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**Biodiversity Indicators for Monitoring
GEF Programme
Implementation and Impacts**

Draft Final Report

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**WORLD CONSERVATION
MONITORING CENTRE**

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Introduction

The GEF needs to report in a variety of contexts on the extent and impact of those of its activities that address biological diversity. To do this in a succinct, meaningful and purpose-specific manner, it requires a portfolio of indicators that can be used to summarise its activities at programme level and demonstrate their impacts over time. It is important that such an indicator portfolio be structured in such a way that it is possible to select individual indicators, or sets of them, to address individual issues raised in the articles of the Convention on Biological Diversity (CBD) and in the decisions of the Conferences of its Parties (CoP).

In this report a broad portfolio of candidate indicators is presented. This is intended neither to be comprehensive, nor to be used in its entirety. On the contrary, we foresee that different subsets of indicators will be used for different reporting purposes, and that the form of their presentation will also vary according to purpose. By identifying a range of indicators that together can satisfy many purposes, it is possible to anticipate data needs, assess the feasibility of meeting them within different time frames, and develop efficient mechanisms for doing so.

Major constraints

The principal long-term aim of this exercise is ultimately to demonstrate impacts by the GEF on biodiversity itself. However, a series of constraints must be taken into account in trying to achieve this. Among the most important are:

- “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;
- 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.
- 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.
- Indicators cannot demonstrate causality. The attribution of particular changes to particular actions will always be at best hypothetical.

It is also important to stress that indicators are a product of monitoring not a substitute for it. Because most meaningful changes in biodiversity take place over periods of decades or longer, any sustained indicator effort requires a commitment to monitoring over these timescales.

Structure of the indicator set

To facilitate the choice of indicators and their linkage, when necessary, with key CBD issues and CoP decisions, the indicator set is structured along three main axes: indicator

type; theme addressed (chiefly in the form of a given Operational Programme or OP); and whether the indicator reflects direct measures taken or results achieved to meet GEF objectives (principally in the form of on-the-ground activities), or reflects measure taken to influence the wider enabling environment.

1. Indicator type

The indicators are divided into four principal categories:

- **Coverage indicators** (Table Ia and Ib) address the question of whether the GEF is addressing biodiversity issues in the right places. Coverage indicators are essentially a measure of effort exerted.
- **Indicators of impacts on pressures and behaviours affecting biodiversity** (Table IIa and IIb) address the question of what impact the GEF is having in alleviating pressures on biodiversity.
- **Indicators of impacts on biodiversity status and trends** address the question of whether GEF activities are achieving their ultimate end (Table III);
- **Context indicators** (Table IV) are those used by the world at large to track general trends in biodiversity and related issues and provide a backdrop or baseline against which GEF efforts can be measured.

2. Thematic focus of indicator

The second structuring axis is based on the thematic foci of GEF activities, which might form a basis for separate reporting or for structuring global reports of GEF accomplishments. Thus within each indicator category, the individual indicators are divided among the six themes explained below, which chiefly reflect the separate Operational Programmes of the GEF relevant to biodiversity. These themes are by no means mutually exclusive and many GEF actions fall under several of them at once. For example, activities addressing biodiversity in arid and semi-arid ecosystems often focus on remnant forest or freshwater ecosystems, and many mountain projects address forests.

A. Arid and Semi-arid Zone Ecosystems

Although not characterised by high species richness, these ecosystems hold significant numbers of species of conservation concern and present unique management problems. They are locally important in supporting human populations, especially through animal husbandry, and produce medicinal and other products of considerable commercial value. They are threatened by land conversion, particularly for irrigated agriculture, and by desertification, excessive ground water extraction, inappropriate fire regimes and overgrazing. Evaluation of pressures and, especially, monitoring of biodiversity status are complicated by low species population densities and the nomadic nature of both wildlife and human populations within these ecosystems. These ecosystems are covered by

the Convention to Combat Desertification. It is expected that a work programme covering arid and semi-arid areas will be agreed at CoP5 of the CBD.

B. Coastal, Marine and Freshwater Ecosystems

Marine, coastal and freshwater ecosystems comprise a huge range of ecosystems of very variable extent and importance for biodiversity. Freshwater ecosystems comprise a minute fraction of the world's area but contain a disproportionately high proportion of biodiversity. Marine ecosystems cover over 70% of the world's land area but are overall somewhat less diverse at species level than terrestrial systems.

Marine fisheries provide the major source of wild protein for humans. Freshwater fisheries are of considerably smaller overall volume but may locally be of great importance as a source of nutrition, particularly for the poor.

Because humans do not live in the sea, pelagic (open ocean) ecosystems are somewhat buffered from human impacts. Biodiversity in open ocean areas is principally affected by overfishing. Coastal ecosystems and semi-enclosed seas are also affected by pollution and other forms of habitat degradation - a high and growing proportion of the world's human population now lives in coastal zones. Freshwater as a resource is heavily exploited for a wide range of uses, many of which have severe adverse impacts on freshwater biodiversity. The latter is also affected by overexploitation and the effects of introduced species. There are indications that freshwater ecosystems may as a whole be the most highly threatened at present.

The nature of aquatic ecosystems makes it often difficult to manage particular areas in isolation. This is particularly true of marine ecosystems, which often require regional-level management. Many important freshwater ecosystems are also transboundary. The latter are often affected by impacts originating some distance away and are heavily impacted activities in other sectors. Two separate work programmes under the CBD – inland waters and marine and coastal – cover these ecosystems.

C. Forest Ecosystems

Forests are very important repositories of biodiversity at all three levels (ecosystems, species, genes), and contain more than half of all species globally. They support large numbers of indigenous groups and supply timber, fuel, medicinal plants and other products that are used throughout modern societies and economies. They are also important reservoirs of carbon that play an important role in the global carbon cycle and its interaction with climate change. Natural forests are under severe pressure from land conversion to support expanding human populations, commercial timber production, fire and other threats. More than half of the world's original complement of forest cover has been lost or degraded. Their complex structure and high biodiversity impose significant constraints on monitoring. Many taxa are as yet unknown in scientific terms, few forest species are adequately monitored for logistic reasons, and assessing the

representativeness of any single taxon is highly problematic. Forests are the subject of a separate work programme under the CBD. A number of other international policy processes are also addressing forest issues.

D. Mountain Ecosystems

Montane ecosystems are difficult to define (based on combination of elevation, topography and climate). They typically have lower diversity than adjacent low lying areas but higher rates of endemism and are often refuge areas for species highly reduced or extirpated from adjacent lowland areas.

Human population density varies. In some areas it is high, with local peoples dependent in part on wild resources; in others it is very low, with only transient human presence. They are important for ecosystem services, playing for example important roles in hydrological cycles and soil conservation that can affect people in large areas far away from the mountains themselves. They are also increasingly important for recreation as well as support of local populations.

Steep topography, often thin soils and low productivity at high altitudes make montane ecosystems and montane biodiversity typically highly vulnerable to disturbance. Mountain ecosystems are threatened by the land conversion activities of expanding human populations, by unsustainable timber harvest and by overgrazing. Localised species have limited migration possibilities. Montane ecosystems are particularly vulnerable to climate change. They may also be affected by airborne pollutants, but are largely insulated from other allochthonous inputs.

Mountain areas are often inaccessible, making monitoring (and management) difficult. Montane areas often mark national boundaries, so that montane ecosystems are often trans-boundary. They are not currently the subject of a CBD work programme but are due to be considered at COP 6 and are the focus of a chapter of Agenda 21.

E. Agrobiodiversity

Agrobiodiversity differs substantively from other thematic areas in being effectively defined by the presence of human impacts. A distinction should be made between:

- biodiversity used in agriculture
- diversity of other species in agricultural systems or in landscapes dominated by agriculture.

At species level, the former is far lower than that of equivalent natural ecosystems; however intraspecific variation (breeds, varieties, landraces) is generally much higher. Diversity of other species in agricultural systems is often lower than would be expected in replacement natural ecosystems. However, many agricultural systems (particularly low-input traditional forms) now play an important role in maintaining biodiversity in addition to that directly used in agriculture.

Agriculture supplies the vast majority of human nutritional needs and also a wide range of other products. Agricultural biodiversity is therefore of fundamental importance to human survival.

Agricultural biodiversity has a complex relationship with technology, trade (and trade regulations), human population pressure and economic development. Pressure for increased yields leads to development of new varieties (ie. increase in diversity) through conventional breeding and new technologies, but also tends to high-input low diversity systems with loss of traditional breeds and forms. Developing international regimes concerning trade (WTO) and patents appear to be important pressures militating against the maintenance of many forms of agricultural biodiversity. Much maintenance of agricultural biodiversity is vested in the knowledge and practices of local and indigenous communities. Agricultural biodiversity is the subject of a separate work programme under the CBD and is the subject of many other international processes, principally under the aegis of FAO.

F. Cross-cutting

Many GEF activities attempt to address issues that affect more than one OP. These are chiefly interventions aimed at improving the enabling environment for conservation and sustainable use of biodiversity, particularly those operating at national level. Examples include general environmental education, implementation of CITES and threatened species legislation. Where relevant, a separate section on these indicators has been included.

G. Global

Some contexts will require the GEF to report on all of its biodiversity related activities as a single body. Because many of the previous themes are overlapping, their respective indicators can not be summed without a danger of double counting. For example, projects addressing cloud forests could contribute to indicators for both the forests and mountains operational programmes. For this reason, global level indicators are included as a separate theme, and care is needed to ensure that in presentation the relation of global indicators to those of the other themes is absolutely clear.

3. Direct measures vs. activities designed to influence the enabling environment.

The third axis distinguishes between activities that affect the status of biodiversity (often by affecting behaviour that impinges directly on biodiversity) from those directed at changing the enabling environments for biodiversity conservation. The term 'enabling environment' encompasses those aspects of the political, economic and social conditions that facilitate the conservation of biological diversity. Relevant aspects of the enabling environment include:

- 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 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.

