ii) **Landscapes, Ecosystems, and Habitats**
 - Vegetation Mapping
 - Land Cover
 - Land Use (wetlands, conservation areas)
- (iii) **Species and Populations**
 - Population Trends
 - Population Distributions
 - (migratory birds, marine mammals, T&E spp., Endemic spp., Exotic spp., Invasive spp., Wild Relatives of Domestic spp., Medicinal spp., Cultural spp., uses, hazards)
- (iv) **Genes**
 - Plant/animal registries, tissue/gene banks
- (v) **Ex-situ Diversity**
 - Zoos, seed banks, germ plasm
- (vi) **Environmental Drivers and Ecological Processes**
 - Atmospheric, Water, Contaminants, Soils, Nutrient Cycling
 - (survey networks, intensive monitoring and research sites)
- (vii) **Social and Economic Drivers**
 - Human Demographics
- (viii) **Capacities and Capabilities**
 - Taxonomists/Systematists
 - Collections

- Universities (Training)
- Libraries, Bibliographies
- Reports, Assessments, Syntheses
- Patents
- Funding Sources

4. DEVELOPING A CORE SET OF INDICATORS

A. General Considerations. CBD Appendix I and the previously developed Biodiversity Country Study Guidelines provide logical sources to develop a set of indicators for the U.S. NBII. A core set of indicators:

- covers the levels addressed by the convention;
- is relatively straightforward and simply understood;
- is supported by existing data programs;
- is useful for other purposes;
- addresses the question of current status; and
- can be used to detect trends in biodiversity.

B. Proposed Set of Core Biodiversity Indicators Programs

- (i) **Biodiversity Level: Habitat**
 - Mapped distributions of natural habitats
 - Mapped distributions of protected areas
 - Mapped distributions of nonprotected land uses
- (ii) **Biodiversity Level: Species**
 - Recorded species present
 - Indigenous species present
 - Nonindigenous species present
 - Endemic species
 - Threatened species: lists, mapped distributions
- (ii) **Biodiversity Level: Genetic**
 - In situ genetic resources: medicinal plants, wild ancestors of domestic varieties
 - Ex situ resources: accessions of crops and livestock in storage, microbial cultures

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CASE STUDY: BRAZIL

by Mr. Bráulio Dias, Brazilian Ministerio do Medio Ambiente, IBAMA, Government of Brazil

1. INTRODUCTION

Brazil has many initiatives underway in the area of environmental monitoring and indicators, and is currently "mapping" these programs, ascertaining information needs and considering how the various initiatives can be integrated for maximum efficiency. These initiatives include, for example:

- (i) Sustainable development indicators initiative;
- (ii) Indicators of environmental quality;
- (iii) National biodiversity strategy and action plan (still under development)
- (iv) Protected area indicators; and
- (v) indicators for monitoring deforestation

2. WORKSHOP ON BIODIVERSITY INDICATORS AND MONITORING

In September 1996, a major workshop on Assessment, Monitoring and Indicators for Biological Diversity was held in Brazil, with the aim of developing a framework for monitoring Brazil's biodiversity. A wide-ranging set of indicators was developed, covering seven categories (see below). In addition, several follow-up steps are being pursued:

- (i) exploring the use of remote-sensing, molecular probes, and new techniques in field studies;
- (ii) examining the characteristics of biodiversity in current conditions, dominant vs. less dominant characteristics, etc.; and
- (iii) assessing the basis for biodiversity indicators.

In Situ Conservation and Protected Areas (PAs)

Creation

- # of PAs per biome, ecoregion and ecosystem type
- size and distribution of PAs
- representativeness and distribution of PAs
- consideration of biodiversity conservation priorities
- consideration of natural ecological units

Management

- land tenure; infrastructure
- presence of keystone species
- proportion of exotic to native species
- maintenance of basic ecological processes
- loss of species

Ex Situ Conservation and Genebanks

- representativeness of different biomes, ecoregions and ecosystems in genebanks
- representativeness of intraspecific variability of endangered and economically important species
- number of assessments of native species and varieties
- rate of loss/exhaustion of assessments in genebanks
- degree/rate of exchange between genebanks
- degree of utilization of genebank collections

Restoration of Endangered Species, Habitats and Ecosystem Services

- rate of population increase
- integrity of habitat
- maintenance of ecological processes
- reduction of human impacts
- genetic, species and ecosystem diversity

Restoration of Degraded Areas

- percentage of native vegetation cover
- structure of diversity of plant communities
- re-colonization by plants, animals and microorganisms

- water quality
- soil quality (organic matter and biota)
- restoration of natural processes

Policies on Environmental Protection and Natural Resources Management

- proportion of protected area to converted/utilized area
- quality and use of water resources
- quality and use of atmospheric resources
- quality and use of soil resources
- presence of taxa indicators of environmental integrity
- degree of connectivity of food webs
- degree of eutrophication of water bodies

Safety of Biodiversity

- # of introduced species and genomes
- quantity of specimens or species of economic/scientific interest removed from the environment
- effectiveness of CITES provisions
- effectiveness of controls of species traffic and quarantine
- effectiveness of biosafety norms
- erosion/loss of genetic diversity patrimony

Environmental Education

- understanding of the meaning and value of biodiversity
- adoption of conservation and sustainable practices
- # of visitors to protected natural ecosystems versus # of visitors to recreational areas within PAs

4. SOME CONCLUDING OBSERVATIONS

- (i) In tropical systems, most of the biodiversity is found in small taxa (e.g., microbes, arthropods, etc.), but most of the existing data is for dominant taxa such as birds and trees;
- (ii) Different taxa respond differently to various human activities, raising the questions of which indicators are most suitable for monitoring;
- (iii) Cause and effect relationships in the biodiversity field are not well established, but are needed if indicators and targets are to be most policy-relevant. Therefore in selecting indicators, ones where strong causal links between pressures and state of biodiversity components can be established should be an emphasis;
- (iv) Effective indicators are needed to establish relationship between biodiversity and ecosystem function;
- (v) We should be practical and start with a few good indicators and build from there; and
- (vi) Perception of biodiversity values varies among stakeholders, and this needs to be considered in monitoring impacts.

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CASE STUDY: CANADA

by Mr. Tony Turner, A.M. Turner and Associates, Ottawa, Canada
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1. OVERVIEW

Major National Programs. Canada has a number of major national programs related to biodiversity indicators, including:

- (i) **National environmental indicators program** (includes biodiversity indicators under themes of biodiversity, forests and marine)
- (ii) **Criteria and indicators for sustainable forest management (SFM)** (includes 6 criteria and 83 indicators that are consistent with the Montreal Process; no targets have been established at the national level since targets are more applicable at the management unit level)
- (iii) **Agri-environmental indicators** (including habitat and species indicators for agricultural environments)

General Approach. The general approach to national environmental indicator development in Canada involves six elements:

- (i) Setting goals for sustainable development
- (ii) Selecting issues
- (iii) Using pressure-state-management response framework and ecosystem model
- (iv) Identifying selection criteria
- (v) Conducting consultations and developing partnerships
- (vi) Adopting national set of indicators

Major challenges. Major challenges to indicator development include:

- (i) a lack of data to support indicator development
- (ii) a need to set targets to measure progress against
- (iii) a need to aggregate and integrate data (e.g., to build meaningful indices from sets of indicators and to integrate biodiversity into broader sustainable development indicator efforts)
- (iv) the need to harmonize various indicator initiatives, as appropriate and to focus efforts on addressing national policy concerns such as biodiversity.

