GEF Evaluation Office

GEF IMPACT EVALUATION

Priorities and indicators for Global Environment Benefits from Biodiversity: The current international architecture

Impact Evaluation Information Document No. 5

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This paper was commissioned by the GEF Evaluation Office (GEF EO) as an input into its program of **Impact Evaluation**.

A first annual report on this program will be presented to the GEF Council at its November 2007 meeting. The findings, interpretations, and conclusions expressed herein are those of the authors and do not necessarily represent the views of GEF Evaluation Office, the GEF Council, or the Governments they represent. The authors of this document would welcome any comments or suggestions on its contents.

The papers in the Impact Evaluation information document series, as of September 2007, are:

1. Approach Paper to GEF Impact Evaluation – *Brann and Todd*
2. Final Report on proposed Approach to GEF Impact Evaluation - *Foundations of Success*
3. GEF Biodiversity Policy Review - *Foundations of Success*
4. Methodological Challenges in Impact Evaluation: The Case of the Global Environment Facility – Todd and Vaessen
5. Priorities and indicators for Global Environment Benefits from Biodiversity: The current international architecture – *Nair*
6. Case Study Methodology – *Conservation Development Centre*
7. Case Study: Bwindi Impenetrable National Park and Mgahinga Gorilla National Park Conservation Project - *Conservation Development Centre*
8. Case Study: Lewa Wildlife Conservancy – *Conservation Development Centre*
9. Case Study: Reducing Biodiversity Loss at Cross-Border Sites in East Africa *Conservation Development Centre*
10. Impacts of Creation and Implementation of National Parks and of Support to Batwa on their Livelihoods, Well-Being and Use of Forest Products – *Namara*
11. Protected Areas and Avoided Deforestation: A Statistical Evaluation – *Andam, Ferraro, Pfaff and Sanchez-Azofeifa*

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A. Introduction: Scope and Context

At the GEF Impact Evaluation inception meeting held at the Conservation Development Centre offices in Nairobi, it was decided that the first Phase of the Impact Evaluation will focus at the 'impact' level of the results chain. This Impact Evaluation is applying a theory-based-approach, which considers *all* stages of a project's history: (1) project design; (2) implementation; and (3) impact; the current document considers how the final long-term results or 'impacts' of GEF projects can be handled.

This document addresses two elements (1) a delineation of when an environmental benefit becomes of global significance, and (2) what methods are available to determine whether these impact have been delivered and are likely to be sustained.

The GEF Instrument provides the overall mandate of the GEF as "a mechanism for international cooperation for the purpose of providing new and additional grant and concessional funding to meet the agreed incremental costs of measures to achieve agreed environmental benefits …"[1] **What are these *"agreed* environmental benefits" in the biodiversity focal area?** This is further explored.

As per the biodiversity focal area strategy, "for the GEF biodiversity portfolio to make the most effective contribution to the three objectives of the Convention on Biological Diversity (CBD)[2], the strategic emphasis of the portfolio is directed towards conserving and sustainably using biodiversity within protected areas and mainstreaming biodiversity in production landscapes/seascapes and sectors (Strategic Objective One and Two, respectively)"[3].

Given the menu of projects to be evaluated by the current impact evaluation[4]**, the focus of this document is Strategic Objective One: Catalyzing Sustainability of Protected Area Systems at National Levels.** These projects are in East Africa, and **Forest Ecosystems are the broad focus** (i.e. Marine and Freshwater ecosystems are not considered in depth).

The results framework for the three projects in East Africa has been developed separately by Conservation Development Centre, and is included as part of this Impact Evaluation information document series. This document provides an overview of some other major

[1] GEF, **GEF Instrument**, Paragraph 2.

[2] The three objectives of the CBD are: conservation of biodiversity, sustainable use of its components, and fair and equitable sharing of benefits arising from the use of genetic resources.

[3] See **Draft GEF Focal Area Strategy for Biodiversity**, October 2006

[4] **Kenya:** ***Lewa Wildlife Conservancy*****; Uganda:** ***Bwindi Impenetrable National Park and Mgahinga Gorilla National Park Conservation*****; Regional:** ***Reducing Biodiversity Loss at Cross-Border Sites in East Africa***

developments taking place to address the conceptualization and measurement of global environment benefits.

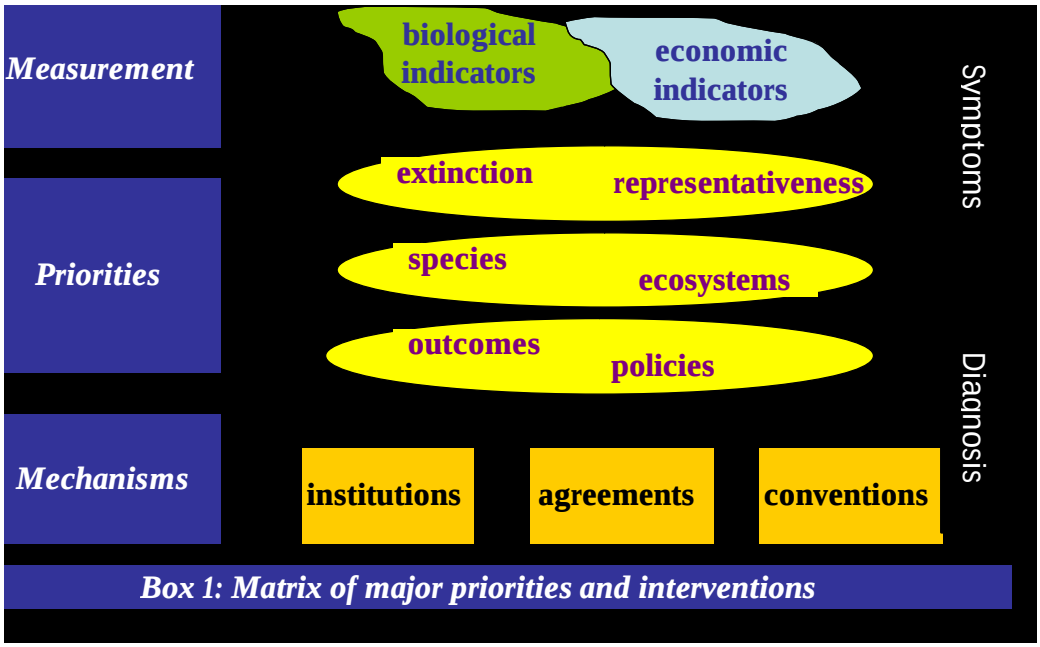
B. The Biodiversity Framework:

1. **An assortment of global benefits from biodiversity *has been agreed* on.** Awareness of the vulnerability of human life as we know it to changes in the environment[5] has increased; in response, numerous international mechanisms (institutions, agreements, Conventions) are in place that address global environmental priorities, particularly for the biodiversity focal area. Starting with the 1992 Earth Summit in Rio de Janerio, 150 governments are now signed on to the Convention on Biodiversity which establishes three main goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources. Other international agreements with their own specific goals include the Ramsar Convention on Wetlands (1975), World Heritage Convention (1975), the Convention on Trade in Endangered Species of Wild Fauna and Flora (1975) and perhaps the most widely-used, the World Conservation Union (referred to as the IUCN, 1948).

   The subsequent prioritization within such agreements depends on the mechanisms applied (see **Box 1**), for example, they include a relative focus on policies or outcomes, on species or ecosystems, on extinction or representiveness. Environmental benefits have thus also been conceptualized as falling into two broad descriptions: those that reflect the array of *symptoms* used to gauge the health of biophysical characteristics (e.g. size, occurrence, variability, quality; Hotspots, Red Lists etc) and those that go on to reflect the *nature of the diagnosis* used in response (e.g. protected areas, CITES etc). Arising from this profusion (and confusion), there have been increased attempts to coordinate concepts (the 2010 Targets established by the Convention on Biodiversity in particular provides this forum). Yet, given the variety of priorities, methodologies and other practical difficulties, this process has not, and probably cannot, lead to complete convergence.

[5] See **Stern Review on the Economics of Climate Change**, January 2007

The valuation of biodiversity is based on a variety of hierarchies including immediate



Box 1: Matrix of major priorities and interventions

economic self-interest (cashing-in on natural resources today), or postponement towards the future (preserving natural resources to ensure its value to later generations, or, to harvest a richer bounty later). Both economic and biological indicators exist; this document primarily considers biological indicators for species, ecosystem and functional diversity.

2. **The dynamics of change in ecosystem variables continues to be unclear** (e.g. the levels of thresholds, buffering capacity, and loss of resilience)[6]. A profusion of concepts and criteria abound regarding when an environmental feature is a global or international benefit. Given the importance of ecosystem functioning, extensive literature examines the effect of species loss on the stability and resilience of ecosystem processes.