The enabling environment can be perceived at all scales from the international through the regional and national to the local. The enabling environment for biodiversity conservation differs among ecosystems and sectors, and activities addressing it can be analysed in terms of both coverage and impact. It is difficult to demonstrate direct links between activities affecting the enabling environment and biodiversity status, but more feasible to consider the coverage of these activities and their potential impact in alleviating pressures on biodiversity (although measuring the impact of enabling environment interventions on behaviour is itself also problematic). Therefore, Tables I and II are divided into (a) direct indicators and (b) enabling environment indicators. Some indicators of change in the global enabling environment are useful as the context for GEF activities and impacts, so a second part is also included for Table IV.

Some kinds of GEF activities essentially deal only with the enabling environment (eg. support for development of NBSAPs). Field projects should generally, however, both have impact on behaviour that directly affects biodiversity and, at least locally, on enabling environments.

Thus, each category of indicators is presented in a separate summary table, organised by theme and divided into ground level and enabling environment indicators, which is followed by a separate account of the individual indicators, organised by theme. In many cases the themes are introduced with comments about characteristics that affect the development of their individual indicators. For each indicator or group of indicators we discuss some of the more important issues concerned with feasibility, implementation and interpretation.

Implementation

Implementing this portfolio of indicators in whole or in part will require the GEF to develop rapidly a means for acquiring and managing the necessary data. As noted in the

discussions of individual indicators, data availability or accessibility is a serious limitation to the immediate implementation of many of the indicators proposed here. Some data are available from published sources, centrally held databases or existing reporting exercises such as the national reports to the CBD. Other data may already be present in the documentation and reports from GEF-supported projects, but extracting them will require significant effort. Still other data are not yet collected consistently for any purpose and will require either specialised research or additional requirements for reporting from project staff.

Thus, implementation of a full portfolio of indicators will require a two-phased approach:

- i) in the first instance, it will be necessary to report on GEF progress without relying on additional data from project staff or special teams, as such requirements are significant burdens and require time to implement;
- ii) subsequently, it will be possible to ask for, and depend on additional information from project staff and Monitoring and Evaluation Dept. sources. These will produce more detailed data that can be aggregated from project to programme level.

The first phase will represent a somewhat top-down approach relying principally on existing information on projects such as their locations, budgets, target ecosystems and species, and already-reported achievements. Using this approach, it will be possible for the GEF to report on its biodiversity-related activities and achievements in an innovative and incisive manner within the year.

The second phase will be based on additional reporting from projects and M & E, but it is critical to minimise additional reporting burdens and to recognise that comparability between projects is potentially very problematic.

Even in the first phase of implementation, a number of methodological and comparability issues will arise. Chief among these is the necessity of allocating projects to themes or Operational Programmes, especially in the case of the coverage indicators. This should be done by attributing each project to *all* of the themes or operational programmes to which it is relevant. There should be no attempt at allocating proportional parts of projects, or resources committed to them, among the themes or OPs. This would require a subjective approach that is invariably time-consuming and lacking in consistency. Instead, all presentations of the indicators must be fully documented so that it is clear that indicators for different themes or OPs are not additive (see global theme above), but represent the degree to which different themes are addressed in the GEF programme overall.

Expansion

As the GEF programme continues to develop, new indicators will need to be developed to deal with new issues and priorities. For example, it is likely that new Operational Programmes will be initiated. The indicator portfolio presented can easily be expanded to accommodate these needs. New themes can be added while retaining the four broad

categories of indicators. It is not essential that all categories of indicator be developed for each theme (e.g. see enabling environment). Individual themes can be presented separately, or synthesised. Clear documentation of each indicator and its data sources is essential for any presentation, but otherwise the system is almost infinitely flexible.

I. Indicators of coverage by GEF biodiversity-related activities (Table I).

Coverage indicators address the question of whether the GEF is engaging in biodiversity-related activities in the right places. There are a number of different visions of global priorities in biodiversity conservation, and the GEF should be able to report on its activities against any and all of these visions. This requires that it maintain good data on locations of its past, present and developing projects at all times.

The question of coverage is relatively straightforward to address when field-based projects are considered, as in Table Ia above. It is less easy to deal with in the case of national level or wider projects aimed at improving the enabling environment. The latter are however still in most cases geographically limited in scope, in that they are often confined to or focused on individual countries, regions or occasionally sub-national political units.

The following are some existing data-sets and initiatives that may prove useful for the development of a set of indicators for demonstrating the extent to which GEF programmes and priorities address global biodiversity priorities. The most important aspect of any such set is that it is global in extent and at least tolerably consistent across the globe. This seriously limits options – a highly sophisticated analysis of biodiversity importance of, say, sub-Saharan Africa is of no use in generating a set of globally applicable programme level indicators. All the following address some global aspect of biodiversity, even if in most cases only a subset, in that they deal with one taxonomic group or with one ecosystem type.

Species-occurrence based approaches

Endemic Bird Areas

BirdLife International have analysed the distribution of all the world's bird species with a breeding range of 50,000 sq.km or less (some 2500 species, or 25% of the world's total). They have identified and mapped all areas (218) with two or more such species. EBAs vary in size from a few square kilometres to more than 100,000 km². Most are in the tropics and sub-tropics, and most have forest as their main habitat type.

Centres of Plant Diversity

In the early 1990s, IUCN and WWF carried out a study similar in some ways to the EBA approach of BirdLife International with the aim of identifying globally important areas for the conservation of plant diversity. A series of criteria was established, principally concerning degrees of species or higher taxonomic level richness or endemism, but also involving other factors such as presence of important gene pools of plants of value to people, a diverse concentration of habitat types a high proportion of species adapted to local soil conditions and some degree of threat to the ecological integrity of the area.

WCMC's Global River Basin Analysis

Using fish family diversity as a surrogate for biodiversity in river basins, WCMC has carried out an analysis of 157 major river basins worldwide, producing a measure of biodiversity

richness for each basin. This has been combined with a set of measures of river basin vulnerability, to produce a set of global level priorities for river basin conservation.

National Biodiversity Index

WCMC has used available data on species richness and number of endemic species of mammals, birds, reptiles, amphibians and vascular plants in each of the world's countries to develop a national biodiversity index that provides a measure of the relative importance of each country in terms of species richness and endemism. The index can be generated either as an area independent measure or can take country area into account (i.e. provide a measure of biodiversity richness per unit area).

Hotspots

A recent analysis (Myers *et al.*, 2000. Nature 403: 853-858) has refined the original hotspots analysis and has used a semi-quantitative approach with expert input to identify major areas for biodiversity conservation, where exceptional numbers of endemic species are undergoing exceptional loss of habitat. The analysis identifies 25 such hotspots, the majority of which are in countries eligible for GEF support, which are claimed to contain as many as 44% of all species of vascular plants and 35% of four vertebrate groups in 1.4% of the land surface of the earth.

Vavilov Centres

Vavilov centres are areas of genetic diversity of wild relatives of domestic crop plants. Although open to differing interpretations, some 14 are generally recognized, all except one at least partially within countries eligible for GEF funding. These are of particular relevance in the consideration of agricultural biodiversity.

Ecosystem/biome/ecoregion-based approaches

Ecofloristic zone analysis

A number of studies, starting with IUCN's system reviews carried out in the late 1980s, have used map-based approaches to assess how representative the cover of protected area networks is in various parts of the world when compared with various ecoregional classification schemes. These schemes may be extremely generalised (e.g. the Udvardy system) or highly detailed. Most involve a combination of biogeographic considerations with an assessment of the predominant potential natural vegetation of a given area. The most recent assessment that covers more than one continent is that of WCMC in 1996 which analysed protected area coverage in the tropics using an ecofloristic zone classification system developed at the University of Toulouse. This system has been digitised for the entire tropics as part of the FAO Forest Resources Assessment. WWF-US has developed a detailed ecoregional classification of South and Central America and is extending this to a full global coverage.

WWF-US Global 200 ecoregions

WWF-US have carried out a global analysis to produce a set of over 200 global priority ecoregions which they consider the most important areas in the world for biodiversity conservation. They have incorporated some measures of uniqueness and richness as well as representativeness.

Large Marine Ecosystems (LMEs)

Some 50 large ecosystem units have been identified and mapped, based on the world's coastal and continental shelf waters. They are defined as: regions of ocean space encompassing near-coastal areas from river basins and estuaries out to the seaward boundary of continental shelves and the seaward margins of coastal current systems. They are relatively large regions of the order of 200 000 km² or larger, characterised by distinct bathymetry, hydrography, productivity and trophically dependent populations. Over 95% of the usable annual global biomass yield of fishes and other living marine resources is obtained from these LMEs.

International processes

World Heritage Sites

The World Heritage Convention was adopted in 1972 and came into effect in 1975. As of February 1999 it had 156 contracting Parties. The convention provides for the designation of areas of "outstanding universal value" as World Heritage Sites, with the principal aim of fostering international co-operation in safeguarding them. Sites are nominated by the signatory nation responsible and are independently evaluated for their world heritage quality before being inscribed by the international World Heritage Committee. Sites may be of cultural value, natural value or mixed. As of early 1999 there were 137 sites recognised for their natural value. "Natural heritage" designates outstanding physical, biological, and geological features; habitats of threatened plants or animal species and areas of value on scientific or aesthetic grounds or from the point of view of conservation.

The convention has established operational guidelines, which include a set of criteria for the inclusion of natural properties on the World Heritage list.

Ramsar Sites

The Convention on Wetlands of International Importance, especially as Waterfowl Habitat (the Ramsar Convention) came into force in December 1975. Each State Party is obliged to list at least one Wetland of International Importance. The Convention states that "Wetlands should be selected for the List [of Wetlands of International Importance] on account of their international significance in terms of ecology, botany, zoology, limnology or hydrology" and indicates that "in the first instance, wetlands of international importance to waterfowl at any season should be included". To facilitate the implementation of this provision, the Convention's COP has adopted a set of criteria supplemented by more detailed guidelines (the criteria are to be reviewed at the 1999

COP). To date the Convention has 114 Parties that have between them identified 970 sites of international importance.

Biosphere Reserves

Biosphere reserves form part of the UNESCO Man and the Biosphere international scientific programme. Such reserves – of which well over 200 currently exist – are not exclusively designated to protect unique or important habitats, but are for a range of objectives which include research, monitoring, training and demonstration as well as conservation. In most cases the human component is vital to the functioning of the biosphere reserve.