2. RISK TO BIODIVERSITY INDEX

As part of an effort to develop an general overview of biodiversity under the National Environment Indicator Program, a *Risk to Biodiversity Index (RBI)* was developed. Using a geographic information system (GIS) approach, the index compiles various data by some 200 distinct ecoregions. The operational version of the RBI is an aggregate of 3 major indices, which include a total of 13 indicators. The three indices are:

- (i) Pressure index (7 indicators)
- (ii) Sensitivity index (5 indicators)
- (iii) Remediation index (1 indicator)

Each indicator (e.g., land use, protected areas) was represented spatially as a GIS map. Each legend class and map was weighted according to expert opinion of its relative impact on biodiversity. Indicators were grouped under the appropriate indicator category (i.e., Pressure, Sensitivity or Remediation) and aggregate indices compiled for each ecoregion. Weighing and combining the indicators in different ways produced different results. All results showed higher risk in ecoregions

characterized by high population and highly modified ecosystems (generally southern Canada) and low risk in ecoregions with low land use pressures and population and high in protected area (generally the north). The system is flexible in the GIS environment because indicators can be added and weightings changed and different scenarios run. In this way the RBI can be tailored to meet the needs of specific sectors (eg., forestry, wildlife). Overall the index can help set national and regional priorities with respect to biodiversity conservation.

3. CANADA'S RESPONSE TO CBD COP-3 DECISIONS

Canada's planned response to COP-3 decisions on indicators will include: (i) documenting current and planned biodiversity indicator and assessment initiatives (including both the federal and hopefully the provincial level), identifying gaps, weaknesses and opportunities with respect to indicators and the Canadian Biodiversity Strategy; and (ii) developing an overarching analytical framework that would enable various data collectors, data and information holders to see the value and linkages of their data in a broader context, and help build bridges across traditional sectoral lines.

4. CANADA'S FIRST NATIONAL IMPLEMENTATION REPORT UNDER THE CBD

In 1995, Canada completed the Canadian Biodiversity Strategy. The federal government, along with the 10 provinces and 2 territories, are each developing action plans to implement the strategy. Canada's first national report will combine contributions from all these jurisdictions and will include policies and programs and other measures taken to implement Article 6 of the CBD. The use of common indicators of progress and targets is not expected in the first national report. It is hoped that the experience of preparing the first reports will point to a need to develop a core set of indicators and targets within Canada.

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CASE STUDY: EUROPE

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1. OVERVIEW

The amount of original work that has been undertaken to analyze and report on biodiversity at the European level is rather limited. Responsible institutions such as the European Commission, the European Environment Agency and the Council of Europe have undertaken a number of initiatives to provide an overview (ETC/NC, 1996, 1996a, NERI, 1995, EEA 1997), but the lack of data harmonization and availability have limited the possibilities. As a result, biodiversity-related assessments have relied heavily on aggregations of existing national data for only a few indicators such as: species numbers (total versus endangered), protected area coverage (percentage), representative sites and their state of protection and ecological quality, the European distribution of key species or selected ecosystem reports (e.g. wetland drainage in the Mediterranean, sand dune degeneration at the European coasts, etc.).

When analyzing the existing biodiversity data and its spatial representation (see Table 1), it becomes apparent that the information frequently lacks clearly defined links to:

- Human interventions: type and extent of human interventions as related to biodiversity status

- and trends
- Ecoregional differences: characteristics and variations between eco-regions
- Role of policies: role of European nature conservation and other sectoral policies
- Overall situation: of a given habitat or landscape type

2. SOME SPECIFIC EUROPEAN INITIATIVES

A. European Environment Agency Ecoregional (EEA) Initiative.

Aware of the need to improve classical nature conservation reporting (e.g., number of protected areas per country, percentage of endangered species, etc.), the EEA asked the newly established European Topic Centre for Nature Conservation to develop a methodology for assessing state and trends of biodiversity. Initial pilot studies in 10 biogeographic regions were based on both satellite data (land cover) and national/regional information on the distribution and status of species, habitats and landscapes. The studies demonstrated the benefits of the new methodological approaches, but showed also the limits in terms of data availability and quality. In particular, data on habitats and landscapes, both very important biodiversity components from the European point of view, pose substantial problems.

In light of the observed difficulties, the EEA follow-up report on the state of Europe's environment (to be published in 1998) is supposed to present a chapter on 'nature and biodiversity' which will put emphasis on pressure indicators rather than on new state indicators (see Table 1). Also it is planned to use the relatively well developed avifaunistic data as indicators for biodiversity. Since the identification of European ecological regions is still underway, the report will use the national level as references.

B. European Statistical Office (EUROSTAT) Pressure Indicators Project.

In response to the Communication on "Environmental Indicators and Green National Accounting" of December 1994, the Environmental Statistics Unit in EUROSTAT is currently developing the "Environmental Pressure Indices Project" (1995). The objective of this project is to create the methodological infrastructure for a comprehensive and accurate description of the pressures on the environment resulting from human activities. EUROSTAT's approach follows OECD's concept of a (Driving Force)Pressure-State-Response model. Among the 10 issues which are to be described is the *loss of biodiversity*. A Scientific Advisors Group of the EU has developed about 25-30 indicators per issue. For each of the categories, the indicators' value with regard to policy relevance, analytical soundness, responsiveness and overall rating (core indicators) have been assessed.

In relation to the two initiatives above, the following options for a pressure index system are under discussion (EUROSTAT and EEA are currently working on the first option):

- (i) Pressure indices system at the national level based on the aggregation of a number of pressure indicators (50-60). The aim would be to provide an equivalent to gross national products (GNPs), with reference to defined and politically approved environmental quality targets.
- (ii) Pressure indices system based on landscape units as parts of eco-regions as the references for defining carrying capacities, sustainable resource management, land use options, conservation goals, etc.

Table 1: Nature Conservation/Biodiversity Indicators of the European Environment Agency (EEA)

Report	Indicators/Assessment criteria
Europe's Environment - The Dobris Assessment (EEA, 1995)	ecosystems: comparison of representative sites according to protection, management problems and stresses by country; grasslands: comparison of land use ratio between permanent pasture, cropland, and dry grassland by country; wetlands: comparison of sites according to hydrological changes, decline in water quality, mineral extraction and tourism for Ramsar sites; sand dunes: loss of area between 1900 and 1990 for 11 countries; coastal saltmarshes: ratio total area versus protected area and area threatened by reclamation; species groups: total number versus threatened species by country; species: distribution trends of key species in selected regions; European distribution of key species (without trends); threat categories for species or families by country; protected areas: total hectares and numbers of sites, and percentage of surface coverage.
Environment in the European Union 1995	species: average percentage of threatened groups for EU12 in total; number of endemic higher plants and vertebrates by country; protected areas: number and total size of protected areas by IUCN category for EU 12.
Environment in the European Union 1998 (concept)	transport: density of network (1960-1996) and corridor potentials: agriculture: farming structure and practice (1960 - 1996); rural development agricultural land use livestock use of fertilizers forest fires water abstraction/use of pesticides urbanization: area built up (1960-1996) land use / land cover changes (1960-1996) species: changes in status, numbers and trends of birds; protected areas: number and total size of protected areas by IUCN category for EU 12. habitats: progress of Natura 2000. fragmentation

3. CONCLUDING OBSERVATIONS

A brief analysis of the existing assessment mechanisms for biodiversity at the European level points at a number of conceptual and qualitative shortcomings with regard to data management in general and the use of indicators or the development of implementation targets in particular. Recently, the implementation of pilot studies in the field of biological and landscape assessment at the European level has provided useful insights for future assessment strategies.

One of the essential findings is that the technical part of biodiversity assessment by means of indicators needs to be supplemented by two crucial tasks:

- (i) **Natural scientists, policy makers and representatives of socio-economic sectors need to enter an active dialogue to identify 'ethic goals' for future landscape and biodiversity profiles.** Without the definition of commonly accepted goals, without a scale to refer to, the decision-makers and the European public will not be able to interpret and accept indicators for biological and landscape diversity. These goals need to address the issues of space, time and contents in more concrete terms.
- (ii) **When developing valid methodologies for biodiversity assessments, international experts need to establish procedures that link top-down approaches to national bottom-up activities.** The development of implementation targets can only be successful if regional and national experts are provided with adequate assessment tools (aggregated, higher level information) and when feed-back and response mechanisms between international and national/regional experts occur early and are highly standardised throughout Europe.