Box 2. Differing Strands of Bio-Valuation:

- **Levels of Focus:** Some scientists, especially from the natural sciences domain, tend to focus on genetic and species levels, whereas others, including social scientists, tend to study biodiversity at the level of species and ecosystems.

- **Dynamics to focus on:** A longstanding theoretical paradigm suggests that species diversity is important because it enhances the productivity and stability of ecosystems. However, recent studies acknowledge that no pattern or determinate relationship needs to exist between species diversity and the stability of ecosystems, instead suggesting that a system's robustness may be linked to the prevalence of a limited number of organisms and groups of organisms, sometimes referred to as 'keystone species'. It is also possible that the specific relationships depend very much on whether the abiotic environment is stable or not.

Source: Nunes et al

Box 2 provides a flavor of the diverging perspectives, which range from protecting particular 'keystone species, to opting for wider approaches that have a 'global' impact.

The rationale for conservation ranges from those that begin with the assumption that biodiversity must be preserved for its *intrinsic or inherent value* (existence value), given also that not all is knowable about it and the future may reveal new value; to those that have more self-interested, anthropocentric views and posit that economic activity depends on the *environmental services* that arise from an environmental resource base which is finite, and must be protected.

3. **The quest for global environmental prioritization:** Resources allocated to ecological resources are finite and restricted, thus priorities for conservation have to be constructed. Varied international approaches include three broad systems, those that address (i) particular regions of species occurrence, (ii) particular types of ecosystems, and (iii) other cross-cutting international approaches.

[6] Arrow K, Constanza et al **Economic Growth, Carrying Capacity, and the Environment**, Science, New Series, Vol 268, No, 5210, April 1995.

Box 3. "Biodiversity"

It's the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

(Source: Convention on Biological Diversity Article 2)

The first two systems aim, in different ways, at over-laying species representativeness with species extinction, to address both diversity and urgency.

The first system includes 'hotspots' (where exceptional numbers of endemic species are undergoing exceptional loss of habitat), Endemic Bird Areas, Centers of Plant Diversity, WCMC's Global River basin Analysis (that uses fish diversity as a surrogate for biodiversity in river basins), Vavilov Centers (areas of genetic diversity of wild relatives of domestic crops that are particularly relevant for agricultural biodiversity). These mechanisms themselves represent global knowledge-networks and are complemented by other databases such as FishBase, Global Mammal Assessment and the Global Amphibian Assessment. The most dominant of this group is the World Conservation Union's Red Lists, these include the 1996 Red List of Threatened Animals, the 1997 Red List of Threatened Plants and the World List of Threatened Trees. Species in the Red List are classified on their degree of vulnerability, based on a combination of variables relating to population and geographic area of occurrence and occupancy.

Ecosystem approaches include Ecofloristic zone analysis (used by the FAO's Forest Resource Assessment and WWF), WWF's Global 200 ecoregions (200 global priority ecoregions most important for biodiversity conservation, measured by uniqueness, richness and representativeness) and the Large marine ecosystems.

The third system encompasses a more diverse mix of approaches that prioritize locations, and assign them as of 'global' value, based on scientific, cultural and aesthetic criteria. This includes the Ramsar Convention, UNESCO's Man and Biosphere which designates reserves for objectives such as research, monitoring, training and demonstration, the World Heritage Sites that designates areas of "outstanding universal value," and the CITES list.

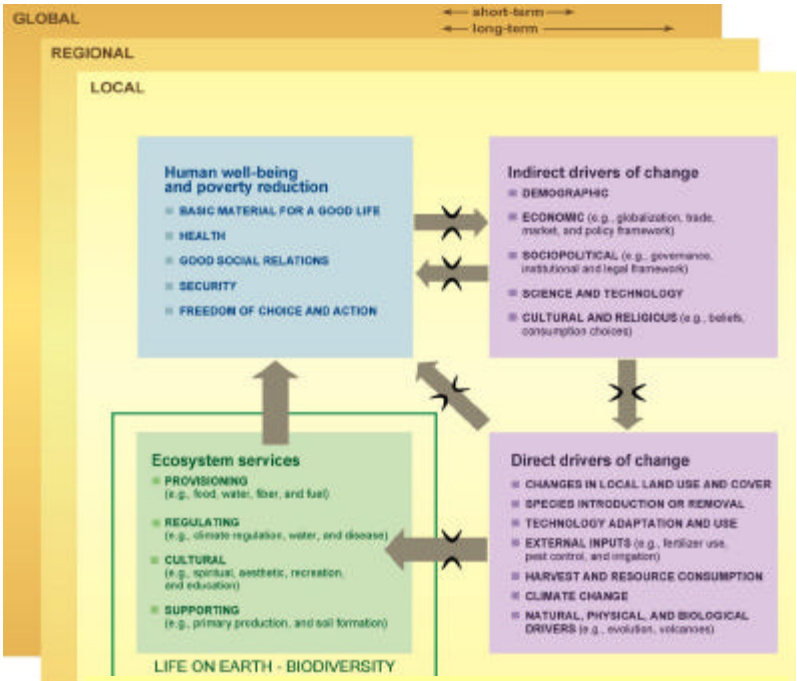
Priorities of the international community are illustrated in **Table 1** below (**Annex I** provides further detail). The Table shows the convergence of major themes (e.g. the need to prevent extinction, ensure representativeness), and the accompanying strategies employed by different mechanisms.

4. **Eco-system Services, local development and global benefits:**
A review of current international practices reveals that 'holistic perspectives' are the current mode for valuing biodiversity – these relate to the integrity, stability and

resilience of complex systems, as compared to measuring particular components[7]. The loss of biodiversity is seen in the context of disrupting the numerous links between species on the planet that keep the earth resilient and stable. The CBD for example, states that "nature's products support such diverse industries as agriculture, cosmetics, pharmaceuticals, pulp and paper, horticulture, construction and waste treatment. The loss of biodiversity threatens our food supplies, opportunities for recreation and tourism, and sources of wood, medicines and energy. It also interferes with essential ecological functions."

In sum, the focus has moved from protecting individual species to protecting entire ecosystems. The trend is towards comprehensive approaches such as the Millennium Ecosystem Approach (MEA) which combines the provisioning, regulating, cultural, and supporting services of ecosystems, as shown in **Box 4.**

The pressure-state-response framework is a standard means of linking the symptoms with their diagnosis, and forms the basis for a number of mechanisms. The Millennium Ecosystem Assessment currently provides a unifying approach that examines *content* of the pressure-state-response model. Correspondingly, in its Operational Strategy, the GEF describes biodiversity as "a source of significant economic, aesthetic, health, and cultural benefits, which form the foundation for sustainable development... Rapid loss of biodiversity poses a global threat to human well-being".[8]



Box 4. Millennium Ecosystem Assessment Approach

The *Programming Document for GEF4 (2006)* [9] promises greater coherence within focal areas, synergies across focal areas, a greater move towards integrated approaches to natural resource management, and more focus on development-environment linkages particularly in the context of the Millennium Development Goals, the Monterrey Consensus, and the Millennium Ecosystem Assessment. The document notes that "the

[7] See these perspectives in Nunes, Paulo A.L.D and C.J.M. van den Bergh, Jeroen, **Economic valuation of biodiversity: sense or nonsense?**, Ecological Economics 39 (203–222), 2001
[8] GEF, **Operational Strategy of the GEF** , Chapter 2, Biodiversity
[9] GEF, **Programming Document for GEF4**, GEF/C.25/Inf.7, May 2005

GEF recognizes the links between local, regional and global environmental management and will seek ways to improve the quality of the regional and global environment through interventions that simultaneously bring local benefits to developing countries. For example, GEF assistance in the biodiversity focal area will continue to support projects that generate multiple benefits (social, ecological and economic) and that have strong linkages to the health, livelihoods and vulnerability of the poor."

While the MEA provides broad clusters of ecosystem services, **Table 4** provides an indicative list of services provided that are viewed as global environment benefits.

5. **Protected Areas and the GEF.** The GEF is reported to be the largest supporter of protected areas globally. As the financial mechanism for the Convention on Biological Diversity, the GEF's biological diversity objectives derive from the guidance of the CBD, and hence the 2010 targets/framework provide a measure of success in achievement of global benefits. The Convention on Biodiversity and the 2010 Targets are covered in some detail in **Table 1.**

Consistent with the guidance of the CBD, the GEF has defined strategic priorities for catalyzing sustainability of protected areas, mainstreaming biodiversity conservation in production systems, capacity building for the Cartagena Protocol on Biosafety, and the generation and dissemination of best practices. The relevant policies and practices of the GEF with regard to global benefits and indicators are examined in **Section E.**

C. Indicators for Impact:

1. Activities at the project-level attempt to address varied indicators, at the gene, species and ecosystem levels. **Table 1** considers the view from a global perspective, noting the type and quality of phenomena -and their accompanying indicators - that are in currency today when global environmental benefits are considered.