Threatened Species

The single most widely accepted global system for assessing the status of species is that developed by IUCN - the World Conservation Union in its Red Lists. Currently three main global Red Lists exist: the 1996 IUCN Red List of Threatened Animals, the 1997 IUCN Red List of Threatened Plants, and the World List of Threatened Trees (published by WCMC in collaboration with the IUCN/SSC).

Species are categorised by degree of threat using a set of explicit criteria. However, reliability and extent of coverage vary considerably between taxonomic groups, with birds being in general the most completely and systematically assessed and many invertebrate groups completely un-assessed.

CITES Species

Species included in the CITES appendices are those that are or may be threatened by international trade. Consideration of these is particularly relevant in the case of sustainable use.

Table Ia. Indicators of coverage of GEF projects – direct interventions

Operational programme/ Focus	Coverage Indicators (Are GEF projects addressing the right places and species?)
A. Arid and semi-arid zone ecosystems	
existing protected areas	1.) Numbers, investment and area covered by projects in arid and semi-arid systems. 2.) numbers and total area of protected areas in arid and semi-arid ecosystems receiving GEF funding.
new protection	3.) numbers and total area of new protected areas gazetted in arid and semi-arid ecosystems with active GEF projects. 4.) numbers and total area of protected areas "newly proposed" or "in preparation" in arid and semi-arid ecosystems with active GEF projects. 5.) Numbers, investment and area covered by projects addressing global red list species characteristic of arid and semi-arid systems. 6.) Numbers, investment and area covered by projects addressing globally endangered and critically endangered species characteristic of arid and semi-arid systems, with body weights >45 kg. 7.) Numbers, investment and area covered by projects in arid and semi-arid systems in global priority areas: WWF ecoregions; countries with high NBI; EBAs; World Heritage sites; Biosphere Reserves; Centres of Plant Diversity; Hotspots.
B. Coastal, Marine and Freshwaters	
existing protected areas	1.) Numbers, investment and area covered by projects in or including coastal, marine and freshwater systems. 2.) Number of protected areas in or including coastal, marine and freshwater ecosystems receiving GEF funding.
new protection	3.) Numbers and total area of new protected areas gazetted in or including coastal, marine and freshwater ecosystems with active GEF projects. 4.) Numbers and total area of protected areas "newly proposed" or "in preparation" in coastal, marine and freshwater ecosystems with active GEF projects. 5.) Numbers, investment and area covered by projects addressing red list species characteristic of coastal, marine and freshwater systems. 6.) Numbers, investment and area covered by projects addressing globally endangered and critically endangered species characteristic of coastal, marine and freshwater systems, with body weights >45 kg.

		7.) Numbers, investment and area covered by projects in coastal, marine and freshwater systems in global priority areas (core list of 6).
		8.) Numbers, investment and area covered by projects in RAMSAR sites.
		9.) Numbers, investment and areas covered by GEF projects addressing issues of freshwater biodiversity in high priority river basins (defined e.g. as those in the upper quartile both of fish family richness and estimated vulnerability).
		10.) Number of LMEs partially or completely covered by GEF projects.
C. Forest		1.) Numbers, investment and area covered by projects in or including forest systems.
	new protection	2.) Numbers and total area of new protected areas gazetted in or including forest ecosystems with active GEF projects.
		3.) Numbers and total area of protected areas "newly proposed" or "in preparation" in or including forest ecosystems with active GEF projects.
	existing protected areas	4.) Number of protected areas in or including forest ecosystems receiving GEF funding.
		5.) Numbers, investment and area covered by projects addressing red list species characteristic of forests.
		6.) Numbers, investment and area covered by projects addressing globally endangered and critically endangered forest species with body weights >45 kg.
		7.) Numbers, investment and area covered by projects in or including forest systems in global priority areas (core list as in A. 7).
D. Mountain		1.) Numbers, investment and area covered by projects in or including mountain systems.
	new protection	2.) Numbers and total area of new protected areas gazetted in or including mountain ecosystems with active GEF projects.
		3.) Numbers and total area of protected areas "newly proposed" or "in preparation" in or including mountain ecosystems with active GEF projects.
	existing protected areas	4.) Number of protected areas in or including mountain ecosystems receiving GEF funding.
		5.) Numbers, investment and area covered by projects addressing red list species in mountain systems.

- 6.) Numbers, investment and area covered by projects addressing globally endangered and critically endangered mountain species with body weights >45 kg.
- 7.) Numbers, investment and area covered by projects in or including mountain systems in global priority areas (core list as in A. 7).

E. Agro-biodiversity

- 1) Numbers, investment and area covered by GEF projects that address agricultural production systems.
- 2) Numbers, investment and area covered by GEF projects in centres of distribution of wild crop relatives (Vavilov centres).
- 3) Numbers, investment and area covered by GEF projects in secondary centres of crop diversity
- 4) Numbers, investment and area covered by GEF projects in high diversity agricultural or mixed production ecosystems.
- 5) Numbers of and investment in GEF projects that directly address maintenance of wild relatives of domestic crops and livestock.
- 6) Numbers of and investment in GEF projects that directly address maintenance of threatened landraces and domestic livestock breeds.

G. Global

- 1) Numbers, investment and area covered globally by GEF projects.
- existing protected areas 2) Number and total area of protected areas in receiving GEF funding.
- new protection 3) Numbers and total area of new protected areas gazetted in GEF project areas.
- 4) Numbers and total area of protected areas "newly proposed" or "in preparation" in GEF project areas.
- PA management 5) Numbers and total area of protected areas with operational management plans receiving GEF funding.
- 6) Total budgets and investment per area or per km perimeter of protected areas with operational management plants receiving GEF funding.
- 7) Numbers of staff per area or per km perimeter in protected areas receiving GEF funding.
- 8) Numbers, investment and area covered by projects addressing globally endangered and critically endangered species with body weights >45 kg.

- 9) Number of threatened species or some subset of threatened species (by category, taxonomic group or both, e.g. critically threatened mammals) directly addressed by GEF projects.
 - 10) Numbers, investment and area covered by projects addressing global red list species.
 - 11) Number of threatened species or some subset of threatened species known or suspected to have populations in areas addressed by GEF projects and that might be expected to benefit from these projects.
 - 12) Numbers, investment and area covered by projects in global priority areas (core list as in A.7).
 - 13) Numbers of an investment in GEF projects directly addressing maintenance of bird diversity in EBAs.
 - 14) Number of and investment in GEF projects directly addressing maintenance of plant diversity in recognised Centres of Plant Diversity.
 - 15) Numbers of and investment in GEF projects in countries with a high NBI.
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Arid and Semi-arid zone ecosystems

There have been no conservation prioritisation exercises that apply specifically to arid and semi-arid zone ecosystems, but areas at high risk of desertification due to impending climate change and other factors have been identified. One way of arriving at a prioritisation for GEF activities would be to examine the overlap between areas of high desertification risk and global priorities for biodiversity action. However, the areas of this intersection are problematic, in that although their biodiversity is vulnerable, it may be difficult to implement effective conservation measures in areas subject to desertification.

- 1.) *Numbers, investment and area covered by projects in or including arid and semi-arid systems;* As with all geographical coverage indicators, this depends on good information on project locations and on some kind of global mapping of these habitats. Arid and semi-arid areas have been globally mapped at fairly coarse resolution on the basis of climatic variables in UNEP's Atlas of Desertification.
- 2.) *Numbers and total area of protected areas in arid and semiarid ecosystems receiving GEF funding.* The *in-situ* protection of biodiversity is a high priority under the terms of the CBD. In general, protected areas may be regarded as alleviating pressures on the biodiversity within them, though the degree to which this is true depends on the effectiveness of their management and the nature of the pressures acting on them. The data for this indicator should come in straightforward fashion from the project documents of those projects associated with arid and semiarid ecosystems. It may be necessary in the first instance to develop a clear (mapped) understanding of where such ecosystems are in order to confirm the relevance of individual protected areas

receiving GEF funding. Precise location and boundary data for the protected areas would also help in this respect. The indicator would be expected to change from year to year but not necessarily in a unidirectional fashion (ie. as some GEF projects are completed and others are begun).

- 3.) *Numbers and total area of new protected areas gazetted in or including arid and semi-arid ecosystems with active GEF projects.* Data required for this indicator are the details of newly protected areas. Timely acquisition of data will require periodic review and inquiry using input from GEF project managers in addition to consultation of data bases maintained by WCMC, which are fully updated only every three years. The indicator will rise slowly because the gazetting process is a slow one. It may be possible to show more progress using intermediate milestones in the protected area creation process like those developed for the same purpose by the WB/WWF Alliance (see below).
- 4.) *Numbers and total area of protected areas "newly proposed" or "in preparation" in or including arid and semi-arid ecosystems with active GEF projects.* The WB/WWF Alliance has defined a series of intermediate milestones in the creation of new protected areas to facilitate the monitoring of progress before full gazettelement is achieved. "Newly proposed" and "in preparation" are two of these milestones, which might be useful to the GEF. Protected areas are "newly proposed" when a recommendation for a site to receive formal protection has become officially sanctioned or adopted by a relevant government body (e.g. national parks administration), which may adopt a pre-existing recommendation or prepare a new proposal of its own. Those "in preparation" have been subjected to further analysis of the officially sanctioned proposal, including participation by a legislative body and/or other identified stakeholders. Although the Alliance and WCMC are developing a monitoring system employing these milestones, it will address only forest ecosystems. Thus, for arid and semi-arid zone ecosystems the GEF will need to develop its own pathways for data acquisition and management. It is likely that indicator will increase, but only on, say, a biennial basis.
- 5.) *Numbers, investment and area covered by projects addressing global red list species characteristic of arid and semi-arid systems.* This indicator is an aggregate from project portfolio information. Many projects specifically target species of conservation concern. Habitat assignment of global Red List species is not complete for either animals or plants, so that in some cases identification of relevant species may be problematic. However, projects concerned with maintenance of biodiversity should routinely report on those globally threatened species that they address.
- 6.) *Numbers, investment and area covered by projects addressing globally endangered and critically endangered species characteristic of arid and semi-arid systems, with body weights >45 kg.* This indicator serves as a somewhat more rigorously and scientifically credible surrogate for threatened "charismatic megafauna". As noted above, habitat assignments of global Red List species are not complete; however this should be straightforward for this small subset of threatened animal species. Examples include: addax, various oryx species, wild bactrian camel, some African elephant and black rhinoceros populations.