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CASE STUDY: GLOBAL

by Ms. Birgitte Bryld.

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1. A THREE-PHASE INDICATORS PROGRAM BY THE CSD

The U.N. Commission on Sustainable Development (CSD) was established in 1992 to help support and monitor the implementation of Agenda 21. In 1995, a five-year work program on sustainable development indicators under the DPCSD was established. The objective is to arrive at a core set of sustainable development indicators for use at the national level by the year 2000. It represents an enormous collaborative effort by more than 30 organizations of the United Nations system, other intergovernmental organizations, non-governmental organizations and governments. The program has three phases:

Phase 1 (completed September 1996): Identify indicators and develop methodology sheets

Using the Driving Force- State-Response Framework, a working list of 134 sustainable development indicators was established, covering the broad scope of the 40 chapters in Agenda 21. The 134 indicators, along with methodology sheets for applying these indicators, were developed by 30+ U.N. organizations, intergovernmental organizations, and non-governmental organizations as well as a large number of individual experts (see listing of indicators in <http://www.un.org/dpcsd/dsd/isd.htm>). The list only includes two specific

indicators for Chapter 15 of Agenda 21: Conservation of Biological Diversity, namely Threatened species as a percent of total native species and Protected area as a percent of total area, although many of the other indicators (e.g., those related to forests, oceans, land management and cross sectoral areas such as finance) are particularly relevant to biodiversity.

Phase 2 (current phase): Multi-country testing program

The second phase, which will be completed in December 1999, focuses on the voluntary testing of these indicators at the national level in 17 countries covering all regions of the world. DPCSD has prepared guidelines to assist the establishment of national testing programs, containing suggestions regarding organization, stakeholder involvement, assessment, evaluation and reporting. Furthermore a format for annual reporting has been developed and regional workshops to address capacity building are being convened.

Phase 3: Interlinkages, Aggregation and Modelling

The third phase (1997-99) will focus on refining the indicators and related methodology sheets, the identification of interlinkages among the indicators of sustainable development, further aggregation and possible modelling.

2. INPUT FOR BIODIVERSITY INDICATORS

The biodiversity indicators in the above-mentioned set are in particular need of strengthening. The DPCSD is therefore explicitly soliciting input in this area in order to refine these indicators.

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II. PRESENTATIONS ON THEMATIC ISSUES

Part 1: Environmental Indicators and Targets

CASE STUDY: THE USE OF REMOTE SENSING DATA

by Dr. Anthony Janetos

U.S. National Aeronautics and Space Administration (NASA); Government of the United States
[THIS SUMMARY IS STILL TO BE COMPLETED]

1. OVERVIEW OF MISSION TO PLANET EARTH (MPE)

NASA's Mission to Planet Earth has established a set of scientific priorities for the period 1996-2002. This includes monitoring trends and patterns of change in regional and global land cover and land use, biodiversity, primary production, etc. The ultimate vision is to develop the capacity to perform repeated global inventories of land cover and land use from space, to help contribute to sustainable development. In this regard, the basic principle underpinning this work is that a better understanding of land cover and land use changes is essential to the provisions of ecological goods and services.

2. A NEW FOCUS ON BIODIVERSITY

A. Overview of New Biodiversity Program. To date, NASA has not focused on the provision of information to help address biodiversity loss. Recently, however, NASA, in collaboration with a group of nongovernmental organizations (NGOs) working in the biodiversity field, has established a Biodiversity Program and an associated working group to consider specific programs and activities under the MPE to help provide such information to the international community.

As a first major activity in the Biodiversity Program, a two-day workshop was held in April 1997. The workshop agreed on four areas of activity under the Biodiversity Program:

- (i) Evaluation at site and eco-regional scales
- (ii) Priority setting
- (iii) Measuring and monitoring
- (iv) Information management and networks

B. Series of Pilot Projects. Starting modestly, a series of pilot projects will be carried out over the next year or two. These will include: [FILL IN]

C. Applications for Supporting Implementation of the CBD at the national, regional and global levels. [FILL IN]

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CASE STUDY: GROUND-TRUTHING SYSTEMS FOR MONITORING BIODIVERSITY

by Dr. Elizabeth Sterling and Dr. Donat Agosti
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1. THE NEED FOR GROUND-TRUTHING PROGRAMS

In developing and applying biodiversity targets and indicators, ground-truthing monitoring systems that directly measure changes to biological resources are a key element. While rapid assessment techniques, remote sensing, models for predicting species distributions and related tools are useful for broad assessments and inventories, they are limited by the data and assumptions used to implement them. For example, remote sensing may be excellent for mapping large, intact or degraded areas, but may not reveal important changes taking place *under* a forest canopy. Also, the current state of remote sensing does not address species composition within a forest or other ecosystem. Ground truthing or ground verification is needed to compensate for these shortcomings.

2. INVENTORY AND MONITORING STUDIES

In the areas of targets and indicators, there are two general categories of on-the-ground studies to measure biodiversity variables: inventory and monitoring studies.

Inventory studies:

- (i) measure the spatial distribution patterns of populationS, species, communities, and/or ecosystems over geographical space; and
- (ii) are used to select and design protected areas, assess potential for sustainable use of natural resources, document distribution of threatened or endangered species, to provide the basis for selecting indicator species or assemblages for ecological monitoring.

Monitoring studies:

- (i) provide information used in managing reserves for maintenance or restoration of composition, structure and function of natural ecosystems;
- (ii) provide information on actual biotic responses to environmental stress;
- (iii) provide early signs of negative responses to environmental changes; and
- (iv) can contribute to assessments of changes in habitat or ecosystem structure, composition or function over time (looking at baseline data) in response to natural factors, human disturbance or management activities.

3. THE USE OF INDICATOR TAXA

A. A Suite of Indicator Species. Many individual indicator species (e.g., birds, butterflies, etc.) are currently being used to help assess the condition of habitats and ecosystems, and to help monitor changes. Increasingly, many scientists are supporting the use of a *suite* of indicators species from unrelated taxa (i.e., classification categories), covering a range of body sizes, growth forms, distributional characteristics, habitats and ecological functions. Very few indicator species fulfill all of the requirements listed below. Still, there is a need to start with some reasonable grouping of indicator species, and to build upon that.

B. Criteria developed for biodiversity indicator taxa. More specific criteria for selecting biodiversity indicator taxa include:

- (i) large spatial and temporal distribution
- (ii) large variety of ecological niches and distributional, population and dispersal traits
- (iii) relatively large population sizes
- (iv) high diversity of species
- (v) many specialist species
- (vi) high endemism
- (vii) fine scale measurability (temporal and geographical)
- (viii) reliability
- (ix) ecological relevant position in the ecosystem
- (x) relevance to policy or management decisions
- (xi) easily identifiable external morphological characteristics
- (xii) sensitivity to environmental disturbance
- (xiii) easy and low-cost observation and collection
- (xiv) pattern of species distribution correlates with the distribution of what is being measured
- (xv) necessary resources are available for analysis

4. BUILD UPON EXISTING GROUND-TRUTHING PROGRAMS

Existing ground-truthing programs and related resources should be used and built upon. These include, for example: Diversitas, IUCN-The World Conservation Union, Man and the Biosphere (MAB) Program, CITES, World Conservation Monitoring Centre (WCMC), RAMSAR, International Plant Genetic Resources

Institute (IPGRI), American Museum of Natural History, Smithsonian Institution (U.S.), Field Museum (U.K.) and Bishop Museum (U.K.). In addition, countries need to build up their capacity and expertise in the area of systematic and conservation biology.