2. Biophysical characteristics, policy change and unifying frameworks are represented in Table 1. The IUCN provides the bulk of the data available

Box 5. Constraints to Identifying Biodiversity Impact [1]:

- "Biodiversity" is a complex and somewhat ill defined concept, for which **no single measure** exists. Different attributes of biodiversity may not be well correlated with each other;
- Virtually all measures of biodiversity show **natural variation** at a wide range of temporal and spatial scales. Disentangling human-induced change from such natural variation is often problematic. This makes it difficult to understand whether observed short-term changes in biodiversity correspond to true trends or to noise created by natural fluctuations
- The **time-scales** on which meaningful change in different attributes of biodiversity can be measured are variable. In many cases they may be significantly longer than that of a normal project cycle.
- Indicators **cannot demonstrate causality**. The attribution of particular changes to particular actions will always at best be hypothetical.

currently, with this information feeding-into and also drawing-from many other mechanisms.

3. The evaluability of indicators is varied, depending on both their SMARTness[10] and the availability of the relevant data. Although targets have been identified and become more comprehensive (in terms of definition and in terms of accountability and responsibility among institutions), the lack of data is persistent. Even when the data are available they are highly aggregated, regionally variable in terms of quality, and often not amenable to being used at a project or site-level. **Table 2** provides an overview of data-availability, but its focus continues at this higher global/national level, relevant for the 2010 Targets

4. Inferential and composite indicators are often chosen by international mechanisms as proxies to measure or diagnose the health of a selected region/area. These are based on broad assumptions. In this vein, numerous indexes of ecosystem resilience have been built, and indicators have been constructed to point to changes that are deemed important within these particular frameworks of thought. For example, the Wild Bird Index used by the European Union is seen as "an indicator of the general health of the wider environment, based on the assumption that declines in wild bird populations are intrinsically linked to the degradation of their environment, and that other species groups are likely to be in decline at the same time and as a result of similar impacts." (See 2010 targets). Similarly, Conservation International uses vascular plant endemism as a prediction of biodiversity richness.

   The GEF's Resource Allocation framework uses a composite indictor that seeks to measure the potential global benefits that can be realized from biodiversity related activities in a country, and provides a relative ranking of countries for meeting the biodiversity objectives of the GEF under the Resource Allocation Framework. For this purpose, GBI_{BIO} uses four characteristics: represented species, threatened species, ecoregion representation, and threatened ecoregions. This mechanism is detailed in **Section E**.

[10] Refers to indicators which have the following qualities: Specific; Measurable; Achievable and Attributable; Relevant and Realistic; Time-Bound, Timely, Trackable, and Targeted. See GEFEO, 2006 "The GEF Monitoring and Evaluation Policy"

Table 1. Priorities and indicators for Global Environment Benefits from Biodiversity : The current international architecture

Theme	Global Priorities	Indicators	Institutions	Species	Ecosystem	Nature of Criteria and indicators[11]
1. Biophysical features or outcomes	**Extinction (reduction in threat of)**	- **Population size** reduction (or) unsustainable population structure - **Geographic range** reduction (or) extreme fluctuation in: (a) extent of occurrence (b) area of occupancy	**IUCN** (Red List)**			Quantity and quality
			World Bird Database** (International Bird Areas)			Quantity and quality Variety Distribution
		- **contains/supports the most important and significant** natural habitats for in-situ conservation of biological diversity, including **those containing threatened species** of outstanding universal value from the point of view of science or conservation. - supports vulnerable, endangered, or critically endangered species or threatened ecological communities	**World Heritage List****			Distribution
			Ramsar Convention on Wetlands**			Quality Distribution
	Representative of uniqueness (scientific or biological)	**representative or rare type** (of support) -supports species that are at critical **stages of life cycle**, or provides refuge during adverse conditions - supports species that are **important for maintaining biological diversity** - wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds	**Ramsar Convention on Wetlands**			Quality Distribution (wetlands)
			World Bird Database (International Bird Area)			Quantity and quality Variety Distribution

[11] The three features chosen by the Millennium Ecosystem Assessment as 'common measures' of Biodiversity at the gene, species and ecosystem level are : variety, quality and quality, and distribution. See Chapter 4, Biodiversity, ***Ecosystems and Human Well-being: Current State and Trends***

***** *Indicates that more detail on criteria and categories is provided in the Annex II – which is attached separately***

Blue, underlined, text represent hyperlinks (clicking on the word will link up to relevant background material on the internet)

Table 1. Priorities and indicators for Global Environment Benefits from Biodiversity : The current international architecture

Theme	Global Priorities	Indicators	Institutions	Species	Ecosystem	Nature of Criteria and indicators[11]
		representative or rare type (of phenomena) - representing major stages of earth's history including the record of life, significant ongoing **geological processes in the development of landforms, or significant geomorphic or physiographic features** - representing significant ongoing **ecological and biological processes in the evolution** and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals	**World Heritage List**			Quality Superlatives (outstanding example representing significant processes)
		- **exceptional levels of biodiversity** (magnitude of taxonomic variability) (a) species richness (b) endemism Earth's most biologically outstanding habitats, terrestrial, freshwater, marine	**WWF**** (Global Ecoregions)			Quantity and quality Variety Distribution
		- regions of the world where the distributions of two or more restricted-range species overlap. (eg *Endemic Bird Areas*).	**World Bird Database** (Endemic Bird Area)			Quantity and quality Variety Distribution
		-**exceptional loss** To qualify as a **hotspot**, a region must meet two strict criteria: it must contain at least 1,500 species of vascular plants (> 0.5 percent of the world's total) as endemics, and it has to have lost at least 70 percent of its original habitat	**Conservation International ** (**Hotspots)			Quantity and quality Variety Distribution
		- **unusual** ecological or evolutionary phenomena	**WWF** (Global Ecoregions)			Variety
		- **Intactness:** wilderness areas that are important because of their size and intactness alone and those that are also rich in biodiversity	**Conservation International (Wilderness Areas)**		(biome)	Quality
		- **Variety**: representative of major biogeographic regions, including a gradation of human interventions	**Man and Biosphere ****			Variety

Table 1. Priorities and indicators for Global Environment Benefits from Biodiversity : The current international architecture

Theme	Global Priorities	Indicators	Institutions	Species	Ecosystem	Nature of Criteria and indicators[11]
	Uniqueness (aesthetics)	contain superlative natural phenomena or areas of exceptional **natural beauty and aesthetic importance**	**World Heritage Site**			Quality
	Usefulness (to humans)	- be of significance for biological diversity **conservation**.	**Man and Biosphere**			Quantity and Quality Variety Distribution
	Health of planet (diagnosis of) **Inferential or composite Indicators**	The **Living Planet Index** measures **trends in the Earth's biological diversity**. It is derived from an aggregate of three different indicators of the state of natural ecosystems(1 313 vertebrate species): • The terrestrial index includes species of mammals, birds, and reptiles found in forest, grassland, savannah, desert, or tundra ecosystems worldwide. • The freshwater index comprises species of mammals, birds, reptiles, amphibians, and fish living in rivers, lakes, or wetland ecosystems. • The marine index includes species of mammals, birds, reptiles, and fish from the world's oceans.	**Living Planet Index ****			
		Vascular plant endemism • 0.5% of global vascular plant diversity (300,000 species) endemic to the region as defined, or 1,500 endemic vascular plant species. Based on "recognition of the critical role of plants in the survival of all other terrestrial life-forms"	**Conservation International** (to identify Hotspots and Biodiversity richness)			Quantity, Variety, Distribution

Table 1. Priorities and indicators for Global Environment Benefits from Biodiversity : The current international architecture						
Theme	**Global Priorities**	**Indicators**	**Institutions**	**Species**	**Ecosystem**	**Nature of Criteria and indicators[11]**
		World Bird Index "Acts as an indicator of the general health of the wider environment, based on the assumption that declines in wild bird populations are intrinsically linked to the degradation of their environment, and that other species groups are likely to be in decline at the same time and as a result of similar impacts"	**World Bird Index** (proposed for use in **2010 Target** for *Abundance and Distribution of Selected species)*			Quantity, Variety, Distribution
2. Policy response						
	Management effectiveness	IUCN has defined a series of six protected area management categories, based on primary management objective The following are the main purposes of management: • Scientific research • Wilderness protection • Preservation of species and genetic diversity • Maintenance of environmental services • Protection of specific natural and cultural features • Tourism and recreation • Education • Sustainable use of resources from natural ecosystems • Maintenance of cultural and traditional attributes	**World Database on Protected Areas**			
	Creation of an 'Enabling Environment'	• Development and reform of biodiversity policies; • Development and reform of biodiversity regulations; • Inclusion of biodiversity issues in the policies of other sectors; • International co-operation in the protection and management of key	various sources[12]			