7.) *Numbers, investment and area covered by projects in arid and semiarid systems in global priority areas: WWF ecoregions; CI megadiversity countries; countries with high NBI; EBAs; World Heritage sites; Biosphere Reserves; Centres of Plant Diversity. (modified ITAD indicator 4).* As with indicators 1-4 above, this requires project location data to permit mapped overlay with maps of priority areas. Most of the latter have now been mapped in some detail. Generally arid and semi-arid areas do not feature highly in priority assessments based on biodiversity, particularly when the latter is viewed in terms of species richness. Exceptions are Mediterranean-type ecosystems, but the high diversity components of these tend to be in sub-humid areas rather than arid or semi-arid areas and are mostly in countries not eligible for GEF funding.

A. Coastal, Marine and Freshwater Ecosystems

These systems are less easily represented in area terms, especially true of marine systems due to wide range of some important species. Also rather different in terms of relationship with terrestrial processes and priorities.

- 1) *Numbers, investment and area covered by projects in or including coastal, marine and freshwater systems; See comments under A. 1) above.* Coastal, marine and freshwater areas are generally geographical rather than ecological features and are straightforward to map.
- 2) *Number of protected areas in or including coastal, marine and freshwater ecosystems receiving GEF funding. See comments under A. 2) above.*
- 3) *Numbers and total area of new protected areas gazetted in or including coastal, marine and freshwater ecosystems with active GEF projects. See comments under A. 3) above.*
- 4) *Numbers and total area of protected areas "newly proposed" or "in preparation" in coastal, marine and freshwater ecosystems with active GEF projects. See comments under A. 4) above.* As noted, although the World Bank/WWF Alliance and WCMC are developing a monitoring system employing milestones in the development of protected areas, it will address only forest ecosystems. Thus, for coastal, marine and freshwater ecosystems the GEF will need to develop its own pathways for data acquisition and management. It is likely that indicator will increase, but only slowly.
- 5) *Numbers, investment and area covered by projects addressing red list species characteristic of coastal, marine and freshwater systems; See comments under A 5) above.* In general, the global threat status of freshwater vertebrates has been much less comprehensively assessed than is the case for terrestrial vertebrates (although even in the latter case, assessments of lower vertebrates is very incomplete). This indicator is therefore less likely to be good reflection of global priority of a particular project (ie. a project in a tropical river system is likely to address a large number of species that are in fact threatened but whose status has not been assessed, so that they do not yet feature in Global Red Lists).
- 6) *Numbers, investment and area covered by projects addressing globally endangered and critically endangered species characteristic of coastal, marine and freshwater*

- systems, with body weights >45 kg; See comments under A 6). Examples include most sea-turtle species, three river dolphins and a small number of marine mammals, including the Mediterranean monk seal and vaquita.*
- 7) *Numbers, investment and area covered by projects in coastal, marine and freshwater systems in global priority areas.* Most of these global prioritisation exercises involve essentially terrestrial ecosystems, though priority areas self-evidently usually include freshwater systems and, often, coastal areas. Caution must therefore be exercised when applying this indicator to this OP.
- 8) *Numbers, investment and area covered by projects in or including RAMSAR sites;* These sites explicitly address wetland ecosystems and have been mapped by WCMC.
- 9) *Number of GEF projects (or some other measure of investment) addressing issues of freshwater biodiversity in high priority river basins (defined e.g. as those in the upper quartile both of fish family richness and estimated vulnerability)* See comments on WCMC's Global River Basin Analysis in introduction to Table 1.
- 10) *Number of LMEs partially or completely covered by GEF projects* See introduction to Table 1 for discussion of LMEs. Because LMEs cover the great majority of the world's coastal areas, an indicator of number of relevant GEF projects in LMEs would not be meaningful. However, number of LMEs covered by relevant GEF projects would give a good indication of how much of the world's productive marine diversity (from a fisheries perspective) was addressed by the GEF. It should be noted that the one important area, both for marine biodiversity and developing country fisheries, that is not currently included in an LME is the South Pacific region.

B. Forest Ecosystems

- 1) *Numbers, investment and area covered by projects in or including forest systems;* See comments under A1) above. A reasonably up-to-date global forest map exists, with reasonable ecosystem classification system.
- 2) *Numbers and total area of new protected areas gazetted in or including forest ecosystems with active GEF projects;* See comments under A2) above.
- 3.) *Numbers and total area of protected areas "newly proposed" or "in preparation" in forest ecosystems with active GEF projects.* . The WB/WWF Alliance has defined a series of intermediate milestones in the creation of new forest protected areas to facilitate the monitoring of progress before full gazettelement is achieved. "Newly proposed" and "in preparation" are two of these milestones, which might be useful to the GEF. Protected areas are "newly proposed" when a recommendation for a site to receive formal protection has become officially sanctioned or adopted by a relevant government body (e.g. national parks administration), which may adopt a pre-existing recommendation or prepare a new proposal of its own. Those "in preparation" have been subjected to further analysis of the officially sanctioned proposal, including participation by a legislative body and/or other identified stakeholders. The Alliance and WCMC are developing a monitoring system employing these milestones, which will address forest ecosystems, and may therefore be a suitable source of data for this

GEF indicator. It is likely that indicator will increase, but only on, say, a biennial basis. It will be important that this indicator is presented with clear definitions of the terms. Its implementation is feasible in the medium term.

- 4.) *Number of protected areas in or including forest ecosystems receiving GEF funding; See comments under A 4) above.*
- 5.) *Numbers, investment and area covered by projects addressing red list species characteristic of forests; See comments under A 5) above. Identification of forest-occurring globally threatened vertebrates is well advanced.*
- 6.) *Numbers, investment and area covered by projects addressing globally endangered and critically endangered forest species with body weights >45 kg; See comments under A 6) above. Examples include: most great apes; Asian rhinoceros species; Asian elephant; tigers.*
- 7.) *Numbers, investment and area covered by projects in or including forest systems in global priority areas (core list of 6); Forest ecosystems feature prominently in most of these global priority areas.*

C. Mountain Ecosystems

- 1) *Numbers, investment and area covered by projects in or including mountain systems; See comments under A 1) above. WCMC have just completed a map showing preliminary identification of montane areas of the world. This map may be refined in future, but provides a good starting point for such an analysis.*
- 2) *Numbers and total area of new protected areas gazetted in or including montane ecosystems with active GEF projects; See comments under A2) above.*
- 3) *Numbers and total area of new protected areas gazetted in or including montane ecosystems with active GEF projects. See comments under A. 3) above.*
- 4) *Numbers, investment and area covered by projects addressing red list species in mountain systems; See comments under A. 4) above. Assignment of this attribute is not well advanced.*
- 5) *Numbers, investment and area covered by projects addressing globally endangered and critically endangered mountain species with body weights >45 kg; See comments under A. 5) above. Examples include snow leopard, mountain gorilla, mountain nyala, mountain tapir.*
- 6) *Numbers, investment and area covered by projects in mountain systems in global priority areas (core list of 6). Montane areas feature prominently in many of the global priority areas. Overlays of the new WCMC map with maps of these areas and geo-referenced GEF project data will permit this indicator to be developed.*

D. Agrobiodiversity

- 1) *Numbers, investment and area covered by GEF projects that address agricultural production systems*

- 2) *Numbers, investment and area covered by GEF projects in centres of distribution of wild crop relatives (Vavilov centres)* Vavilov centres have been mapped although their boundaries are somewhat ill-defined.
- 3) *Numbers, investment and area covered by GEF projects in secondary centres of crop diversity* Identification of secondary centres of crop diversity is likely to be dependent on reporting by project staff.
- 4) *Numbers, investment and area covered by GEF projects in high diversity agricultural or mixed production ecosystems* Examples of such systems include forest garden cultivation systems in South-east Asia.
- 5) *Numbers of and investment in GEF projects that directly address maintenance of wild relatives of domestic crops and livestock* This information should be directly obtainable from project reporting.
- 6) *Numbers of and investment in GEF projects that directly address maintenance of threatened landraces and domestic livestock breeds* Threatened landraces have not been adequately catalogued at global level (and such an exercise may present intractable problems); FAO have made good progress cataloguing threatened livestock breeds. Initial implementation of this indicator only requires that projects report on whether they are addressing threatened landraces or domestic livestock breeds, and not exactly which or how many of these.

E. Global

- 1) *Numbers, investment and area covered globally by GEF projects.* This is a baseline indicator to show overall trends in biodiversity-related GEF projects.
- 2) *Numbers, investment and area covered by projects addressing globally endangered and critically endangered species with body weights >45 kg.* This will give a global indication of the extent to which threatened "charismatic megafauna" are addressed by GEF projects.
- 3) *Number of threatened species or some subset of threatened species (by category, taxonomic group or both, e.g. critically threatened mammals) directly addressed by GEF projects.* This will almost certainly be reported as a matter of routine by relevant projects.
- 4) *Numbers, investment and area covered by projects addressing global red list species* Most projects can be expected already to report whether they address globally threatened species or not (note that unlike indicator 5) below, this indicator does not require projects to itemise all threatened species that they deal with).
- 5) *Number of threatened species or some subset of threatened species known or suspected to have populations in areas addressed by GEF projects and that might be expected to benefit from these projects.* This requires complete reporting on threatened species coverage by GEF projects.
- 6) *Numbers, investment and area covered by projects in global priority areas: WWF ecoregions; CI megadiversity countries; EBAs; World Heritage sites; Biosphere Reserves; Centres of Plant Diversity.* See discussion in introduction to table 1.