5. THE SWISS EXAMPLE OF A GROUND-TRUTHING PROGRAM

The Government of Switzerland has established an extensive biodiversity monitoring program (BDM-CH) which includes direct indicators of species distribution and abundance. Major steps in the program are outlined below:

- (i) Local inventories are conducted (birds, butterflies, grasshoppers, dragonflies and plants)
- (ii) Distribution of rare species is monitored
- (iii) Thirty indicator were selected (11-state, 14-pressure and 5-response), including indicators directly linked to changes in species distribution and abundance, as well as their habitats
- (iv) Habitats comprising more than 10% of the national area will be monitored
- (v) Integration of monitoring efforts at regional and local levels

Major lessons from biodiversity monitoring in Switzerland include:

- (i) knowledge of national biodiversity [???
- (ii) standardized collecting protocols are necessary
- (iii) sufficient expertise to identify species is needed
- (iv) groups of species should be selected for answering specific monitoring questions
- (v) greater than 200 years of expertise accumulated and accessible

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CASE STUDY: USING GROUND ANTS AS A BIODIVERSITY INDICATOR GROUP

by Dr. Donat Agosti, Research Scientist, American Museum of Natural History (United States)

1. THE USE OF SOCIAL INSECTS AS A SURROGATE MEASURE OF BIODIVERSITY

For most regions of the world, indicators that *directly* measure the state and change in biodiversity are needed. Given financial, expertise and other logistical constraints, such a system can only be developed for a limited number of organisms, and may still take many years to develop. In the short-term, specific groups of organisms, such as social insects, may be particularly useful as surrogate indicators.

2. THE USE OF ANTS AS A PARTICULARLY PROMISING INDICATOR TAXA IN THE SHORT-TERM

A. Why ants? Among social insects, ground living ants are particularly promising as an indicator taxa, and fulfill many of the criteria listed in other presentations. Ants represent up to 30% of the total animal biomass in a tropical forest ecosystem and thus play an ecologically important role. They are reasonably diverse, allowing for comparisons among different sites. Their taxonomy is relatively well known, they are easily collected all year round because of their social lifestyle, and standardized, reproducible collecting techniques are available.

B. The ALL Protocol. A group of scientists worldwide involved in research of ground living ants developed a standardized protocol for the assessment of their biodiversity -- known as the Ants of the Leaf Litter (ALL Protocol). These scientists have made a commitment to cooperate in the preparation of standardization of collection techniques, identification tools, in training of local personnel, and in making information on those species widely available global data network (http://research.amnh.org/entomology/social_insects).

The ALL-protocol produces (i) a list of species and their abundance; (ii) an estimated number of total species in a given area; and (iii) the estimated fraction of the total ground living ants in the sampled area. In terms of practical applications, ALL data could potentially be used for many purposes (e.g., measuring sustainable use of forests, rehabilitation, impacts of climate change projects, rapid inventorying using combination remote sensing data and other taxa, etc.).

3. INDICATORS WHICH COULD BE DERIVED FROM ALL DATA

A number of particularly useful indicators which could be derived from ALL data include:

- (i) total # of collected species (standardized)
- (ii) estimated total # of species
- (iii) # of introduced species
- (iv) # of endemic species
- (v) # of specialists vs. generalists
- (vi) species with small population size vs. larger population size
- (vii) change in # of species over time
- (viii) change in composition of species over time
- (ix) spatial differences in the # of rare vs. common species
- (x) spatial differences in the # of restricted vs. wide-range species

ALL data cannot yet readily be used to develop national-level indicators without a significant increase in capacity. Building up capacity over time allows development of national indicators by extending site surveys into a national network of surveys. The operating costs of an ALL monitoring system are quite low. One sample (including 75% of species) can be analyzed within one week. The costs over ten years of developing the recommended global expert knowledge and information infrastructure has been estimated at US\$ 10 - 25 million.

4. GENERAL RECOMMENDATIONS FOR NEXT STEPS

- (i) CBD Parties should identify and agree upon, at the global level, relevant species groups as a minimal set of core indicators;
- (ii) Build capacity to enable CBD Parties to use this minimal indicator set;
- (iii) Strengthen collaboration between scientific community and users within Parties; and
- (iv) Distribute protocols and results using electronic media.

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CASE STUDY: FOREST BIODIVERSITY
by Nigel Dudley, World Wide Fund for Nature International

1. FOREST QUALITY INDICATORS

In recent years, WWF has been exploring methodologies to evaluate forest biodiversity and to develop forest quality indicators at the landscape level. In this regard, the following four elements have been identified as particularly important. Areas for potential development of indicators of forest quality under each element have also been identified. A particularly important finding of this work is that biodiversity is heavily influenced by what could be termed the "authenticity" of a forest (i.e., the degree to which an existing human-influenced forest compares to a forest in its natural condition in that particular landscape).

- (i) **Authenticity**
 - composition
 - pattern
 - function
 - process
- (ii) **Forest Health**
 - health of trees
 - health of flora and fauna
 - robustness to changing conditions
- (iii) **Environmental Benefits**
 - biodiversity conservation
 - soil and watershed protection
 - impacts on other natural and semi-natural habitats
 - climate stabilization
- (iv) **Social and Economic Values**
 - wood products
 - non-timber forest products
 - employment
 - recreation
 - homeland
 - historic value
 - educational and research value
 - cultural and aesthetic value
 - spiritual and religious value
 - local distinctiveness

2. GENERAL PRINCIPLES FOR DEVELOPMENT OF FOREST BIODIVERSITY INDICATORS

- (i) Forest biodiversity is affected by more than just the area under trees
- (ii) Most forests have been influenced by people (anthropogenic systems)
- (iii) Biodiversity is influenced by the authenticity of the forest
- (iv) High biodiversity can exist in non-natural forests (e.g., West Kalimantan, Indonesia)
- (v) Quality of biodiversity (as well as, for example, species richness) is also important
- (vi) Care must be taken in the choice of indicators from biological and social perspective
- (vii) This is a very inexact science

3. LEVELS FOR MEASURING FOREST BIODIVERSITY

Forest biodiversity can be measured at several levels, as outline below. Also listed are data collection techniques, needed classification schemes and examples of specific elements to be measured.

- (i) National survey
 - road classification
 - age-classes to help define forest condition
 - red lists
- (ii) Landscape survey
 - satellite data
 - aerial surveys
 - ground-level surveys of structure
- (iii) Structural survey (authenticity)
 - geology and soil type
 - species composition, age structure, etc.
- (iv) Indicators survey (using a suite of indicator species and larger taxa)
 - lichens and fungi associated with age-classes and micro-habitats
 - vascular plants associated with ancient woodlands
 - birds associated with old forests
- (v) Genetic survey
 - historical surveys
 - local variation
 - detailed genetic studies

4. OTHER IMPORTANT PROCESSES AND ACTIVITIES THAT CAN CONTRIBUTE TO FOREST BIODIVERSITY INDICATORS AND TARGETS

- (i) Intergovernmental processes to develop national-level criteria & indicators of Sustainable Forest Management (Montreal, Helsinki, Tarapoto, Dry-Zone Africa, Central America, etc.)
- (ii) Forest Resources Assessment (by the FAO and UNECE)
- (iii) Forest Stewardship Council (nongovernmental initiative), which has developed principles for sustainably managed forests at the management unit level
- (iv) WWF Forest Scorecards Process

5. CBD ROLE IN INDICATORS AND TARGETS

The CBD implementation process presents a unique opportunity to set measurable targets within national forest programs, and to develop a set of indicators to measure progress toward achieving these targets. In this regard, two broad sets of indicators are needed:

- (i) A limited, core set of simple indicators which could be applied in the short-term
 - simple measures of forest condition, protected areas, etc.
- (ii) A larger set of more ambitious indicators to be developed and applied over the long-term

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Part 2: Financial Indicators and Targets

FINANCIAL INDICATORS FOR PROTECTED AREAS

by Alexander James, Department of Land Economy, University of Cambridge;
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1. INTRODUCTION

A financial indicator can be defined as a measure of investment in biodiversity conservation by national governments. It is a "response" indicator as it measures national response to biodiversity loss in financial terms. Standardized data on national investment in protected areas can provide measurable indicators and targets for global biodiversity assessment.