[12] See Jenkins and Kapos; IUCN

Table 1. Priorities and indicators for Global Environment Benefits from Biodiversity : The current international architecture

Theme	Global Priorities	Indicators	Institutions	Species	Ecosystem	Nature of Criteria and indicators[11]
		biodiversity resources affected by more than one nation; • Development and implementation of fiscal (and other) incentives to promote conservation of biodiversity and elimination of perverse incentives; • Leveraging of additional resources from national and other international sources; • Promotion of research relevant to the conservation and sustainable use of biodiversity; • Raising public awareness of the importance of biological diversity and the need for conserving it, through education and dissemination in the media; • Stakeholder involvement in development and implementation of mechanisms for conservation and sustainable use of biodiversity. • Percentage of threatened species that have protected status in each nation				
	Sustainable Management of Forests	• Extent of forest resources • Biological diversity • Forest health and vitality • Productive functions of forest resources • Protective functions of forest resources • Socio-economic functions				FAO, Forest Resources Assessment

Theme	Global Priorities	Indicators	Nature of Indictors
II. Unifying Frameworks	**CBD and 2010 targets: To achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on earth.**		
	Status and trends of the components of biological diversity	• Trends in abundance and distribution of selected species	Living Planet Index is an indicator of the state of global biodiversity Wild Bird Index measures average population trends of a representative suite of wild birds. Currently used in Europe.

Theme	Global Priorities	Indicators	Nature of Indictors
		• Coverage of protected areas	•Data will be obtained from the World Database on Protected Areas and will monitor changes in extent of protected areas globally, including increases in the number of Marine Protected Areas and the growth in area of their coverage. • Overlay w Biodiversity: degree to which areas of key importance for biodiversity around the world are protected, and will help to identify ecologically distinct priority areas for conservation • Management effectiveness: The indicator will focus on three themes: protected area design, adequacy and appropriateness of management systems and processes, and delivery of protected area objectives.
		• Change in status of threatened species	The IUCN Red List of Threatened Species is regarded as the most authoritative and objective system for classifying species by their risk of extinction The Red List forms the basis of two indicators: the Red List Index (RLI) and Sampled Red List Index (SRLI).
		• Trends in genetic diversity of domesticated animals, cultivated plants, and fish species of major socioeconomic importance	The indicator will be composed of sub-indicators on: • The quantity of accessions, genera, species, and crops conserved in ex situ collections; • The quality of ex situ collections; • Capacity to conserve crop genetic diversity in ex situ collections in terms of conservation facilities and human resources. The indicator will be applicable at a range of scales, from collection (by crop and facility) to global. Trends for the period 1998 to 2007 will be available by 2010.
	Sustainable use	**Area of forest, agricultural and aquaculture ecosystems under sustainable management** **Proportion of products derived from sustainable sources**	**Area of forest under sustainable management** One aspect of the indicator on area of forest under sustainable management would involve analysis of trends in uptake of forest certification schemes, as well as contributions of certification schemes to conservation. **Area of agricultural ecosystems under sustainable management.** Data for the following 'core' indicators comes at least in part from the World Agricultural Information Centre (WAICENT) database, maintained by FAO: Development and adoption of policies, strategies, and plans that

Theme	Global Priorities	Indicators	Nature of Indictors
		Ecological footprint and related concepts	support and promote the sustainable use of agriculture Adoption of best agricultural practices and technologies by farmers and herders Status and trends of agricultural biodiversity and ecosystem services Status and trends in sustaining agricultural livelihoods **Proportion of fish stocks in safe biological limits** The indicator has good spatial and species coverage, and catch statistics should be available for all commercial fisheries. The indicator has been published in FAO publications including the State of the World's Fisheries and Aquaculture (SOFIA), and the catch statistics it is based on are also included in the Marine Trophic Index and Ecological Footprint. **Status of species in trade :** Trade data can be used to identify trends in aspects of sustainable use including production rates of sustainable and non-sustainable commodities or species, the source and quantity of specimens from specific areas, and trends in harvest rates of species. For example, changes in the CITES Appendices can denote a change in the perceived or actual threat posed by international trade, acting as an indirect proxy for changes in threats to the survival of the species in question. **Ecological footprint and related concepts**: a widely used measure to determine how much of Earth's regenerative capacity is being used up by human activities. The Footprint assesses demand by measuring the amount of terrestrial and marine area that is required to provide the ecosystem resources and services necessary to support any defined human activity, given current technology. The Footprint of a human population is calculated using information about its size and material standard of living, including its use of energy and natural resources, and how efficiently these resources are turned into consumption products, as well as the area occupied by buildings, roads, and other types of societal infrastructure.

Theme	Global Priorities	Indicators	Nature of Indictors
	Threats to biodiversity	**Nitrogen deposition**	Trends in **the deposition of nitrogen**, and the subsequent response of ecosystems to this deposition, can be used as an indicator of threats to biodiversity and ecosystem health. The concept of critical loads and what happens when they are exceeded is already used in Europe as an indicator for quantifying the response of ecosystems. The quality and quantity of data on nitrogen deposition varies regionally
		Trends in invasive alien species	Several countries have ongoing, systematic monitoring programmes for **invasive alien** (IAS) species, and various single indicators, largely focussing on the number of IAS, have been developed and applied at country and regional level. Data may also be obtained from the IUCN Red List, which records the primary threats to species including the impacts of IAS. Several trends in IAS will be identified by 2010
	Ecosystem integrity and ecosystem goods and services	**Marine Trophic Index**	The **Marine Trophic Index** is calculated largely using catch composition data from countries around the world, collected by FAO. National-level indices have been calculated, and the national data can also be readily applied at the global level. Time series data from commercial fisheries are available from 1950.
		Water quality of freshwater ecosystems	Several well-established **water quality** indicators are available, and provide a good overview of the overall integrity of freshwater ecosystems: Biochemical Oxygen Demand, Nitrate concentration, Suspended sediments and pH and temperature
		Connectivity / fragmentation of ecosystems	**Forest Fragmentation:** An existing global scale assessment has been performed using coarse-resolution remote sensing data. This indicator will assess changes in the fragmentation of forest ecosystems. **River fragmentation and flow regulation** It has two components: fragmentation (number and placement of dams), and flow regulation (how much water is stored behind dams). **Nutritional status of biodiversity** Food composition data, together with food consumption surveys, are used for determining nutritional adequacy and food security for individuals, households, communities, and nations. A basic concept in nutrition is dietary diversity, the logical extension of which is biodiversity

Theme	Global Priorities	Indicators	Nature of Indictors
	Status of traditional knowledge, innovations and practices	Status and trends of linguistic diversity and numbers of speakers of indigenous languages Other indicator of the status of indigenous and traditional knowledge	This indicator will assess the status and trends of linguistic diversity and numbers of speakers of indigenous languages, to act as such a proxy.
	Status of access and benefits sharing	**Official development assistance provided in support of the Convention**	A 'biodiversity marker' has been developed by the OECD and the CBD Secretariat to monitor activities targeting the objectives of the Convention. Data have been assembled for 1998-2000, and the marker is expected to continue to be used until at least 2009.
	GEF Biodiversity Tracking Tools To measure progress in achieving the targets and indicators established at the portfolio level under Strategic Priority One and Strategic Priority Two of the biodiversity focal area. The following targets and indicators are being tracked for all GEF-3 projects and will be tracked for all GEF-4 projects.		
	Catalyzing Sustainability of Protected Area Systems at National Levels (Indicators for Strategic Priority One)	• The number of countries that receive support for strengthening protected area (PA) systems to ensure their long-term sustainability. • The number of hectares of PAs supported. • The number of PAs supported and the percentage of marine or freshwater protected areas. • Number of protected areas and total hectares under any "global priority lists" or other international recognition (e.g. Biosphere reserves, World Heritage Sites, Ramsar, WWF Global 200 etc.). • The percentage of individual PAs that demonstrate **improved management effectiveness** against baseline scenarios by mid-term and end of project as a contribution to a national PA system. • The percentage of PA systems that demonstrate improved management effectiveness against baseline scenarios by mid-term and end of project.	The tracking tool also includes an assessment of protected area management effectiveness which is derived from the "World Bank/WWF Alliance for Forest Conservation and Sustainable Use Site-Level Management Effectiveness Tracking Tool for Protected Areas." These are to be applied three times: at work program inclusion or CEO endorsement (for medium size GEF projects), at project mid-term, and at project completion.