- 7) *Number of GEF projects (or some other measure of investment) directly addressing maintenance of bird diversity in EBAs; This should be routinely reported.*
- 8) *Number of GEF projects (or some other measure of investment) directly addressing maintenance of plant diversity in recognised Centres of Plant Diversity This should be routinely reported.*
- 9) *Number of GEF projects (or some other measure of investment) in countries with a high NBI This allows for a more systematic analysis of whether high diversity countries are receiving a disproportionately high allocation of investment. From the viewpoint of global priorities this should be the case but it may also give rise to political sensitivities and so should be used with caution.*

Table Ib. Indicators of coverage of GEF projects – enabling environment interventions

Operational Programme/ Focus	Coverage Indicators (Are GEF projects addressing the right places and species?)
A. Arid and semi-arid zone ecosystems	<ol style="list-style-type: none"> 1) Number of, and investment in, GEF projects in or including arid and semi-arid ecosystems that explicitly address each relevant category of enabling activity as set out in section 3 of the introduction (ie. biodiversity policies; biodiversity regulations; cross-sectoral policies; international co-operation; incentives; leveraging; research; public awareness and education; stakeholder participation. 2) Number of, and investment in, national level GEF projects that explicitly aim to improve range management policies.
B. Coastal, Marine and Freshwaters	<ol style="list-style-type: none"> 1) Number of, and investment in, GEF projects in or including arid and semi-arid ecosystems that explicitly address each relevant category of enabling activity as set out in section 3 of the introduction (see A 1 above). 2) Number of, and investment in, national level GEF projects aimed at improving fisheries policies. 3) Number of, and investment in, national level GEF projects directed at policy improvement with respect to water resources. 4) Number of, and investment in, national level GEF projects involving integrated coastal zone management
C. Forest	<ol style="list-style-type: none"> 1) Number of, and investment in, GEF projects in or including forest ecosystems that explicitly address each relevant category of enabling activity as set out in section 3 of the introduction (see A 1 above). 2) Number of, and investment in, national level GEF projects involving biodiversity-related forest policy reform.
D. Mountain	<ol style="list-style-type: none"> 1) Number of, and investment in, GEF projects in or including montane ecosystems that explicitly address each relevant category of enabling activity as set out in section 3 of the introduction (see A 1 above). 2) Number of, and investment in, national level GEF projects involving biodiversity-related policy reform concerning use of mountain regions.
E. Agro-biodiversity	<ol style="list-style-type: none"> 1) Number of, and investment in, GEF projects in or including agricultural systems that explicitly address each relevant category of enabling activity as set out in section 3 of the introduction (see A 1 above). 2) Number of, and investment in, national level GEF projects involving biodiversity-related agricultural policy reform.

G. Cross-cutting

- 1) Number of, and investment in GEF projects aiming to secure reform in endangered species legislation.
 - 2) Number of, and investment in GEF projects aiming to improve compliance with multilateral environmental agreements.
 - 3) Number of, and investment in GEF projects aiming to reform game management policy/hunting regulations.
 - 4) Number of, and investment in GEF projects aiming to improve environmental impact assessment requirements and implementation.
 - 5) Number of, and investment in GEF projects aiming to incorporate biodiversity issues in the policies of other sectors, e.g. mining and energy.
 - 6) Number of, and investment in GEF projects aiming to incorporate biodiversity issues in industrial and commercial policies.
 - 7) Number of, and investment in GEF projects aiming to include biodiversity issues in education.
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F. Global

- 1) Numbers of, and investment in projects directed at drafting NBSAPs in countries containing any of the global priority areas.
- 2) Numbers of, and investment in projects directed at policy reform in countries containing any of the global priority areas.
- 3) Number of countries with a high NBI (defined as e.g. upper quartile) eligible for GEF funding that have benefited from country level funding.

Because the above indicators are reflections of the intended functions of GEF projects, the data necessary to produce them should be included as a matter of course in project reports (although it is possible that some interpretation and categorization of goals as set out in such reports may be necessary). It should be possible to make these indicators operational in the short term.

II. Indicators of GEF impacts on pressures and behaviours affecting biodiversity (Table IIa and IIb).

Indicators of impacts on pressures and behaviours address the question of how successful the GEF is being in affecting the causes of biodiversity loss. As with coverage indicators, they can be divided into those that convey information about interventions that directly affect pressures on biodiversity (Table IIa) and those that are intended to affect the broader enabling environment (Table IIb).

Impacts on behaviour can be exerted at all societal levels, from the individual through the community and institutional to the systemic. Generally, ground interventions (ie. those involving field-based projects) will be expected primarily to affect behaviour of individuals and local communities and institutions. Such interventions may affect behaviour that has a direct impact on biodiversity (eg. support for fisheries enforcement officers should reduce illegal destructive fishing methods) but may also affect the local enabling environment (eg. educating and encouraging fishers to develop their own sustainable fisheries management regimes). National level interventions in general address the wider enabling environment and attempt to affect systemic behaviour (eg. national level policies) and the behaviour of national institutions. However, if successful such interventions should ultimately manifest themselves in changes in individual behaviour (eg. reform of national education policies so that biodiversity is included in school curricula should ultimately affect the behaviour of those individuals taught under a changed curriculum).

In this framework, interventions that affect pressures directly are presented in four broad categories (Table IIa): protected areas; protected areas management effectiveness; sustainable management and use; and specific pressures.

Protected Areas: The existence of protected areas in GEF areas of interest and GEF investment in their management and in the establishment of new protected areas are included in the coverage indicators in Table I. The GEF may also wish to use these measures as a way of expressing its role in reducing pressures on biodiversity in these areas.

PA Management Effectiveness: Another important way that the GEF acts to reduce pressures on components of biodiversity is by improving the management of protected areas. It is difficult to define and document improvements in management effectiveness. Some simple measures relating to management plans, budgets and staffing of protected areas are proposed here. Additional useful measures are likely to emerge from the various efforts currently underway to develop frameworks for assessing management effectiveness. These include work by the IUCN World Commission on Protected Areas (WCPA) and a parallel effort by the WB/WWF Alliance. Future approaches are likely to include both quantitative measures and expert qualitative assessments. The latter are a promising approach for the GEF, but potentially pose problems of consistency of evaluation in space and time.

Sustainable Use: Sustainable use of biodiversity is one of the principal goals of the CBD. However, pragmatic definitions of sustainable use and ways of assessing it are still in

development. The various certification initiatives depend on the evaluation of management against a portfolio of criteria, so the incidence of certification of management among GEF project areas may be one indicator of sustainable use. Where formal certification has not been sought, it may be possible to base evaluation on the evidence for the existence and enforcement of regulations such as catch limits. True documentation of sustainable management and use, particularly at species level, depends on long term monitoring of populations of target species status, and on adaptation of management in response to the results of the monitoring. The existence of such monitoring programmes is one indicator of sustainable management. Another approach that may be useful for assessment of sustainability (and perhaps specific pressures) is qualitative evaluation by project managers according to sets of guideline criteria. Performing these evaluations would help project managers to identify their own quantitative monitoring needs. This concept is discussed further in the concluding section of this document.

Specific pressures: These indicators depend on the clear recognition of specific pressures that act on particular subsets of biodiversity, such as those represented by the Operational Programmes. In general, the identification of these pressures is relatively straightforward, though the priority assigned to individual pressures may vary from place to place and may change with time. It may be appropriate to evaluate indicators relating to a particular pressure only for those projects where that pressure has been identified as an important factor.

Table IIa. Indicators of GEF Impact on Pressures and Behaviours Directly Affecting Biodiversity

Operational Programme/ Focus		Impacts on pressures and behaviour (Are GEF projects alleviating pressures on biodiversity?)
A. Arid and semi-arid zone ecosystems	PA management	<ol style="list-style-type: none"> 1) Numbers and total area of PAs in arid and semiarid ecosystems receiving GEF funding that have operational management plan. 2) Total budgets and investment per area or per km perimeter of protected areas in arid and semiarid ecosystems receiving GEF funding that have operational management plans. 3) Numbers of staff per area or per km perimeter in protected areas in arid and semiarid ecosystems receiving GEF funding that have operational management plants.
	Pressures	<ol style="list-style-type: none"> 4) Deviation of fire regime form understood natural regime in GEF project areas in arid and semi-arid ecosystems. 5) Changes in desertification intensity in GEF project areas in arid and semi-arid ecosystems. 6) Changes in hunting pressures on GEF project target species in arid and semi-arid ecosystems.

	Sustainable use	<ol style="list-style-type: none"> 7) Rate of land conversion to other uses in GEF project areas in arid and semi-arid ecosystems. 8) % of or area of GEF projects in arid and semi-arid ecosystems where local use of fuelwood is known or believed to be sustainable. 9) % of or area of GEF projects in arid and semi-arid ecosystems where local harvest of medicinal plants is known or believed to be sustainable. 10) % of or area of GEF projects in arid and semi-arid ecosystems where local hunting activities are known or believed to be sustainable. 11) % of or area of GEF projects in arid and semi-arid ecosystems where grazing pressure is known or believed to be sustainable. 12) % of or area of GEF projects in arid and semi-arid ecosystems where water extraction does not exceed rate of replenishment.
B. Coastal, Marine and Freshwaters	PA management	<ol style="list-style-type: none"> 1) Numbers and total area of PAs in coastal, marine and freshwater ecosystems receiving GEF funding with operational management plans. 2) Total budgets and investment per area or per km perimeter of protected areas with operational management plans in coastal, marine and freshwater ecosystems receiving GEF funding. 3) Numbers of staff per area or per km perimeter in protected areas in coastal, marine and freshwater ecosystems receiving GEF funding.
	Pressures	<ol style="list-style-type: none"> 4) Rate of abstraction of freshwater vs. rate of replenishment in GEF project areas. 5) Level of input of sediment in GEF project areas. 6) Level of input of chemical pollutants in GEF project areas. 7) Deforestation rate within catchments in GEF project areas. 8) % of watercourse under natural flow regime in GEF project areas. 9) Capacity to enforce fisheries regulations in GEF project areas.
	Sustainable use	<ol style="list-style-type: none"> 10) Fisheries catch per unit effort in GEF project areas. 11) Proportion of catch obtained using non-destructive techniques in GEF project areas. 12) Proportion of fisheries catch discarded in GEF project areas. 13) Species composition of catch in GEF project areas.