Financial indicators should be included in a core set of biodiversity indicators under the CBD, as they are necessary to help: (i) identify priority geographic areas for international assistance; (ii) track investments in priority regions and countries annually; (iii) provide a basis for estimating regional and global financial shortfalls; and (iv) provide a basis for assessing the adequacy of international assistance for biodiversity.

As one examines various international statistical sources, it becomes quickly apparent that very little information exists on biodiversity investment. International reporting of government budgets does not isolate biodiversity expenditures. Researchers wanting this information have had to conduct surveys of government agencies, and as a result, the available data is incomplete and non-standard.

2. WCMC STUDY ON INVESTMENT IN PROTECTED AREAS

In 1996, World Conservation Monitoring Centre (WCMC) completed a study on national investments in protected areas, reaching several important conclusions:

- (i) Total global investment in biodiversity conservation is about \$11 billion annually, of which approximately \$2 billion is provided by foreign donors;
- (ii) The largest single activity in global biodiversity investment is protected areas, accounting for two-thirds of annual investment;
- (iii) Wide regional variation exists in national investment in protected areas, with a global average of \$US 776 per square kilometer;
- (iv) National assessments of target budgets for protected area agencies for different regions varies between \$200 and \$2,500 per square kilometer; and
- (v) The global shortfall in protected area agency budgets is approximately \$1.3 billion annually.

3. SELECTING FINANCIAL INDICATORS AND TARGETS

Selecting the most effective financial indicators and targets is complicated by several factors. For example, a wide range of activities directly affecting biodiversity are funded, through a number of different sources of funds, including foreign and domestic government, private, and NGO agencies. In particular, selecting an indicator that could help provide information useful at the regional and global levels, requires standardizing the definition of biodiversity investment. One specific financial indicator and target are proposed below:

A. Proposed indicator: government investment in protected areas

The annual budget of the agency charged with management of a country's protected areas could serve as one

useful financial indicator. The agency could then serve as a focal point for collecting and reporting on relevant data in this regard. Investments could be analyzed and reported in a number of ways (e.g., protected area investment per square kilometer or investment as a percentage of gross domestic product-GDP).

B. Proposed target: shortfall budgets for protected areas

Financial shortfall can be estimated by each protected area agency as the additional financing required to meet its *stated* conservation objectives. A financial target could be the combined actual and shortfall budgets, which can also be reported on and compared in a number of ways (e.g., per square kilometer or target investment as a % of GDP).

The advantages of these proposed indicators and targets are that they (i) are easily reported; (ii) can be standardized and compared across countries; and (iii) capture the majority of government investment in biological diversity.

4. IMPROVING NATIONAL REPORTING OF BIODIVERSITY INVESTMENTS UNDER THE CBD

National implementation reports under the CBD represent an opportunity to gather data on a core set of biodiversity indicators. These reports will cover all aspects of the implementation of National Biodiversity Strategies, including investments. The suggested guidelines provided by the CBD's Conference of the Parties (COP) on how to report on budgets are very general. Therefore, at least the first set of national reports (due 1 January 1998) are unlikely to provide standardized data on protected area investment.

This points to the need for the COP to strengthen the guidelines for including biodiversity investments in national reports. The COP may want to develop, for example, a standardized format for reporting biodiversity investments. This could detail government expenditure in each of the following areas: identification and monitoring (Art. 7); in situ conservation (Art. 8); ex situ conservation (Art. 9); research and training (Art. 12); public education and awareness (Art. 13); technical and scientific cooperation (Art. 18); and financial resources (Art. 20).

As an additional important step, governments should include budgets for biodiversity conservation, particularly protected areas, in annual reporting of government financial statistics. The establishment of standardized financial reporting would greatly facilitate international comparisons of biodiversity investment and the identification of priority areas for international support.

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tel: +1.415.326.0990; fax: +1.415.326.0980; e-mail: anjames@msn.com. Also, see: James, A. N., Green, M. J. B., and Paine, J. R. (1997). *Financial Indicators for Biological Diversity Conservation: A Global Analysis of Protected Area Investment*. Cambridge, UK: World Conservation Monitoring Centre (in press).

DONOR COUNTRY FINANCIAL ASSISTANCE

by Rob Lake, Royal Society for the Protection of Birds, U.K.

1. CBD OBLIGATIONS AND CURRENT TRENDS IN FINANCIAL ASSISTANCE

Donors' financial obligations under the CBD derive from two principal articles of the Convention.

- (i) **Article 20(2)** states: "the developed country Parties shall provide new and additional financial resources to enable developing country Parties to meet the agreed full incremental costs to them of implementing measures which fulfil the obligations of this Convention" (provided through the Convention's financial mechanism - currently the Global Environment Facility). While the GEF is a 'new' source of funds -- in that it did not exist before 1991 -- it is questionable whether the finance it has provided has been genuinely 'additional' to previous official development assistance (ODA) for biodiversity, and it has certainly not been additional to total ODA.
- (ii) **Article 21(4)** requires donor countries to "consider strengthening existing financial institutions to provide financial resources for the conservation and sustainable use of biological diversity".

Despite these twin obligations, since the signing of the CBD in 1992, OECD statistics do *not* show an overall increase in total ODA for biodiversity -- i.e., GEF and other sources combined. Furthermore, of particular concern, current ODA reporting systems do not provide reliable figures on trends in aid for biodiversity: donors use different classifications of "biodiversity" expenditure, have incomplete coverage and use imperfect definitions of "biodiversity-related" activities. Indeed, the OECD acknowledges that their statistics on biodiversity investment are unreliable. This points to a major problem that needs to be addressed.

2. GUIDANCE BY THE CBD CONFERENCE OF THE PARTIES (COP)

In recognition of this problem, the CBD COP (in Decision III/6) 'urges developed country Parties to cooperate in the development, where possible, of standardised information on their financial support for the objectives of the Convention {...}. Where possible, these Parties should submit this information to the CBD Secretariat in their national reports'. In addition, Decision III/6 'urges all funding institutions, including bilateral and multilateral donors as well as regional funding institutions and non-governmental organisations, to strive to make their activities more supportive of the Convention...'. Other decisions by the COP (in particular, on the need for a core set of biodiversity indicators) suggests the need to develop some simple indicators of financial assistance that could be standardized and reported upon by all donor country Parties.

Joint work by the CBD Secretariat and the OECD is now in hand to develop ways of tracking and reporting biodiversity-related expenditures by donors.

3. PROPOSED INDICATORS AND TARGETS FOR FINANCIAL ASSISTANCE

- (i) **Target for Monitoring ODA Flows:** By end of 1997, a standardized system will be put in place for monitoring/reporting biodiversity-related aid through the OECD.
- (ii) **Indicator and Target for National ODA Volumes**
 Indicator: Volume of aid for biodiversity in relation to 1992 level.
 Target: All donors should increase their aid for biodiversity by 25% by 2000.
- (iii) **Target for Development Agency Legislative/Mission Statement:** If they have not already done so, by the end of 1998, donors should review existing legislation governing their development agency, and/or the agency's mission statement, and enact any necessary amendments to ensure that the agency's purpose and objectives are to pursue environmentally sustainable development that conserves biodiversity, maintains the integrity of ecosystems and supports the objectives and specific provisions of the CBD.
- (iv) **Target: Formal Policy Statement by Donor Countries.** By the end of 1998, all donors should adopt formal policy statements on biodiversity or review and amend as necessary existing policy statements to ensure that they deal comprehensively with all aspects of the CBD, including

- financial assistance-related provisions.
- (v) **Target-Setting for Funded Projects**
 Indicator: Bilaterally-funded biodiversity projects should have clearly expressed biodiversity outcome objectives and targets.
 Target: By the end of 1998, all donors should start to use biodiversity outcome objectives.
 - (vi) **Evaluations of Bilaterally-Funded Projects**
 Indicator: Plans and methods developed for evaluations of the effectiveness of bilaterally-funded biodiversity projects and the impact on biodiversity of other projects.
 Target: By the end of 1998, all donors that have not already done so should conduct biodiversity evaluations of their bilateral portfolios.
 - (vii) **Target for Donor Coordination**
 Target: By October 1997, the OECD Development Assistance Committee (DAC) Working Party on Development Assistance and Environment should initiate a process to exchange best practice and enhance donor coordination in biodiversity activities.