Theme	Global Priorities	Indicators	Nature of Indictors
	Mainstreaming Biodiversity Conservation in Production Landscapes/Seascapes and Sectors (Indicators for Strategic Priority Two)	• Number of projects in each production sector (forestry, fisheries, agriculture, and tourism, etc.) targeted to mainstreaming biodiversity into the sector. • Number of hectares in production landscapes and seascapes that contribute to biodiversity conservation or the sustainable use of its components. • Percentage of projects in each sector that have supported the incorporation of biodiversity aspects into a) sector policies and plans at national and sub-national levels; b) legislation; c) implementation of regulations and its enforcement, and d) monitoring of enforcement. • Percentage of projects that mainstream biodiversity into GEF Implementing Agency/Executing Agency development assistance, sector, lending programs or other technical assistance programs. • Measurement of cumulative market changes to which GEF projects have contributed. • Number of individuals that demonstrate improved livelihoods based on sustainable use and harvest against the baseline scenarios.	

D. Quality and Extent of Data:

Based on the assessment of the *Global Biodiversity Outlook (2006)* the table gives an overview of the state of the 2010 indicator development and data.

As per the *Global Biodiversity Outlook*, several indicators have sufficient resolution to determine a change in the rate of biodiversity loss by 2010 (particularly those scoring "3" in Table 2) . Others may be developed for use by 2010.

Table 2 The Quality of the Data Available according to the 2010 Indicators

Trend	Indicator	Score
	Status and trends of the components of biodiversity	
	Trends in extent of selected biomes, ecosystems, and habitats	3
	Trends in abundance and distribution of selected species	3
	Coverage of protected areas	3
	Change in status of threatened species	1
	Trends in genetic diversity of domesticated animals, cultivated plants, and fish species of major socioeconomic importance	3
	Sustainable use	
	Area of forest, agricultural and aquaculture ecosystems under sustainable management	1
	Proportion of products derived from sustainable sources	
	Ecological footprint and related concepts	3
	**Threats to biodiversity**	
	Nitrogen deposition	3
	Trends in invasive alien species	1
	Ecosystem integrity and ecosystem goods and services	
	Marine Trophic Index	3
	Water quality of freshwater ecosystems	3
	Trophic integrity of other ecosystems	
	Connectivity / fragmentation of ecosystems	
	Incidence of human-induced ecosystem failure	
	Health and well-being of communities who depend directly on local ecosystem goods and services	
	Biodiversity for food and medicine	
	Status of traditional knowledge, innovations and practices	
	Status and trends of linguistic diversity and numbers of speakers of indigenous languages	1
	Other indicator of the status of indigenous and traditional knowledge	
	Status of access and benefits sharing	
	Indicator of access and benefit-sharing	
	Status of resource transfers	
	Official development assistance provided in support of the Convention	1
	Indicator of technology transfer	

Trend in Indicator:

• Direction is indicated by the arrows. • Broad arrows indicate a high level of confidence about the trend; narrow arrows indicate low confidence; •Dark (red) arrows indicate a trend that is negative for biodiversity; pale (green) arrows indicate a trend that is positive for biodiversity.

Quality of Indicator:

3: Good indicator methodology with globally consistent time course data
2: Good indicator, but no time course data
1: Indicator requires further development and/or limited data.

Source: *Global Biodiversity Outlook*

Table 3. Unknown Frontiers: The Current State of Taxonomic Affairs and the 2010 Targets

Most estimates of the total number of species on Earth lie between 5 million and 30 million. Of this total, roughly 2 million species have been formally described; the remainder are unknown or unnamed. The overall total could be higher than 30 million if poorly known groups such as deep-sea organisms, fungi, and microorganisms including parasites have more species than currently estimated.

Between 12% and 52% of species within well-studied higher taxa are threatened with extinction, according to the *IUCN Red List.* Less than 10% of named species have been assessed in terms of their conservation status. Of those that have, birds have the lowest percentage of threatened species at 12%. The patterns of threat are broadly similar for mammals and conifers, which have 23% and 25% of species threatened, respectively[13].

Among a range of higher taxa, the majority of species are currently in decline. Studies of amphibians globally, African mammals, birds in intensively managed agricultural lands, British butterflies, Caribbean corals, waterbirds, and fishery species show the majority of species to be declining in range or number.

Homogenization, the process whereby species assemblages become increasingly dominated by a small number of widespread, human-adapted species, represents further losses in biodiversity that are often missed when only considering changes in absolute numbers of species. The many species that are declining as a result of human activities tend to be replaced by a much smaller number of expanding species that thrive in human altered environments.

We lack comprehensive global-scale measures to assess whether the internationally agreed target of significantly reducing the rate of loss of biodiversity by 2010 will be met. However, our understanding of the dynamics of drivers, and particularly of lag times from changes in drivers to eventual impacts on biodiversity, suggest it is most unlikely to be achievable.

Source: Millennium Ecosystem Approach, Chapter 4 "Biodiversity',

[13] The Table reflects the extent of extinction and taxonomic development.

Table 4.8. Number of Species in IUCN Red List Categories for Comprehensively Assessed Taxonomic Groups (Baillie et al. 2004)

Class	EX	EW	Subtotal	CR	EN	VU	Subtotal	LR/cd	NT	DD	LC	Total
Animals												
Mammals	73	4	77	162	352	587	1,101	64	587	380	2,644	4,853
Birds	129	4	133	179	345	689	1,213	0	773	78	7,720	9,917
Amphibians	34	1	35	427	761	668	1,856	0	359	1,290	2,203	5,743
Plants												
Conifers	0	0	0	17	43	93	153	26	53	59	327	618
Cycads	0	2	2	47	39	65	151	0	67	18	50	288

See IUCN 2001 for more details on the definitions of the Red List categories.

Key

EX extinct
EW extinct in the wild
CR critically endangered
EN endangered
VU vulnerable
LR/cd lower risk/ conservation dependent
NT near threatened
DD data deficient
LC least concern

E. Protected Areas and Global Environment Benefits

- An accepted definition of protected areas is: ***An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means***[14]**.**

- Protected areas are categorized on the basis of their ***Primary Management Objective*** by IUCN. Protected area categories I to VI are arranged in a matrix, reflecting their primary and secondary management objectives as per the 1994 *Guidelines for Protected Area Management Categories*[15]. The categorization is reflective of a 'gradation of human intervention' and can be viewed in consonance with the Millennium Ecosystem Approach (MEA) to ecosystem services.

Box 5. CBD Goals for Protected Areas Program

Goal 1.1 - To establish and strengthen national and regional systems of protected areas integrated into a global network as a contribution to globally agreed goals.

The Convention on Biodiversity links with the MEA, noting that the ecosystem approach "provides a framework within which the relationship of protected areas to the wider landscape and seascape can be understood, and the goods and services flowing from protected areas can be valued. In addition, the establishment and management of protected area systems in the context of the ecosystem approach should not simply be considered in national terms, but where the relevant ecosystem extends beyond national boundaries, in ecosystem or bioregional terms as well. This presents a strong argument for and adds complexity to the establishment of transboundary protected areas and protected areas in marine areas beyond the limits of national jurisdiction."

[14] *From the Workshop on Categories held at the IVth World Congress on National Parks and Protected Areas (1992).*
The primary global source of data on protected areas is the World Database on Protected Areas (WDPA) which is managed by the World Conservation Monitoring Centre of the United Nations Environment Programme, and funded by the WDPA Consortium.

[15] Based on these objectives, protected areas are then expected to "emerge clearly as distinct categories," managed mainly for the following (see also **Annex I**) :

I. Strict protection (i.e. Strict Nature Reserve / Wilderness Area)
II. Ecosystem conservation and recreation (i.e. National Park)
III. Conservation of natural features (i.e. Natural Monument)
IV. Conservation through active management (i.e. Habitat/Species Management Area)
V. Landscape/seascape conservation and recreation (i.e. Protected Landscape/Seascape)
VI. Sustainable use of natural ecosystems (i.e. Managed Resource Protected Area)

- At the GEF, the MEA approach has been particularly fundamental in identifying the global benefits of the Land Degradation Focal Area [16]. **Table 4** below provides an indicative list of services provided, that are incorporated into assessments of global benefits. The interaction of Ecosystem services is shown, indicating the wide-scope of what a global benefit is. As per the guidelines for protected area, while all categories are equally important to conservation and the system is based on management objective, it is also neutral about the managing agency or landowner[17].

How to assess quality of Protected Area management?

- The Conference of Parties to the Convention on Biological Diversity in collaboration with the United Nations Forum on Forests, IUCN, the Collaborative Partnership on Forests, and other relevant bodies with the aim of establishing and ensuring long-term sustainability of protected forest areas, use the following criteria to measure management effectiveness[18]:
    1. *Comprehensive*, when they include the full range of forest ecosystems across a landscape,
    2. *Representative*, when they include all types of forest (table 1) in a given geographical area,
    3. *Adequate*, when they maintain ecological viability of populations, species and communities, and
    4. *Effective*, when they conserve biological diversity.
- The IUCN[19] provides some ideas for exploration, which are particularly relevant at a **project-level:**
    a. *Response:* a) number of sites protected and unprotected; b) area of protected sites; c) area protected as core zones; and d) area protected as multiple-use zones. Measuring major changes in internal zoning (e.g. creation of core zone from multiple use zones), and *reductions* in sites protected (e.g. de-gazettement of a protected area or retraction of the biodiversity conservation goal in an indigenous area).