		14) Proportion of catch from native species in GEF project areas.
		15) Age/size structure of catch of target species in GEF project areas.
		16) Proportion of harvest obtained by local people in GEF project areas.
C. Forest	PA management	1.) Numbers and total area of PAs with operational management plans in forest ecosystems receiving GEF funding.
		2.) Total budgets and investment per area or per km perimeter of protected areas with operational management plans in forest ecosystems receiving GEF funding.
		3.) Numbers of staff per area or per km perimeter in protected areas in forest ecosystems receiving GEF funding.
	Pressures	4.) Km road access of different grades per km ² in GEF project areas.
		5.) Annual forest clearance in GEF project areas.
	Sustainable use	6.) Proportion of total timber extraction from certified forests in GEF project areas.
		7.) Area of forest under certified management in GEF project areas.
		8.) % of or area of GEF projects in forests where local hunting activities are known or believed to be sustainable.
		9.) % of or area of GEF projects in forests where collection of non-timber forest products is known or believed to be sustainable.
D. Mountain	PA management	1.) Numbers and total area of PAs in mountain ecosystems with operational management plans receiving GEF funding.
		2.) Total budgets and investment per area or per km perimeter of PAs with operational management plans in mountain ecosystems receiving GEF funding.
		3.) Numbers of staff per area or per km perimeter in PAs in mountain ecosystems receiving GEF funding.
	Pressures	4.) Rate of deforestation on slopes >20% in GEF project areas in montane ecosystems.
	Sustainable use	5.) % of or area of GEF projects in montane areas where local hunting activities are known or believed to be sustainable.

E. Agrobiodiversity

- 1) Proportion of agricultural land under certified production systems in GEF project areas.
- 2) Proportion of agricultural land under other forms of traditional low-impact high diversity production systems in GEF project areas.
- 3) Proportion of irrigated water from non-renewable resources used in agriculture in GEF project areas.
- 4) Application rates of persistent pesticides, herbicides and fertilizers in GEF project areas.
- 5) Proportion of agricultural land on slopes > 20% stabilised in GEF project areas.
- 6) Rate of loss of productive agricultural land in GEF project areas.
- 7) Rate of conversion from other systems to agricultural land in GEF project areas.
- 8) Periodicity of swidden cultivation in GEF project areas in tropical moist forest ecosystems.
- 9) Proportion of nutritional needs applied locally by agriculture in GEF project areas.

F. Global

- 1) Numbers and total area of PAs with operational management plans receiving GEF funding
- 2) Total budgets and investment per area or per km perimeter of protected areas with operational management plans receiving GEF funding.
- 3) Numbers of staff per area or per km perimeter in protected areas receiving GEF funding.
- 4) % or total area in GEF project areas where major natural resource use is known or believed to be sustainable.

A. Arid and Semi-arid zone ecosystems

- 1.) *Numbers and total area of PAs in arid and semiarid ecosystems receiving GEF funding that have operational management plans.* This indicator is an attempt to quantify the degree to which the GEF is supporting effective protected area management rather than “paper parks”. It will need substantial research to acquire the data. The data could be requested from project reporting, but clear guidance and criteria for the functionality of management plans would be required. Some useful work is now being conducted by Tropenbos on criteria for management plan evaluation. Also, WB/WWF Alliance and IUCN work on protected area management effectiveness may provide useful guidance.
- 2.) *Total budgets and GEF investment per area or per km perimeter of protected areas in arid and semiarid ecosystems receiving GEF funding.* This indicator is another attempt to quantify the degree to which the GEF is supporting effective

protected area management rather than “paper parks”. It is more objective than the assessment of whether a management plan is operational, but it will require substantial research to acquire the data. The data could be requested from project reporting, but the burden imposed could be significant in some cases. Examining both total PA budgets and the GEF contribution could also provide useful perspective on the GEF’s effectiveness in leveraging additional funds.

- 3.) *Numbers of staff per area or per km perimeter in protected areas in arid and semiarid ecosystems receiving GEF funding.* This indicator is another attempt to quantify the degree to which the GEF is supporting improved protected area management. The data could be requested from project reporting, but their acquisition will require substantial research.
- 4.) *Deviation of fire regime in GEF project areas from accepted ‘natural’ regime.* Determination of natural fire regimes is problematic, particularly in areas that have long been subject to human influence. This indicator is likely only to be feasible in the longer term.
- 5.) *Changes in desertification intensity in GEF project areas.* Using GEF project locations and the *UNEP Atlas of Desertification*, it should be possible to estimate desertification intensities for the areas in which the GEF is working. The Atlas is revised periodically which will introduce a component of change. However, it must be recognised that the desertification assessments are based on expert opinion and on unevenly sized focal areas of assessment, which weakens the comparability of different areas. The important parameter is the direction of change within a given location, so it is this that should be evaluated and then combined across project areas. Comparison with areas not targeted by the GEF should then be possible.
- 6.) *Changes in hunting pressures on GEF project target species.* Because of the characteristic low densities and nomadic habits of both wildlife and human populations in arid and semi-arid ecosystems, consistent assessment of hunting pressure is problematic. It may be possible to generate and overview from project-level evaluation of qualitative changes in hunting pressure, but care will be needed.
- 7.) *Rate of land conversion to other uses in GEF project areas in arid and semi-arid ecosystems.* Determination of rates of conversion over large areas will be dependent on some form of remote sensing.
- 8.) *% of GEF projects in arid and semi-arid ecosystems where local use of fuelwood is known or believed to be sustainable.* Measurement of fuelwood use over extensive areas is problematic. In the early stages, development of this indicator should be based on expert (almost certainly qualitative) assessment on the part of project staff.
- 9.) *% of GEF projects in arid and semi-arid ecosystems where local harvest of medicinal plants is known or believed to be sustainable.* As 8.) above.
- 10.) *% of GEF projects in arid and semi-arid ecosystems where local hunting activities are known or believed to be sustainable.* As 8.) above.

- 11.) *% of GEF projects in arid and semi-arid ecosystems where grazing pressure is known or believed to be sustainable.* As 8.) above.
- 12.) *% of GEF projects in arid and semi-arid ecosystems where water extraction does not exceed rate of replenishment.* Estimation (though not detailed quantitative measurement) of this should be feasible in most project areas. This indicator is also relevant to the following OP.

B. Coastal, Marine and Freshwater Ecosystems

- 1) *Numbers and total area of PAs in aquatic ecosystems receiving GEF funding that have operational management plans.* See A. 1) above.
- 2) *Total budgets and GEF investment per area or per km perimeter of protected areas in aquatic ecosystems receiving GEF funding.* See A. 2) above.
- 3) *Rate of abstraction of freshwater vs. rate of replenishment in GEF project areas.* See A. 3) above.
- 4) *Level of sediment input in GEF project areas.* Estimation of this over wide areas is problematic; however, sampling protocols are well-established and could be incorporated into project design.
- 5) *Level of sediment input in GEF project areas.* Estimation of this over wide areas is problematic; however, sampling protocols are well-established and could be incorporated into project design.
- 6) *Level of input of chemical pollutants in GEF project areas.* Estimation of this is problematic.
- 7) *Deforestation rate within catchments in GEF project areas.* General considerations of estimation of deforestation rates apply. Estimation of rates within particular catchments is likely to require some form of GIS analysis.
- 8) *% of watercourse under natural flow regime in GEF project areas.* Detailed estimation of this over wide areas is problematic. However, annual rate of loss of such areas should be possible to estimate.
- 9) *Capacity to enforce fisheries regulations in GEF project areas.* This should be relatively easy to measure.
- 10) *Fisheries catch per unit effort in GEF project areas.* Although frequently used as an estimator of sustainability, CPUE is difficult to measure with accuracy. Where unit effort varies considerably from year to year it is also difficult to interpret.
- 11) *Proportion of catch obtained using non-destructive techniques in GEF project areas.* Estimation of this is likely to be on a qualitative basis, carried out by project field staff.
- 12) *Proportion of fisheries catch discarded in GEF project areas.* Estimation of this will depend on sampling. Although not a direct indicator of sustainability it provides useful information on the state of fisheries management.
- 13) *Species composition of catch in GEF project areas.* Changes in catch composition

over time can provide valuable indications of long-term sustainability. Typically, overfished areas show a gradual shift in major fisheries species from higher to lower trophic level guilds. Such shifts can be detected by sampling of landings. However meaningful change may take several years to manifest itself, so that this indicator is only likely to become operational in the medium or longer term.

- 14) *Proportion of catch from native species in GEF project areas.* This indicator applies particularly to inland waters, where native species are frequently displaced by introduced fisheries species, to the long-term detriment of biodiversity and, often, the productivity of the fishery involved. As with indicator 13 above, this can be estimated using sampling of landings.
- 15) *Age/size structure of catch of target species in GEF project areas.* As with indicator 13, changes in the age and size structure of catches of target species provide a powerful indicator of fisheries sustainability. Unsustainable fisheries typically show a shift to smaller, younger individuals in catches. This can be measured straightforwardly by sampling of landings. Changes often manifest themselves more rapidly than those in indicator 13, so that this indicator could be made operational in the short-term if appropriate monitoring is in place.
- 16) *Proportion of harvest obtained by local people in GEF project areas.* Although not a direct measure of sustainability of harvest, this is an important indicator of likely long-term sustainability of the fishery.

C. Forest

- 1) As A 1) above.
- 2) As A 2) above.
- 6) As A 3) above.
- 7) *Km road access of different grades per km² in GEF project areas.* Road access provides an important indicator of forest vulnerability and should be relatively straightforward to measure within project areas.
- 8) *Annual forest clearance in GEF project areas.* Measurement of deforestation over wide areas generally depends on some form of remote sensing.
- 9) *Proportion of total timber extraction from certified forests in GEF project areas.* Although data on volume of timber extracted from certified forests should be relatively straightforward to obtain, overall timber extraction data are often more problematic, particularly where there is a large informal or illegal sector.
- 10) *Area of forest under certified management in GEF project areas.* This should be straightforward to establish and should serve as a powerful indicator of sustainability.
- 11) *% of or area of GEF projects in forests where local hunting activities are known or believed to be sustainable.* Measurement of hunting intensity in forest areas is problematic, particularly in areas where such activity is notionally illegal. In the first instance, assessment of this variable is likely to be on the basis of qualitative expert assessment by ground-based project personnel.
- 12) *% of or area of GEF projects in forests where collection of non-timber forest products*

is known or believed to be sustainable. See indicator 9) above.

D. Mountain

- 1) As A 1) above.
- 2) As A 2) above.
- 3) As A 3) above.
- 4) *Rate of deforestation on slopes >20% in GEF project areas in montane ecosystems.* See general comments on deforestation above.
- 5) *% of or area of GEF projects in montane areas where local hunting activities are known or believed to be sustainable.* See general comments on hunting in 8) above.