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Part 3: Legal Indicators and Targets

OPTIONS FOR DEVELOPING LEGAL INDICATORS AND TARGETS

by David Downes, Senior Attorney, Center for International Environmental Law (CIEL)

1. INTRODUCTION

Many Parties to the CBD seem ready to begin exploring how to develop a core set of legal indicators and targets. It seems most likely that we will be able to develop indicators, rather than targets, at the outset. It may be useful to begin by exploring both the difficulties to be anticipated in developing a core set, and -- on the other hand -- the factors that support development of a universal set of indicators. One of the main challenges is that national laws must be tailored to fit into the distinctive package of measures each society adopts under its national biodiversity strategy. Also, national laws and legal systems differ significantly according to cultural, political, historical, economic and sometimes religious features, which vary among regions, countries and communities.

On the other hand, the societies of most CBD Parties share a number of features that will help support the development of a core set of legal indicators:

- (i) principles and "laws" on biological and environmental sciences;
- (ii) global economic forces (e.g. global markets, trade, transnational corporations);
- (iii) elements of modern parliamentary democracy (existence of legislative and judiciary branches of government; a bureaucratic administrative state; legal recognition of human rights);
- (iv) shared legal traditions among many countries; and
- (v) a commitment to international laws (e.g., the CBD, ratified by some 166 governments).

2. PROPOSAL FOR A PROCESS UNDER THE CBD TO DEVELOP LEGAL INDICATORS AND TARGETS

A. Introduction. At the outset, it should be emphasized that many elements already exist that can be the basis for legal indicators for implementation of the CBD. Principal among these is the text of the CBD itself. It is very important to recognize that the CBD already contains general targets that governments are obligated to meet, such as establishing a system to assess biodiversity impacts of proposed projects.

Also important are formal decisions by the CBD Conference of the Parties (COP), such as the *Jakarta Mandate on Marine and Coastal Biodiversity*. These multilateral decisions by the Parties serve as compelling guidelines for measures to implement the CBD. Another source of elements for implementation are found in other multilateral agreements, such as CITES, the U.N. Agreement on Straddling and Highly Migratory Fish Stocks, and the conservation obligations of the U.N. Convention on the Law of the Sea. Also useful will be legal measures commonly or usually found in national legislation of the Parties to the CBD.

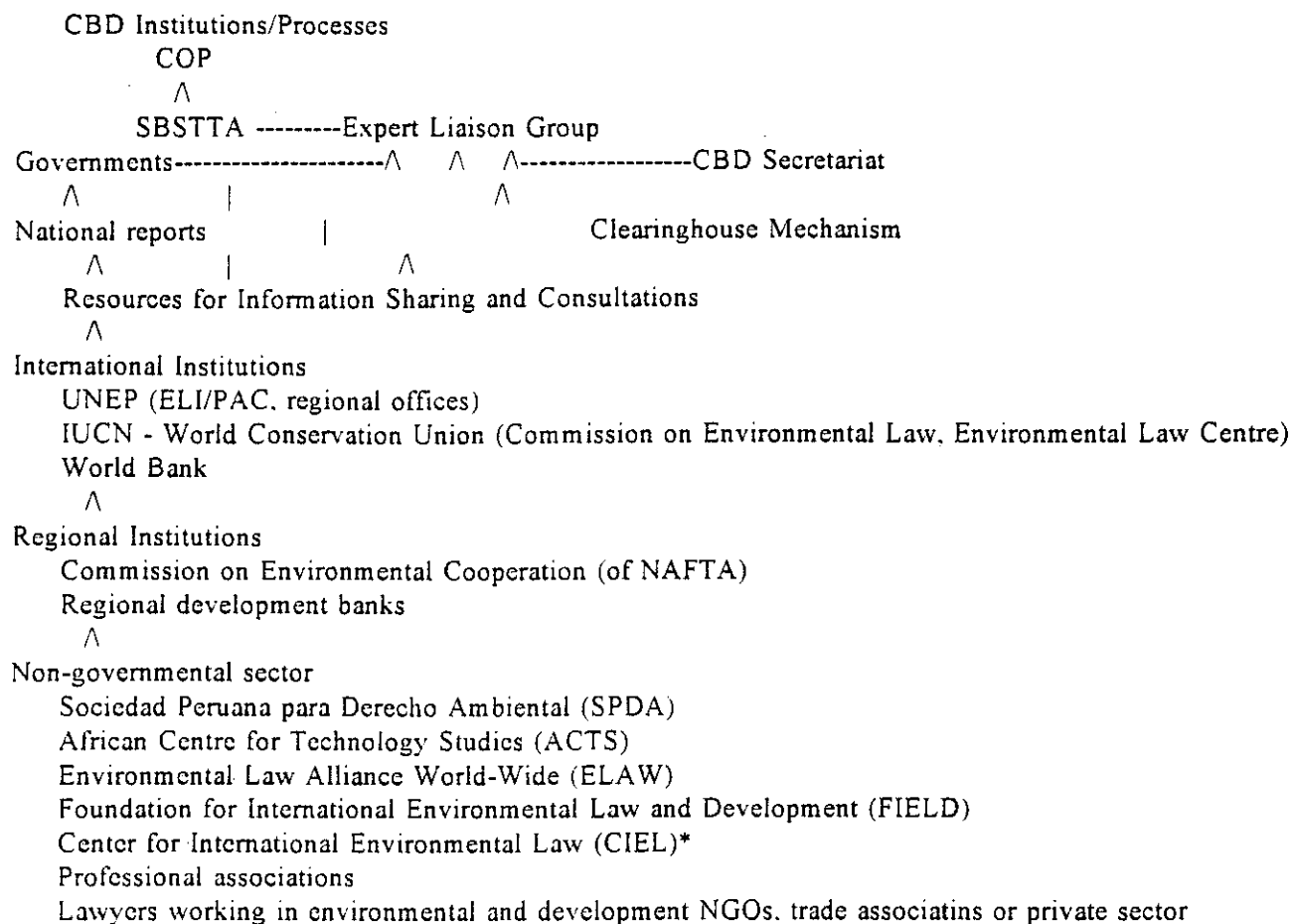
Some of these elements have been reviewed and analyzed by non-governmental organizations (NGOs), intergovernmental organizations (IGOs), and academia. To take a few of the many examples, the Center for International Environmental Law and the IUCN Environmental Law Centre have identified optional elements for inclusion in national biodiversity legislation, and Kothari and Singh have reviewed Indian law in the context of the CBD.

In sum, there are significant resources and expertise to draw upon for developing legal indicators and targets. What is needed is a process to synthesize this information and feed it into the formal CBD process so that participants in that process can make use of it themselves. Figure 1 provides some ideas on how such a process might work. It is not intended to provide exhaustive lists of institutions that could contribute, but merely some examples.