[16] For Land degradation and Global Benefits see recent meeting on this topic **GEF Land Degradation Focal Area Indicators** January 8-9, 2007 FAO Headquarters, Rome, Italy http://www.thegef.org/projects/Focal_Areas/land/LDFocalAreaIndicators.html

[17] IUCN Management Categories, IUCN,

[18] UNEP/CBD/IW.PFA/1/2, 23 October 2003, pp7 **'Opportunities And Challenges For Establishing And Ensuring Long-Term Sustainability Of Protected Forest Areas In The Context Of The Programme Of Work On Forest Biological Diversity'**

[19] Kennedy Elizabeth, 2004, "The Outcomes Monitoring framework: Detailed indicator descriptions"

b. *Dosage/Strategy: a)* number of guards/wardens per km of border and/or per km^2 of area of formal protected areas or other appropriate sites; b) Adequacy of demarcation for each site can be measured by calculating existing kilometer of boundary demarcation as a percentage of the total number of boundary kilometer under pressure. Kilometer of border under pressure can be estimated if necessary (e.g. using hunting camps, illegal logging roads, etc.).
c. *Local benefits* can be estimated by assessing of the following that apply *a)* The site provides employment as protected area staff; b) The site generates employment as guides, porters, etc.; c) The site provides direct benefit through sharing entrance fees, compensation, support for local projects, etc. d) The site provides the base for the establishment of compatible industries providing employment, e.g. restaurants, hotels, etc.; e) Other Improvements in societal qualities that may be included: Increases in indices of quality of life, such as the Human Development Index; Reduced poverty, greater life expectancy, better employment opportunities; Greater equity in access to natural resources and the distribution of benefits from their use.
d. *Management Plans developed*: a) Appropriate goals and plans b) Appropriate goals but no plans c) No goals or plans

- The World Commission on Protected Areas (WCPA) has developed a 'framework' for management assessment. The WCPA framework aims both to provide some overall guidance in the development of assessment systems and to encourage standards for assessment and reporting. The World Bank/WWF Management Effectiveness Tracking Tool and subsequently, the GEF Biodiversity Tracking Tools, form part of a series, which range from the *WWF Rapid Assessment and Prioritization Methodology* used to identify key protected areas at threat within a protected area system to detailed monitoring systems such as those being developed by the *Enhancing Our Heritage* project for UNESCO natural World Heritage sites. The framework evaluates the status of the environment (context, threats, policy); appropriateness of design; resources assigned; efficiency and appropriateness of management process; effectiveness of actions (outputs); extent objectives were achieved (impact)[20]. **This framework provides the basis for the GEF's tracking tools for the biodiversity focal area, for Strategic Priority One.**

- At a recent meeting on Protected Areas, the Convention on Biological Diversity finalized an Evaluation Matrix, the purpose of this matrix is to provide for a strategic assessment of progress made, challenges/obstacles, and also for capacity-building needs, reporting on progress achieved globally in the

[20] World Bank and WWF, 2003, "**Reporting Progress at Protected Area Sites :** A simple site-level tracking tool developed for the World Bank and WWF"

implementation of the programme of work on protected areas and in identifying strategic priorities for implementation [21]

[21] See UNEP/CBD/COP/8/INF/27 , **Report Of The Expert Workshop On Protected Areas**, 19 March 2006

Table 4. Indicative List of Ecosystem Services

Appendix 2

INDICATIVE LIST OF ECOSYSTEM SERVICES

Regulating services responsible for maintaining natural processes and dynamics

Biodiversity-related regulating services

- maintenance of genetic, species and ecosystem composition
- maintenance of ecosystem structure
- maintenance of key ecosystem processes for creating or maintaining biodiversity

Land-based regulating services

- decomposition of organic material
- natural desalinization of soils
- development / prevention of acid sulphate soils
- biological control mechanisms
- pollination of crops
- seasonal cleansing of soils
- soil water storage capacity
- coastal protection against floods
- coastal stabilization (against accretion / erosion)
- soil protection
- suitability for human settlement
- suitability for leisure and tourism activities
- suitability for nature conservation
- suitability for infrastructure

Water related regulating services

- water filtering
- dilution of pollutants
- discharge of pollutants
- flushing / cleansing
- bio-chemical/physical purification of water
- storage of pollutants
- flow regulation for flood control
- river base flow regulation
- water storage capacity
- ground water recharge capacity
- regulation of water balance
- sedimentation / retention capacity
- protection against water erosion
- protection against wave action
- prevention of saline groundwater intrusion
- prevention of saline surface-water intrusion
- transmission of diseases
- suitability for navigation

Water related regulating services (ctd.)

- suitability for leisure and tourism activities
- suitability for nature conservation

Air-related regulating services

- filtering of air
- carry off by air to other areas
- photo-chemical air processing (smog)
- wind breaks
- transmission of diseases
- carbon sequestration

Provisioning services: harvestable goods

Natural production:

- timber
- firewood
- grasses (construction and artisanal use)
- fodder & manure
- harvestable peat
- secondary (minor) products
- harvestable bush meat
- fish and shellfish
- drinking water supply
- supply of water for irrigation and industry
- water supply for hydroelectricity
- supply of surface water for other landscapes
- supply of groundwater for other landscapes
- genetic material

Nature-based human production

- crop productivity
- tree plantations productivity
- managed forest productivity
- rangeland/livestock productivity
- aquaculture productivity (freshwater)
- mariculture productivity (brackish/saltwater)

Cultural services providing a source of artistic, aesthetic, spiritual, religious, recreational or scientific enrichment, or nonmaterial benefits.

Supporting services necessary for the production of all other ecosystem services

- soil formation,
- nutrients cycling
- primary production.
- evolutionary processes

Source: Op cit, UNEP/CBD/COP/8/27/Add.2

F. Recapitulation of GEF Global Environmental Priorities:

1. Findings from the Biodiversity Program Study[22] (2004):

- **The scope of the GEF has never been expressed in terms of measurable biodiversity goals and outcomes** to which each GEF-funded program and its component projects must make a defined contribution that ultimately roll up to deliver impacts on global biodiversity over time. This stems from a lack of clarity on what the Council is "actually expecting the GEF overall and, more specifically, the GEF Biodiversity Program to deliver and if those still-implicit expectations have ever been realistic given the operating environment in which the GEF exists."
- **Certain types of biodiversity indicators appear frequently among many projects**: including change in the extent or quality of various habitats or vegetation types, change in vegetation cover, change within specific ecosystems, such as mangroves. With regard to species indicators, there is a focus on numbers of large mammals and birds at the site, although these population estimates were generally not linked to measurable areas.
- **There are no common themes describing characteristic(s) of species to be measured**: absolute or relative numbers, densities, distribution, composition, behavioral attributes (for example, number and distribution of nesting sites, hatching rates, midden densities, etc.) or some combination of these characteristics (species number and distribution)
- **Sure ways that project-level impacts will deliver global-level impacts exist, but this alone will not stem current biodiversity loss:** global gains can be achieved at the local level if targeted species are considered globally endemic, range-restricted, rare, or among the species listed as "endangered" or "critically endangered" in IUCN's Red List of Threatened Species (IUCN, 2003). "Easy victories" could be scored among the many endemic taxa and species of Madagascar, in the Cape Floral Kingdom in South Africa, or simply, through conserving the giant panda in China. But this is not the point. Conserving endemic and rare species alone will not stem the current rates of biodiversity loss.
- **The current extinction crisis includes the loss of diversity within populations** (Hughes et al., 1997) **as well as the loss of common and widespread species**, their numbers and distribution, and their roles in ecosystem functioning. Declines in their abundance and distribution are as much and, in some cases, more of an expression of global biodiversity loss than the decline of endemic, rare, or endangered species. In fact, these species (the majority of the world's flora and fauna) represent the truly "neglected" realm of biodiversity loss. In this sense, all countries actively contributing to the objectives of the CBD are assisting in the conservation of biodiversity, regardless of whether they are home to species and ecosystems that have been identified as being of "global importance."

[22] GEF EO, Biodiversity Program Study, 2004

2. The Resource Allocation Framework and the "Global Benefit Index" [23]

Biological diversity is defined by the CBD in terms of the variability in genes, species, and ecosystems. The RAF is aligned with the 2010 targets of the CBD through the incorporation of the following elements:

(a) **Magnitude of taxonomic variability** at the species and higher levels, by recognizing species richness with special emphasis on threatened species. As speciation is correlated with genetic diversity, it also recognizes variability at the genetic level;

(b) **Large and unique eco-regions** that provide opportunities for expansion in the global network of protected areas, both by area and species representation;

(c) Explicit inclusion of marine and terrestrial biodiversity, recognizing their **distinct contributions to ecosystems** in these spheres[24]; and

(d) Recognition that **all biodiversity is important** and provision of opportunities for sustainable use and the maintenance of ecosystem services at various scales, by ensuring a minimum level of resources to all countries.