E. Agriculture

- 1) *Proportion of agricultural land under certified production systems in GEF project areas.* Measurement of this should be a stated target of GEF projects working in agricultural systems. Because many agricultural certification systems operate at relatively fine scale (that is individual farms are assessed as separate units), compilation of this data is likely to be more cumbersome than the equivalent for forest systems (see indicator C 7. above).
- 2) *Proportion of agricultural land under other forms of traditional low-impact high diversity production systems in GEF project areas.* Measurement of this is likely to be based on semi-qualitative assessment by project staff, at least in the initial stages.
- 3) *Proportion of irrigated water from non-renewable resources used in agriculture in GEF project areas* Measurement of this over extensive areas is problematic.
- 4) *Application rates of persistent pesticides, herbicides and fertilizers in GEF project areas.* Measurement of this over extensive areas is problematic.
- 5) *Proportion of agricultural land on slopes > 20% stabilised in GEF project areas.* Measurement of this is likely to be based on semi-qualitative assessment by project staff, at least in the initial stages.
- 6) *Rate of loss of productive agricultural land in GEF project areas.* Measurement of this is likely to be based on semi-qualitative assessment by project staff, at least in the initial stages.
- 7) *Rate of conversion from other systems to agricultural land in GEF project areas.* Measurement of this is likely to be based on semi-qualitative assessment by project staff, at least in the initial stages.
- 8) *Periodicity of swidden cultivation in GEF project areas in tropical moist forest ecosystems.* This gives a good indication of likely sustainability of shifting agricultural use in tropical forest ecosystems and is therefore relevant to forests (theme C above). The interval between successive cultivation cycles is usually over 5 years even in highly stressed areas. Development of this indicator will therefore be likely to be dependent on availability of historical data, at least in the short term.
- 9) *Proportion of nutritional needs applied locally by agriculture in GEF project areas.* As with fisheries, although not a direct measure of sustainability of agricultural

production over the short term, this is an important measure of likely long-term sustainability.

F. Global

- 1) As A 1) above.
- 2) As A 2) above.
- 3) As A 3) above.
- 4) *% or total area in GEF project areas where major natural resource use is known or believed to be sustainable.* Assessment of this is undoubtedly a long-term goal.

Table IIb. Indicators of GEF Impact on Pressures and Behaviours Affecting Biodiversity – Enabling Environment Interventions

Operational Programme/ Focus		Impact Indicators (Are GEF projects improving the enabling environment for conserving and using biodiversity sustainably?)
A. Arid and semi-arid zone ecosystems	Policy	1.) Number or proportion of countries receiving GEF funding that have subsequently developed range management policies that include recognition of importance of biodiversity.
	Regulation/ Participation	2.) Number or proportion of GEF projects in arid and semi-arid ecosystems where local people have become involved in formulation of hunting regulations.
		3.) Number or proportion of GEF projects in arid and semi-arid ecosystems where a mechanism has been developed for self-regulation of hunting by local people.
		4.) Number or proportion of countries receiving GEF support that have subsequently included recognition of importance of biodiversity in arid and semi-arid ecosystems included in agriculture, industry and commerce sector policies.
	Cross-sectoral	4.) Number or proportion of countries receiving GEF support that have subsequently included recognition of importance of biodiversity in arid and semi-arid ecosystems included in agriculture, industry and commerce sector policies.
		5.) Number of exchanges of views (or personnel) between countries sharing individual tracts of rangeland promoted by GEF projects.
	Transboundary	5.) Number of exchanges of views (or personnel) between countries sharing individual tracts of rangeland promoted by GEF projects.
		6.) Number of transboundary agreements on pastoral use of rangelands that have been facilitated by GEF projects.
	Incentives	7.) Number or proportion of countries receiving GEF support where incentives for overstocking of rangeland have been eliminated.
	Leveraging	8.) Increase in overall budget in GEF project areas in arid and semi-arid ecosystems additional to that provided by the GEF.
	Research	9.) Numbers of (or investment in) research projects to investigate status of arid and semi-arid ecosystem species in GEF project areas initiated subsequent to GEF intervention.
	Public awareness	10.) Numbers of field guides to arid and semi-arid ecosystem species in local languages produced with GEF support.
11.) Numbers of GEF-sponsored media events and press coverage of desertification issues in and around areas of GEF influence.		
12.) Numbers of school children reached by GEF-funded educational materials on values and fragility of arid and semi-arid ecosystems and their species.		

B. Coastal, Marine and Freshwaters	Policy	1) Number or proportion of countries receiving GEF funding that have subsequently developed fisheries policies that explicitly address biodiversity issues (<i>cf.</i> non-GEF countries).
	Regulation/ participation	2) Number or proportion of GEF projects where local fishers are involved in formulation of national or sub-national fisheries regulations.
		3) Number or proportion of GEF projects where a mechanism exists for self-regulation of fishing by local people.
	Cross-sectoral	4) Number or proportion of countries receiving GEF support that have subsequently included recognition of importance of aquatic biodiversity included in agriculture, industry and commerce sector policies.
	Transboundary	5) Number of regional (ie. bilateral or multilateral) fisheries management plans promoted by GEF projects.
	Incentives	6) Number or percentage of GEF projects where local fishers have access to certification standards (eg. MSC certification) for fisheries products.
	Leveraging	7) Increase in overall budget in GEF project areas in aquatic ecosystems additional to that provided by the GEF.
	Research	8) Numbers of (or investment in) research projects to investigate status of aquatic species in GEF project areas initiated subsequent to GEF intervention.
	Public awareness	9) Numbers of field guides to aquatic species in local languages produced with GEF support.
		10) Numbers of GEF-sponsored media events and press coverage of issues concerning aquatic ecosystems and fisheries in and around areas of GEF influence.
		11) Numbers of school children reached by GEF-funded educational materials on aquatic ecosystems and fisheries.
C. Forest	Policy	1) Number or proportion of countries that have developed national forest programmes that include recognition of biodiversity preservation as an important function of forests following GEF intervention.
	Regulation/ Participation	2) Number or proportion of GEF countries that involve concessionaires in the formulation of timber extraction regulations.
		3) Number or proportion of GEF projects where local people are involved in formulation of national or sub-national hunting regulations.
		4) Number or proportion of GEF projects where a mechanism exists for self-regulation of hunting by local people.

Cross-sectoral	5) Number or proportion of countries receiving GEF support that have subsequently included recognition of importance of forest biodiversity in agriculture, industry and commerce sector policies.
Transboundary	6) Number of GEF projects that have facilitated regional (international) discussions of forest issues. 7) Number of exchanges of views (or personnel) between countries sharing individual tracts of forest promoted by GEF projects. 8) Number of transnational forest areas for which mutual agreement of management goals between countries has been facilitated by GEF projects.
Incentives	9) Number or proportion of countries receiving GEF support where “homesteading” regulations or other incentives for forest clearance have subsequently been eliminated. 10) Number or proportion of GEF project areas where small forest owners have been given access to forest product certification. 11) Number or proportion of GEF project areas where improved markets and distribution networks have been provided for certified forest products.
Leveraging	12) Increase in overall budget in GEF project areas in forest ecosystems additional to that provided by the GEF.
Research	13) Numbers of (or investment in) research projects to investigate status of forest species in GEF project areas instigated following GEF intervention.
Public awareness	14) Numbers of field guides to forest species in local languages produced with GEF support. 15) Numbers of GEF-sponsored media events and press coverage of forest issues in and around areas of GEF influence. 16) Numbers of school children reached by GEF-funded educational materials on multiple values of forests and their species.

D. Mountain

Policy	1) Proportion of countries receiving GEF funding that have subsequently developed clear policies on watershed protection that recognise the role of biodiversity. 2) Proportion of countries receiving GEF funding that have soil conservation policies.
Cross-sectoral	3) Number or proportion of countries receiving GEF support that have subsequently included recognition of importance of montane biodiversity included in agriculture, industry and commerce sector policies.

	Transboundary	4) Number of regional (ie. bilateral or multilateral) montane area management plans promoted by GEF projects.
	Leveraging	5) Increase in overall budget in GEF project areas in montane ecosystems additional to that provided by the GEF.
	Research	6) Numbers of (or investment in) research projects to investigate status of montane species in GEF project areas initiated subsequent to GEF intervention.
E. Agro-biodiversity	Policy	1) Number or proportion of countries receiving GEF funding that have subsequently developed agricultural policies that explicitly address biodiversity issues.
		2) Number or proportion of countries receiving GEF funding that have subsequently developed national policies or regulations explicitly recognizing and protecting the agricultural innovations, knowledge and practices of local and indigenous communities embodying traditional lifestyles.
		3) Number or proportion of countries receiving GEF funding that have subsequently incorporated use of local land races and indigenous livestock breeds in national breeding programmes.
	Incentives	4) Number or proportion of countries receiving GEF funding that have subsequently eliminated or reduced incentives for inappropriate agricultural development.
		5) Number or proportion of countries receiving GEF funding that have subsequently developed national certification standards for agricultural products.
		6) Number or proportion of countries receiving GEF funding that have subsequently developed distribution systems for certified agricultural products produced by small-scale farmers.
		7) Number or percentage of GEF projects where local producers have access to distribution systems for certified products.
	Research	8) Numbers of (or investment in) research projects to investigate status of local landraces and livestock breeds in GEF project areas instigated following GEF intervention.
	Leveraging	9) Increase in overall budget in GEF project areas in agricultural areas additional to that provided by the GEF.
F. Cross-cutting	Policy	1) Proportion or number of countries receiving GEF funding that are currently implementing their National Biodiversity Strategies and Action Plans.
	regulation	2) Proportion or number of countries receiving GEF funding that have subsequently developed national protected areas systems plans.