B. A Legal Expert/Liaison Group under the CBD SBSTTA. An expert or liaison group under the CBD's Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) could be an important vehicle for moving this process forward. Possible Terms of Reference for such a group include:

- (i) Recommend legal indicators and options for targets for implementation of the CBD which could be incorporated into future national implementation reports;
- (ii) Recommend legal indicators and options for targets in the context of ecosystem themes on the COP's workplan (e.g., inland waters, coastal/marine, agriculture, forests);
- (iii) Recommend guidelines for national processes to define legal targets; and
- (iv) Propose next steps by a legal experts group/network to help operationalize recommendations (e.g., capacity building, cooperation).

**Figure 1: An Information Sharing Process for the
Development and Application of Legal Indicators and Targets**



* If agreed to by other partners, CIEL would be prepared to help catalyze and coordinate NGO contributions in this area.

3. SOME PRELIMINARY OPTIONS FOR LEGAL INDICATORS

In lieu of more in-depth work on legal indicators and targets, governments and stakeholders could consider the following types of options and questions:

- (i) Are laws and regulations in place that implement the general legal targets that are clearly evident in the CBD's text itself?
- (ii) To what extent has there been meaningful public participation in review and development of laws?
- (iii) To what extent has information about biodiversity-related laws been made accessible to the public?
- (iv) To what extent has the precautionary approach been integrated into laws?

- (v) Has there been a review of existing laws to assess the extent to which they implement the CBD, and formal COP decisions made regarding its implementation?
- (vi) What level of capacity exists to apply and enforce laws? (e.g., staffing of enforcement agencies, training of enforcement personnel)
- (vii) What level of effectiveness has been achieved in monitoring and enforcing biodiversity-related laws? (possible indicators might include cases prosecuted, convictions or penalties imposed, violations reported)

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Part 4: Capacity Indicators and Targets

INTRODUCTION TO BIODIVERSITY CAPACITY INDICATORS AND TARGETS

by Dr. John L. Hough, U.N. Development Programme (UNDP)

1. BACKGROUND

Capacity relates to the ability of individuals and organizations to perform functions effectively, efficiently, and sustainably. Various dimensions can be identified which either facilitate or constrain functional capacity:

- (i) the overall societal context, including the economic, social, cultural and political environment in which individuals and organizations operate;
- (ii) the legal, regulatory, policy, and normative context in which individuals and institutions operate;
- (iii) the relationships between institutions, including the flow of information and levels of networking, linkages, coordination and cooperation;
- (iv) organizational structures, including management, processes, functions, and resources; and
- (v) the human resource base and its knowledge, skills and behaviour.

2. IMPACT INDICATORS AND TARGETS

Ultimately the ability to carry out tasks is assessed by measuring the extent to which the tasks themselves are being accomplished. If the task is implementation of the Convention on Biological Diversity (CBD), measures of the state of conservation of biodiversity, the state of sustainable use -- particularly the pressures on biodiversity, and the degree to which the sharing of benefits associated with biodiversity are equitable -- are the indicators of impact of biodiversity capacity. Consequently no separate "impact indicators" for capacity are required, they are the same as the impact indicators used to measure the outcomes of CBD implementation. Similarly "impact targets" for capacity must be defined in terms of the accomplishment of the task of implementing the CBD. Capacity to do this is secondary to the target of implementation itself.

3. PROCESS INDICATORS AND TARGETS

Capacity indicators and targets are relevant to measuring progress towards implementation of the CBD, and how effective, efficient and sustainable that progress is. However, setting generalized capacity targets is difficult since capacity requirements are highly specific and dependent on the nature

of the problem being addressed. Until the specific problem is known, the capacity targets and indicators cannot be set. For example, while geographic information system (GIS) skills may be required to solve some biodiversity problems, political skills are needed to solve others. Capacity requirements are also interdependent, for example, the human skills required in any particular organization depend on the resources available, the organizational structure, the relationship between that and other organizations, the legal and policy context, etc., as well as on the problem being addressed. Consequently capacity targets and indicators must be set on a case-by-case basis.

4. CAPACITY INDICATORS AND THE CBD

Indicators of capacity to implement the CBD must measure the extent to which each of the dimensions of capacity facilitate or inhibit CBD implementation. Identification of indicators is facilitated if CBD implementation is broken down into its three essential tasks:

- (i) conservation of biodiversity (changing or maintaining the state of biodiversity);
- (ii) sustainable use (generating and responding to pressures on biodiversity); and
- (iii) equitable sharing of benefits

Indicators must also be developed for the different scales at which the CBD must be implemented, i.e.

- (i) global
- (ii) regional
- (iii) national
- (iv) sub-national / local

The implication of this is that capacity targets and indicators can only be set in the context of specific situations. However, some samples of the kinds of indicators that might be used are given below.

5. SOME EXAMPLES OF INDICATORS OF CAPACITY FOR IMPLEMENTATION OF THE CBD

A. Societal Context

- (i) extent to which the general public understands the term "biodiversity"
- (ii) extent to which subsidies encourage or discourage biodiversity considerations in economic decision making
- (iii) number, size and age of NGO's dealing specifically with biodiversity

B. Legal and Policy Context

- (i) how recently the national laws on access to ownership of genetic materials were revised
- (ii) importance assigned to biodiversity in National Environmental Action/Management Plans
- (iii) comparative levels of budgetary commitments to biodiversity institutions

C. Institutional relationships

- (i) clarity of mandates to different organizations to deal with particular aspects of biodiversity
- (ii) effectiveness of communication between organizations
- (iii) degree of cooperation between organizations dealing with biodiversity

D. Organizational Structures and Resources

- (i) clarity of organizational mission statement

- (ii) clarity in lines of accountability
- (iii) adequacy of physical environment, resources, materials

E. Human Resources

- (i) extent to which skills and tasks are matched
- (ii) regularity and seriousness of performance monitoring and review
- (iii) degree of job satisfaction and motivation

F. Interactions between Components

- (i) percentage of university applicants indicating wish to study biodiversity
- (ii) number of court cases successfully prosecuted in which biodiversity regulations were contravened
- (iii) level of use of biodiversity themes in product advertising

6. CONCLUSION

Capacity is a means to an end, not an end in itself. Hence while capacity indicators and targets are essential to measuring progress towards CBD implementation, they cannot measure whether CBD objectives have been achieved. Capacity indicators must be defined within the context of specific tasks and particular situations.

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(U.N. Headquarters, New York; Conference Room #4; 3 - 4 April 1997)

(Total # of participants: 86)

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Annex IV:

BIBLIOGRAPHY OF RESOURCES ON BIODIVERSITY INDICATORS, TARGETS, AND RELATED ISSUES

BOOKS:

Bakkes, J.A. and van Woerden, J.W., eds. (1997). *The Future of the Global Environment: A Model-Based Analysis Supporting UNEP's First Global Environment Outlook*. RIVM and UNEP, Nairobi (Kenya).

Groombridge, B., ed. (1992). *Global Biodiversity: Status of the Earth's Living Resources*. Report compiled by the World Conservation Monitoring Centre, Natural History Museum, IUCN, UNEP, WWF, WRI. Chapman & Hall, London (UK).

Granholm, H., T. Vahnenen & S. Sahlberg eds. (1996). "Background Document" *Intergovernmental Seminar on Criteria and Indicators for Sustainable Forest Management, August 19-22, Helsinki, Finland*. Ministry of Agriculture and Forestry, Helsinki (Finland).

Haywood, V.H. ed. (1995). *Global Biodiversity Assessment*. Global Environment Facility/UNEP. Cambridge University Press, Cambridge (UK).

Miller, Kenton & Steven Lanou (1995). *National Biodiversity Planning: Guidelines Based on Early Experiences Around the World*. WRI, UNEP, IUCN. WRI Publications, MD (USA).

Prabhu, R., C. Colfer, P. Venkateswarlu, L. Cheng Tan, R. Soekmadi & E. Wollenberg (1996). *Testing Criteria and Indicators for the Sustainable Management of Forests: Phase 1 Final Report*. Center for International Forestry Research, Jakarta (Indonesia).

UNEP (1997). *Global Environment Outlook*. UNEP, Nairobi (Kenya).