- **Terrestrial Score for each country**

The terrestrial score for each country is built from detailed subnational data available for specific taxanomic groups. The score is constructed in four steps:

a) Identify all components of distinct terrestrial ecoregions within a country (Country-Ecoregion Components or CECs);

b) **Score for each Country-Ecoregion Component using four characteristics –**

- **represented species:** each species receives a total credit of 1 globally, which is distributed across CECs in proportion to the remaining habitat for the species[25]
- **threatened species: a**fter evaluating global threats to each existing species, IUCN classifies it into one of six categories: extinct in the wild, critically endangered, endangered, vulnerable, near threatened and least concern[26].

23 GEF/C.26/2/Rev.1, August 24, 2005 "Technical Paper On The GEF Resource Allocation Framework"

[24] The GBI-BIO index for a country is a weighted average of the country's scores for marine biodiversity and terrestrial biodiversity, with the terrestrial score weighted 80 percent and the marine score weighted 20 percent.

[25] For instance, if 60 percent of the habitat for a species lies in a particular CEC and the remaining 40 percent is distributed evenly across two other CECs, the three CECs receive credits of 0.6, 0.2, and 0.2 for that species. All other CECs do not receive any credits for the species. For each CEC, species credits are totaled for each of the taxonomic groups (or taxa) and normalized using the total number of species in the taxa worldwide. The CEC score for represented species is computed as the average of the normalized credits for the six taxonomic groups for which data are currently available. This approach gives equal representation to the taxa at the world scale.

- **ecoregion representation:** each terrestrial CEC represents an ecoregion with unique characteristics from a global perspective. Each ecoregion receives a total credit of 1 globally, which is distributed across the CECs comprising that ecoregion in proportion to the remaining habitat (land that is uncleared for agriculture or urban settlement)

- **threatened ecoregions**; the World Wildlife Fund classifies all ecoregions into three groups: critical/endangered, vulnerable and stable. Taking scientific estimates of habitat-degradation rates into account, the three categories are respectively assigned threat credits of 4, 2 and 1. The threat credit for each ecoregion is distributed across its constituent CECs in proportion to the remaining habitat. This index captures the scale, uniqueness and threat level of each CEC. Like the represented ecoregion index, it will be replaced by more precise indicators of genetic diversity, ecosystem services and other components of biodiversity as comprehensive data become available for all GEF-eligible countries

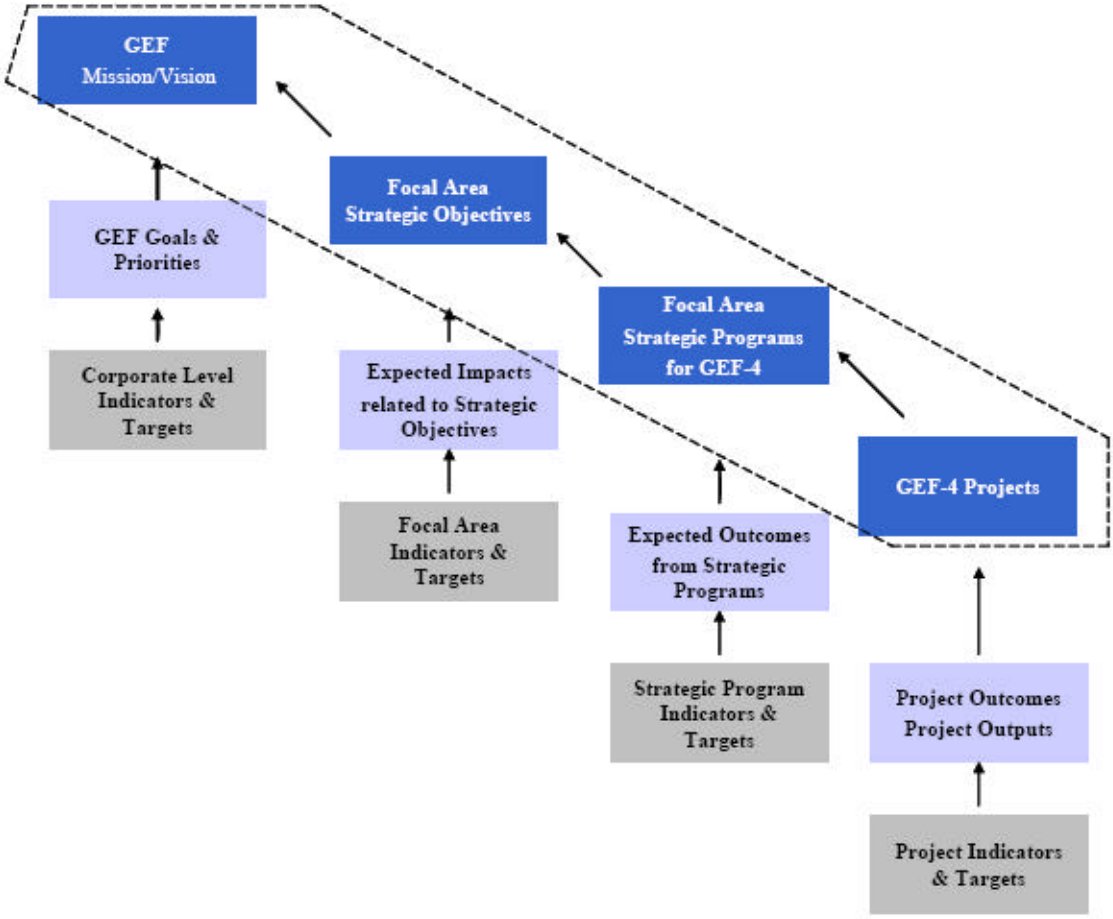
(1) the composite score for each terrestrial CEC is determine using a weighted average of the four characteristics scores; and
(2) the score for each country is computed as the sum of scores for all of the CECs in the country.

[26] Taking scientifically-estimated extinction probabilities and conservation priorities into account, the six categories are respectively assigned weights of 10, 10, 6.7, 1, 0 and 0.8 (8 The highest weight, 10, is applied to both critically endangered species and species that are extinct in the wild. The latter category is given critical weighting so that conservation priorities will expand the possibility for future re-introduction of the relevant species into their native habitats.

3. Current Indicator Development at the GEF:

The figure below provides the framework used at the GEF, as referred to in **the Draft Concept Paper: Results Based Management Framework** that is currently being developed at the GEF.

GEF Results framework linking strategies, impacts, and indicators



The indicators selected as part of this Results framework are under discussion. They are linked to the 2010 Targets, and it appears that for Strategic Objective One (Catalyzing Sustainability of Protected Area Systems), the expected impact is "**Biodiversity conserved and sustainably used in protected area systems**" with Indicators (a) Extent of habitat cover (hectares) by biome type maintained as measured by cover and fragmentation in PA systems (b) Extent and percentage increase of new habitat protected (hectares) by biome type in protected area systems that enhances ecosystem Representation (c) Protected area management effectiveness as measured by PA scorecards that assess site management, financial sustainability and capacity. The expected outcomes are as follows:

Strategic Programs for GEF-4	Expected Outcomes	Indicators
Sustainable Financing of Protected Area Systems at National Level	Protected area systems secures increased revenue & diversification of revenue streams to meet total expenditures required to meet management objectives Reduction in financing gap to meet PA management objectives	Total revenue and diversification in revenue streams
Increasing Representation of **Effectively Managed** Marine Protected Areas in National Protected Area Systems	Increased coverage of marine ecosystems globally and in national protected area systems Improved management of marine protected areas	Number and extent (coverage) of marine protected areas compared to 2006 global baseline for GEF eligible countries Protected area management effectiveness
Strengthened Terrestrial **Protected Area Networks**	Improved ecosystem coverage of under-represented terrestrial ecosystem areas as part of national PA systems Improved management of terrestrial protected areas	Terrestrial ecosystem coverage in national protected area systems Protected area management effectiveness as measured by individual protected area scorecards

G. Conclusion: Proposal for Impact Evaluation use of Indicators and Classifications Systems

Box 7. What is 'Impact'?
"Positive and negative, primary and secondary long-term effects produced by a development intervention, directly or indirectly, intended or unintended."[27]

(Source: OECD's Development Assistance Committee :DAC)

1. **Examine the theory**

Indicators signify the 'measurement' of a particular phenomenon, based on a 'concept'. Given the use of the theory-based-approach, it is useful if not critical to deconstruct the concepts behind these measures[28]. These measures are often nominal, i.e. they are mutually exclusive categories like the type of management in Protected Area categories that allow measurement of frequency; or ordinal measures, that represent a hierarchical ordering like the IUCN categories that represent degrees of vulnerability. Impact, as shown in Box 7., is a broad concept and requires a comprehensive evaluation approach.