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| | 3) Proportion or number of countries receiving GEF funding that have subsequently developed guidelines for protected area selection, establishment and management. |
| | 4) Proportion or number of countries receiving GEF funding that have subsequently enacted or revised legislation to protect threatened species. |
| Transboundary | 5) Proportion or number of countries receiving GEF funding that have subsequently ratified one or more multilateral environmental agreements. |
| | 6) Proportion or number of countries receiving GEF funding that are CITES Parties have subsequently improved implementation of CITES. |
| Incentives | 7) Proportion or number of countries receiving GEF funding that have subsequently implemented at least one fiscal incentive programme to promote conservation of biodiversity. |
| Leveraging | 8) Overall budget allocated to conservation and sustainable use of biodiversity in countries receiving GEF funding before and after GEF interventions. |
| Research | 9) Proportion or number of countries receiving GEF funding that have subsequently instigated one or more research programmes concerning indigenous biodiversity or have increased resources allocated to such research. |
| Public awareness | 10) Proportion or number of countries receiving GEF funding that have subsequently developed policies to include biodiversity in national education curricula. |
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The following comments apply in large measure to enabling activities in all the different thematic areas and will not therefore be repeated for each of them. Notably distinctive features of each thematic area will, however, be dealt with separately.

As noted in the introduction, changes in the enabling environment present particular problems of attributability, especially when these changes are at national level or higher. One approach may be to compare the enabling environment in countries that have received GEF support for enabling activities with those that have not. However, the great majority of eligible countries have now received such support and there are now few countries against which to compare them (ie. that might serve as a control). A more satisfactory approach may be to use historical analysis - that is to compare conditions before GEF support with those subsequently. Most simply, this would involve determining the number or percentage of countries where a given beneficial change to the enabling environment (eg. elimination of perverse incentives in agricultural production) had occurred subsequent to GEF involvement. A more sophisticated approach may take into account the time elapsed since GEF support was instigated (eg. number or percentage of countries where the GEF initiated funding of enabling activities four or more years ago that have undergone a given beneficial change to the enabling environment).

III. *Indicators of GEF impacts on status of and trends in biodiversity (Table III)*

Impact indicators address the question of the direct effects on biodiversity of GEF activities, which as noted in the introduction often have serious associated problems of causality and attribution. While in some cases attribution might be relatively unambiguous and uncontroversial (eg. direct protection of sea-turtle nesting beaches leading to an increase in annual sea-turtle hatchling survival) in most indication of any impact will depend on use of context indicators (Table IV) or on hypothetical extrapolation from historic data indicating what the status is projected to have been without GEF intervention.

Table III. Indicators of GEF impacts on status of and trends in biodiversity

Operational Programme/ Focus	Impacts on biodiversity status and trends (how are GEF activities affecting key components of biodiversity?)
A. Arid and semi-arid zone ecosystems	<ol style="list-style-type: none"> 1) Local population estimates of target arid and semi-arid zone species in GEF project areas, presented individually or combined to provide trend data using methods developed for LPI. 2) Changes in extent of undegraded arid and semi-arid habitat in GEF project areas.
B. Coastal, Marine and Freshwaters	<ol style="list-style-type: none"> 1) Local population estimates of target aquatic species in GEF project areas, presented separately or combined to provide trend data using methods developed for Living Planet Index. 2) Changes in extent of healthy coral reef in GEF project areas. 3) Changes in extent and quality (patch size, maximum tree size) of mangroves in GEF project areas.
C. Forest	<ol style="list-style-type: none"> 1) Local population estimates of target forest species in GEF project areas, presented separately or combined to provide trend data using methods developed for Living Planet Index. 2) Changes in natural forest extent in GEF project areas.
D. Mountain	<ol style="list-style-type: none"> 1) Local population estimates of target mountain species in GEF project areas, presented separately or combined to provide trend data using methods developed for Living Planet Index. 2) Changes of extent of undegraded montane habitat in GEF project areas.
E. Agrobiodiversity	<ol style="list-style-type: none"> 1) Changes in number of local land races and domestic livestock breeds in GEF project areas.

- 2) Changes in extent of agricultural area using low-input high diversity production methods in GEF project areas.

F. Global

- 1) Local population estimates of target species in all ecosystems presented separately or combined to provide trend data using methods developed for the Living Planet Index.
 - 2) Changes of total extent of undegraded ecosystems in GEF project areas.
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A. Arid and Semi-arid zone ecosystems

1. *Local population estimates of target arid and semiarid zone species in GEF project areas, presented individually or combined to provide trend data using methods developed for LPI.* The open nature of arid and semi-arid ecosystems means that populations of some species, particularly large ungulates, can be monitored quite effectively over large areas. However, in more arid areas, population densities of most species tend to be low, so that it is difficult to detect meaningful changes over the short to medium-term.

B. Coastal Marine and Freshwater Ecosystems

1. *Local population estimates of target aquatic species in GEF project areas, presented separately or combined to provide trend data using methods developed for Living Planet Index.* In coastal regions, sea-turtle nesting, seabird breeding colonies and pinniped (seal and sea-lion) populations are all relatively easy to monitor and can show significant changes over relatively short timescales. Sirenian and cetacean populations are generally more difficult to assess. The latter in particular are also difficult to interpret as most cetaceans have populations that range over wide areas. Where individual habitats (particularly coral reefs) are well monitored, frequency of sighting of large fishes (>1 m) serves as a useful surrogate indicator of the state of biodiversity. However sub-marine monitoring of this kind is expensive and time-consuming and not practical over large areas.

B. Forest Ecosystems

1. *Local population estimates of target forest species in GEF project areas, presented separately or combined to provide trend data using methods developed for Living Planet Index.* Monitoring of most species in forests is problematic for practical reasons. In tropical forests virtually all species occur at low population densities (ie. are naturally rare) and even where monitoring is possible, it is difficult to detect meaningful changes over the short or medium term. Diurnal primates and a few bird species (eg. Argus pheasants in South-east Asia) can be monitored reasonably successfully, although such monitoring is time-consuming and labour-intensive.

C. Mountain Ecosystems

1. *Local population estimates of target mountain species in GEF project areas, presented separately or combined to provide trend data using methods developed for Living Planet Index.* Monitoring of most species in mountains is problematic for practical reasons.

E. Agrobiodiversity

1. *Changes in number of local land races and domestic livestock breeds in GEF project areas.* Assessment of this over large areas is problematic, and in the first instance is likely to be based on qualitative or semi-qualitative assessment by project staff.
2. *Changes in extent of agricultural area using low-input high diversity production methods in GEF project areas.* Assessment of this over large areas is problematic, and in the first instance is likely to be based on qualitative or semi-qualitative assessment by project staff.

IV. Indicators for providing context for evaluating GEF work on Biodiversity (Table IV)

Context indicators are those used by the world at large to track general trends in biodiversity and related issues. The GEF will neither play a key role in the development of these indicators nor expect them to reflect GEF activities. However, they will provide important background against which to portray GEF efforts. For example, general declines in populations of marine mammals, or steep decline in status of freshwater biodiversity.

Table IV. Indicators for providing context for evaluating GEF work on biodiversity

Operational Programme/ Focus	F. Context Indicators
A. Arid and semi-arid zone ecosystems	1) Global trends in populations of species characteristic of arid and semi-arid zone ecosystems combined and expressed as an index <i>cf.</i> LPI. 2) Global qualitative evaluation of species population trends in arid and semi-arid zone ecosystems. 3) Global estimates of degradation of arid and semi-arid ecosystems.
B. Coastal, Marine and Freshwaters	1) Global trends in populations of coastal, marine and freshwater species combined and expressed as an index <i>cf.</i> LPI. 2) Global qualitative evaluation of coastal marine and freshwater species population trends. 3) Global estimates of rate of degradation or loss of key coastal, marine and freshwater habitats (eg. mangroves, coral reefs).
C. Forest	1) Global trends in populations of species characteristic of forest ecosystems combined and expressed as an index <i>cf.</i> LPI. 2) Global qualitative evaluation of species population trends in forest ecosystems. 3) Global estimates of loss of forest ecosystems.
D. Mountain	1) Global trends in populations of species characteristic of forest ecosystems combined and expressed as an index <i>cf.</i> LPI. 2) Global qualitative evaluation of species population trends in forest ecosystems. 3) Global estimates of loss of forest ecosystems.
E. Agrobiodiversity	1) Global trends in diversity of land races and breeds used in agricultural systems 2) Global trends in extent of agricultural area using low-input high diversity production methods in GEF project areas.
F. Global	1) Global trends in populations of species combined with ecosystem trends where available and expressed

as an index cf. LPI.

- 2) Global qualitative evaluation of species population and ecosystem condition trends.
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NEXT STEPS

This report should not be regarded as an end-product, but rather part of a continually evolving process. Experience has shown us that there is a limit to the value of theoretical processes in indicator development, which may have now been reached in this case.

The next step is to make some indicators operational. We recommend that this be done in a semi-structured and adaptive rather than prescriptive way. In the first instance, an audience and focus for an initial indicator output should be identified. This will allow preliminary choice of a fairly broad subset of potentially relevant indicators from the overall indicator portfolio presented here.

Data-gathering and analysis for these indicators can then be initiated, in the first instance by tapping GEF documentation at project and programme level and readily available external sources. This exercise will rapidly clarify feasibility issues. It should refine the initial subset into a smaller core set of indicators that can be implemented immediately and updated regularly on the basis of existing data sources. For these, the best approaches to presentation (graphs, charts, text, tables, maps) should be determined experimentally.

The exercise should also provide an estimate of the resources needed to obtain, manage and keep current data required for a wider set of indicators. It will also indicate how current internal GEF and implementing agency reporting mechanisms may need to be modified in order to generate missing data and what external data sources will be useful in the longer term.

Implementing a wider indicator set will undoubtedly impose some increased reporting burdens on project and programme staff at all levels, although every effort should be made to keep these to a minimum. Experience has shown that those affected by monitoring and reporting requirements are much more willing to expend time and effort in these activities if they believe that the results will be used in concrete fashion. Presentation to them of outputs using the initial core indicator subset described above should serve this end.

Furthermore, for motivational and practical reasons it is very important the views of those responsible for monitoring are taken into account and are seen to be taken into account from early on – those on the ground very often have the best understanding of what is both feasible and relevant in monitoring. Therefore, we consider it essential that further development of this indicator set be carried out in as participatory and transparent a fashion as possible. At the very least, proposed new reporting requirements will need to be reviewed and tested by a subset of project and programme staff.

As we have stated, we believe that the basis for this future work is contained in the body of this report. However, we also believe strongly that further progress will only now be made by experimentally implementing a small number of indicators in the manner outlined above.