ARTICLES AND PAPERS:

Aldrich, M., C. Billington, D. Bryant, V. Kapos and R. Luxmoore (1995). *Developing Indicators of Habitat Condition and Vulnerability*. Draft Report on a World Resources Institute/World Conservation Monitoring Centre Workshop and Subsequent Research, October, 1995. World Resources Institute and World Conservation Monitoring Centre. Washington, D.C. (USA) and Cambridge (UK).

BIONET, WCMC, WRI & Worldwatch Institute (1997). *Biodiversity Indicators and Implementation Targets*. Discussion Draft. BIONET, Washington, D.C. (USA).

Brazilian Ministry of Environment, Water Resources and the Amazon Region, et. al. (1996). *Assessment, Monitoring and Indicators for Biological Diversity: Methods From a Tropical Perspective*. Recommendations from a workshop convened by the Brazilian Government to the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) of the Convention on Biological Diversity, Second Meeting, Montreal, 2-6 September, 1996.

Burke, Laretta (1997). *Reporting Requirements and Information Systems - Synergies Between the Conventions on Biological Diversity, Climate Change and Desertification and the Forest Principles*. Draft Discussion Paper. World Resources Institute, Washington, D.C (USA).

- Glowka, L., F. Burhenne-Guilmin and H. Synge (1994). *A Guide to the Convention on Biological Diversity*. IUCN-World Conservation Union, Gland (Switzerland).
- Hammond, A., A. Adriaanse, E. Rodenburg, D. Bryant and R. Woodward (1995). *Environmental Indicators: A Systematic Approach to Measuring and Reporting on Environmental Policy Performance in the Context of Sustainable Development*. World Resources Institute, Washington, D.C. (USA).
- Institute of Terrestrial Ecology (1996). *Assessment of Follow-Up Activities in the European Environment Agency (EEA) Member Countries to the Convention on Biological Diversity*. ITE, Huntingdon (UK).
- IUCN-World Conservation Union (1996). *Five Years After Rio: Measuring Progress in the Implementation of the Convention on Biological Diversity*. A Special Focus report by IUCN to the Earth Council. IUCN, Gland (Switzerland).
- James, A., M.J.B. Green and J.R. Paine (1997). *Financial Indicators for Biodiversity Assessment: In Situ Conservation Investments*. Draft paper submitted for the GBF, 3-4 April, 1997. University of Cambridge, Cambridge (UK).
- Laane, R.W.P.M. and B.J.E. ten Brink (1990). "Modern Monitoring: Data-Rich, Information-Poor". *Land & Water International*. Netherlands, Vol. 68, pp.12-16.
- Levy, K., T.F. Young and R.M. Fujita (1996). *Restoration of the San Francisco Bay-Delta-River System: Choosing Indicators of Ecological Integrity*. Environmental Defense Fund and the Bay Institute of San Francisco. San Francisco, CA (USA).
- Martin, R.B. (1997). *Sustainable Use: The Quest for Independent Variables*. First Draft Paper prepared for the 4th Meeting of the Steering Committee of the Sustainable Use Initiative to be held in Kuala Lumpur, Malaysia, 31 March - 3 April, 1997. Southern Africa Sustainable Use Specialist Group.
- McNeely, J.A. (1996). *Assessing Methods for Setting Conservation Priorities*. Paper presented to OECD Conference on Biodiversity, Cairns, Australia, March 1996. IUCN, Gland (Switzerland).
- Reid, W.V., J.A. McNeely, D.B. Tunstall, D.A. Bryant, M. Winograd (1993). *Biodiversity Indicators for Policy-Makers*. World Resources Institute and IUCN, Washington, DC (USA).
- Rodenburg, E., D. Tunstall and F. van Bolhuis (1995). *Environmental Indicators for Global Cooperation*. Global Environmental Facility (GEF) Working Paper, No. 11. World Bank, Washington, D.C. (USA).
- ten Brink, B. and W. Douma (1995). *Biodiversity Indicators for Integrated Environmental Assessments at the Regional and Global Level*. Draft Discussion Paper. (RIVM) National Institute for Public Health and Environmental Protection, Bilthoven (Netherlands).
- Tunstall, D. (1992). *The Growing Importance of Scientific Rules of Thumb in Developing Indicators of Sustainability*. Draft paper. World Resources Institute, Washington, D.C. (USA).
- UNEP (1996). *Report of the 2nd Meeting of the SBSTTA*, UNEP/CBD/COP/3/3 (7 September 1996).
- UNEP (1996). *Options for Implementing Article 7 of the Convention*, UNEP/CBD/COP/3/12 (15 September 1996).
- UNEP (1996). *Appraisal of the SBSTTA Review of Assessments of Biological Diversity and Advice on Methodologies for Future Assessments*, UNEP/CBD/COP/3/13 (15 September 1996).
- United Nations (1996). *Work Programme on Indicators of Sustainable Development of the Commission on*

Sustainable Development. Division for Sustainable Development, United Nations Department for Policy Coordination and Sustainable Development.

Wade, D.L. (1997). *Indicators of Small Mammal Diversity*. Draft paper. Monmouth, IL (USA).

Wascher, D.M. (1995). *State and Pressure Indicators for Assessing Biodiversity in Europe*. Draft paper. European Centre for Nature Conservation.

Winograd, M. *Environmental Indicators for Latin America and the Caribbean: Toward Land-Use Sustainability*. GASE, Ecological Systems Analysis Group.

World Resources Institute and World Conservation Monitoring Centre (1995). *Biodiversity Indicators and Convention Reporting*. Summary of a panel discussion hosted by WRI and WCMC and presented at the Second Conference of the Parties to the Convention on Biological Diversity, Jakarta, Indonesia, November, 1995.

INTERNET RESOURCES:

Consortium for Study of North Temperate Montane Ecosystems (CSNTME). "Biodiversity in Montane Ecosystems: Identifying Data Sources and Designing Exchange Protocols" at <http://www.mrc.montana.edu/~csntme/biodiversity-workshop.html>

ENTRI. "Biodiversity: Treaties, Environmental Indicators, and National Responses" at <http://sedac.ciesin.org/pidb/guides/sec3-biodiversity.html>

Environmental Resource Information Network (ERIN- Australia) at http://kaos.erin.gov.au/general/erin_info/intro.html

International Institute for Applied Systems Analysis. "Implementation and Effectiveness of International Environmental Commitments". IIASA-IEC Project Description at <http://www.iiasa.ac.at/Admin/OSR/RP95/IEC.html>

Kejimukujik Ecological Research and Monitoring Centre. *Kejimukujik Newsletter*, Vol.1, No.1-Summer 1995 at http://cs715.cciw.ca/eman-temp/reports/newsletters/kejimukujik/smith_bio_plots.html

Lazar, A. *The Ecological Monitoring and Assessment Network. First National Meeting Report, January 16-19, 1995* at <http://www.cciw.ca/eman-temp/reports/publications/national95/part18.html>

Smith, R. and E. Lofroth, project leaders. "Selection, Development and Presentation of Biodiversity Indicators for Environmental Reporting" at http://www.res.for.gov.bc.ca/news/frbc/proposal/ss_72.html

UNEP, Environmental Assessment Division. *Earth Views*. Vol. 3, No.1-January, 1996 at <http://www.unchs.unon.org/unep/products/eia/news-3-1.htm>

World Bank. "Operational Strategy of the Global Environmental Facility" at <http://www.worldbank.org/html/get/public/opstrat/ch2.htm>

World Resources Institute Publications. "National Biodiversity Planning: Guidelines Based on Early Experiences Around the World" at <http://www.wri.org/biodiv/nbp-summ.html>

Wynberg, R. "Towards a Policy for the Conservation and Sustainable Use of South Africa's Biological Diversity. A Discussion Document" at <http://www.wn.apc/biodiv/biodivt.htm>