2. **Examine the boundaries and scope of this evaluation**[29]

- What are the policy questions that this evaluation might address?
- How will the evaluation build on the existing project and sector knowledge base and feed into future projects in this sector and country?
- What were the intended consequences/objectives, and assumptions, of the intervention? Does the 'theory' point to possible unintended consequences?
- What data exists and might be relevant for use in the evaluation?
- What is the identification strategy (i.e. how to identify the impact of the project separately from changes due to other causes)?
- Given that the GEF is mandated to be 'catalytic' and that this Study aims to identify impact (see Box), the spatial and temporal boundaries and scales considering the 'effect' of interventions are not clear, and need to be defined.
- As documented above, Biodiversity and its global benefits are nebulous concepts, open to interpretation and this Evaluation should aim to provide some clarity, from the project-level.
- The focus of the indicators has largely been on the first objective of the CBD (conservation of biological diversity). The **second objective (sustainable use of biological resources) is not addressed as consistently**. This is a lacuna mentioned in the OPS3, [30] where it was found that while 'several projects have demonstrated that the generation of income is a good alternative for local populations,' the Biodiversity Program Study mentions that 'several projects reported activities not producing enough income, resulting in an increased demand for the targeted resource'. Indicators for this have not been included in this document, and need to be explored at a project-level, given the particular context and intervention used.

27 DAC, 2002. "Glossary of Key Terms in Evaluation and Results Based Management."
28 See Weiss, Carol 'Evaluation', Second edition, Prentice Hall, 1998
29 See also Impact Evaluation and Project Cycle, 2006
30 GEF EO, Third Overall Performance Study of the GEF, 2005 (pp27)

- **The 'Implementation gap" and other information required for Impact evaluation**[31]: a growing body of evaluation material is viewing interventions as shown in the figure below: First, Second, Third order conditions each respectively relate to enabling conditions, changes in behavior and changes in outcome variable. These are underlined as important intermediate steps that have to be met, and therefore measured/evaluated, before reaching an 'end outcome' (or fourth order).

Box 8. Four Orders of Outcomes

Change is dynamic. For each change in state there are associated changes in the behavior of key partners and stakeholders within the sphere of influence of the management activity. Some expressions of First, Second and Third Order outcomes accumulate concurrently within a given time period, and they are not always achieved in a strictly sequential progression. The point is well-made for integrated coastal management projects that "by far more effort has gone into developing and refining and monitoring Third Order outcomes than either First or Second Order outcomes. This has contributed to a very major problem with the designs of most [ICM] initiatives in developing nations. This is that most investments in [ICM] set their ''bottom line'' targets primarily in Third Order terms even when experience should have made it abundantly clear that these lie beyond the time scales of the usual donor or development bank funded ''project''"

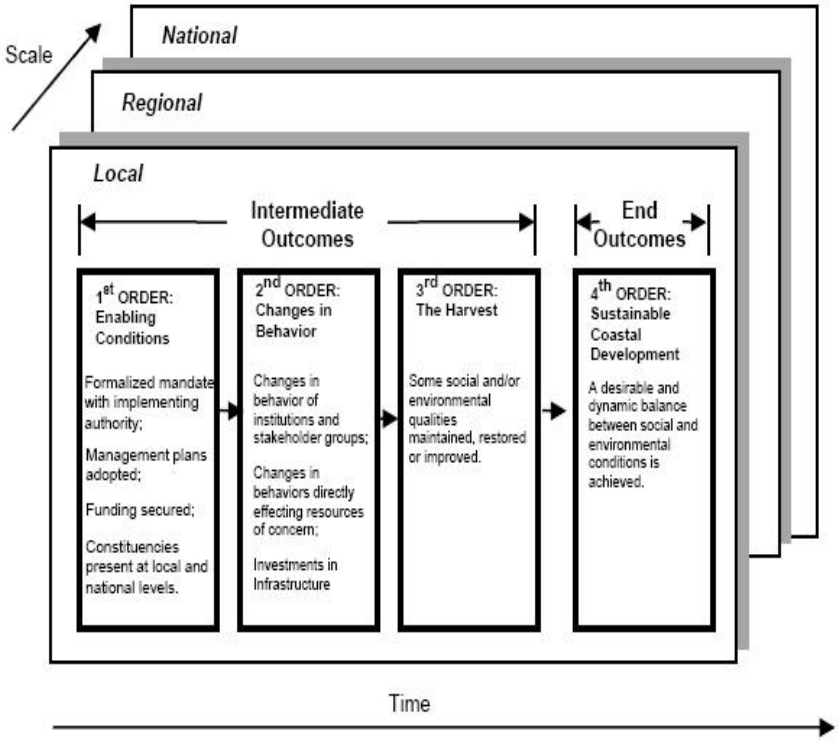


Fig. 1. The four orders of coastal governance outcomes. Adapted from [2].

[31] Olsen, Stephen B. **Frameworks and indicators for assessing progress in integrated coastal Management initiatives**, Ocean & Coastal Management 46 (2003) 347–361

The figure above (Box 9 below) provides an example of indicators to measure the Behavioral Change outcomes, in this case for an Integrated Coastal Management Program:

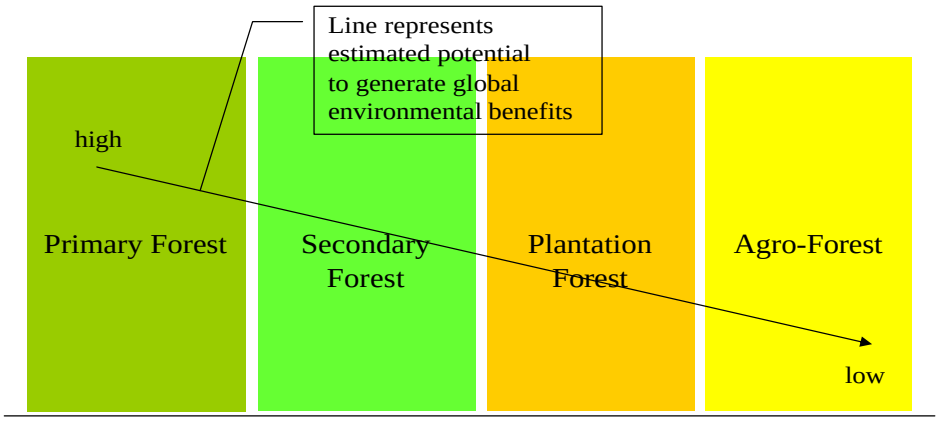
Box 9. Examples of indicators related to Behavior Change
(Second Order outcomes)

are:

1. **Changes in the behavior of institutions and interest groups.**
   - Collaborative planning and decision making through task forces, commissions, civic associations and the like.
   - Successful application of conflict mediation activities.
   - Evidence of functional public-private partnerships.
   - Collaborative actions by user groups.
   - Use of new school curricula on ICM topics.
2. **Changes in behaviors directly affecting resources of concern.**
   - Elimination of destructive fishing practices and over-harvesting.
   - Land use practices that reduce contamination of water, sustain fresh water inflows to estuaries.
3. **Investments in Infrastructure Supportive if Integrated Coastal Management Policies and Plans.**
   - Construction and maintenance of shoreline protection works.
   - Construction of port facilities and other transportation related infrastructure.
   - Waste disposal and pollution reduction infrastructure including sewage treatment facilities, sanitary landfills, runoff retention basins.
   - Infrastructure to enhance and protect public access to the shore including rights of way, boardwalks, signage programs.
   - Investments in habitat protection and restoration including purchase of protected areas and conservation easements, construction of artificial reefs, installation of mooring buoys.

For *Future Directions and Challenges*, the GEF acknowledges[32] that "were the GEF to expand its engagement in sustainable forest management beyond current practice, two issues are closely inter-related and require a synthetic analysis. First, the concept of incrementality as applied in the forest production landscape and second, what kinds of forests, as defined by their degree of naturalness and resulting global significance, should receive GEF support in response to country-driven requests for assistance. The figure depicts that, in *general* terms, the potential to generate global environmental benefits is highest in primary forest and this potential decreases across the forest continuum as the level of intensity of human intervention increases. The estimation of a forest's potential to generate global environmental benefits will then be determined by an array of factors that are site specific (e.g., management practices, biological factors etc.) thus, the gradation from high to low, although accurate as a general trend, will not always be strictly linear.

[32] GEF, **Support to Sustainable Forest Management across the GEF Focal Areas, October 2006**



Forest continuum based on degree of naturalness as described by the CBD

Annex attached separately