CONVENTION ON BIOLOGICAL DIVERSITY

SECRETARIAT

15 May 2001

NOTIFICATION

Dear Madam/Sir:

Subject: Development of Indicators for Biological Diversity

Indicators are about how to measure progress and achieve targets. Article 7 of the Convention on Biological Diversity (CBD) states:

Each contracting Party shall, in accordance with its particular conditions and capabilities:

a) Identify components of biological diversity important for its conservation and sustainable use; and

b) *Monitor through sampling and other techniques, the components of biological diversity identified pursuant to paragraph (a) above, paying particular attention to those requiring urgent conservation measures and those which offer the greatest potential for sustainable use.*

Pursuant to this article, COP decisions II/9, III/9 and III/10 require that national implementation reports by Parties should include targets and indicators, and that a core set of indicators should be included by governments in their national implementation reports.

Given the complexity of the issue, the lack of data on many indicator variables and the lack of capacity in most developing countries to develop indicators and effectively monitor progress, it became clear from the meetings of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) and the Conference of the Parties (COP), that the work on indicators is a long-term process.

As a starting point, and to enable the Conference of Parties to be able to report on global trends on biological diversity, it is necessary to compile a set of indicators that are currently being used by Parties as a basis to assist countries to develop their own indicators at the national level as part of their monitoring processes.

To: National Focal Points of the CBD

United Nations Environment Programme
UNEP

Tel: (514) 288.22.20
Fax: (514) 288.65.88

Email: secretariat@biodiv.org
Web: www.biodiv.org

World Trade Centre
393 Saint-Jacques Street, Suite 300
Montréal, Québec, Canada H2Y 1N9

The Executive Secretary, with the assistance of a liaison group of experts, prepared a core set of indicators derived from various international and national initiatives, which was presented to the Conference of Parties at its fifth meeting. Some Parties felt that a global set of core indicators was premature and requested the Executive Secretary to promote the development of indicators at the national level in accordance with recommendation III/5, including the development of a key set of standard questions, a set of principles for designing national level monitoring programmes as well as a list of available and potential indicators.

It is in this context that I am requesting all National Focal Points to the Convention to provide the Secretariat with existing indicators that are currently operational in their respective country. Attached, for your reference, are some indicators that have been developed under various initiatives at various levels which you may use as a reference point. You may add to or subtract from this list, indicate which of the listed indicators are used and provide any other comments, as appropriate. It may be useful to mention the specific purpose for which a particular indicator is used and its success as a monitoring tool for the status and trends of biodiversity.

In providing the indicators please do not restrict yourself to those indicators developed under the CBD process. Indicators developed under other processes such as CSD, State of the Environment Reporting etc. may also be relevant and should be included.

I have also been requested to develop a list of principles to guide Parties in developing their indicators and a set of standard questions that indicators can help to answer for policy makers. I am attaching as Annex 1 some proposed principles and questions for your comments.

We would appreciate if you could complete the table and return it to the Secretariat together with your comments **no later than 15 June 2001**.

Please accept the assurances of my highest consideration.

Hamdallah Zedan
Executive Secretary

INDICATIVE LIST OF BIODIVERSITY INDICATORS

	INDICATORS	USED OR NOT	COMMENTS
ECOSYSTEM / HABITAT	**Forestry biodiversity**		
	Total forest area		
	Total Forest area as a % of total land area		
	% forest cover by forest type(primary, secondary or plantation)		
	Ratio between exotic species and native species in plantation area		
	Forest area change by forest type (primary, secondary or plantation)		
	Per capita wood consumption		
	Change in land use, conversion of forest land to other land uses (deforestation rate)		
	Self-generating area per habitat type		
	Self-generating area as a % of total area		
	Fragmentation of forests		
	% protected area of total forest area		
	% protected area with clearly defined boundaries		
	% forest managed for wood production		
	% forest land managed for recreation and tourism to total forest area		
	Area and % of forests managed for catchment protection		
	% forest protected areas by forest type by age, class, and successional stage)		
	Area and length and numbers of biological corridors		
	Annual volume and area of timber harvested-indigenous and plantation		
	Contribution of forest sector to GDP		
	Number and size of forest fires		
	Reforested and afforested areas		
	Area and extent of degraded lands reclaimed through forest operations		
	Relationship between forest cover and frequency of flooding		

	Changes in the proportions of stands managed for conservation and utilization of genetic resources (gene reserves, seed collection stands, etc.		
	Area and % of forest area affected by anthropogenic effects (logging, harvesting for subsistence).		
	Area and percentage of forest area affected by natural disasters (insect attack, disease, fire and flooding)		
	Forest conversion affecting rare ecosystems by area		
	Extent of mixed stands		
	Managed forest ratio		
	Wood harvesting intensity		
	Estimate of carbon stored		
SPECIES	Absolute and relative abundance, density, basal area, cover, of various species		
	Threatened tree species as a percentage of the 20 most used for commercial purposes		
	Number of threatened, keystone, flagship species		
	Number of extinct, endangered, threatened, vulnerable and endemic forest dependent species by group (e.g. birds, mammals, vertebrates, invertebrates)		
	List of flora and fauna		
	Existence of procedures for identifying endangered, rare, and threatened species		
	Existing strategies for *in situ*/*ex situ* conservation of genetic variation within commercial, endangered, rare and threatened species of forest flora and fauna.		
	Number of forest dependent species whose populations are declining		
	Population levels of representative species from diverse habitats monitored across their range		
	Number and extent of invasive species		

ECOSYSTEM/HABITAT	**Agricultural Biodiversity**		
	Agricultural area by crops (cereal, oil crops, forage, woodlands)		
	Agricultural area (intensively farmed, semi-intensively farmed and uncultivated)		
	Change in area of agricultural land (converstion to or from agriculture)		
	Intensification and extensification of agricultural land use		
	Use of agricultural pesticides		
SPECIES	Number of species threatened by agriculture by group e.g. birds, mammals, vascular plants, vertebrates, invertebrates)		
	Number of vertebrate species using habitat on agricultural land by species.		
	Differences in species diversity and abundance of arthropods and earthworms in organically and conventionally cultivated arable land		
	Rate of change from dominance of nondomesticated species to domesticated species		
	Species diversity used for food		
	Erosion/Loss of genetic diversity patrimony		
	Crops/livestock grown as a percentage of number of 30 years before		
GENES	Accession of crops and livestock in ex-situ storage (number or percentage)		
	Replacement of landraces with few imported ones		
	Replacement of indigenous crops		
	Accessions of crops generated in the past decade (per cent)		
	Coefficient of kinship or parentage of crops		
	Inbreeding/outbreeding rate		
	Rate of genetic interchange between populations (measured by rate of dispersal and subsequent reproduction of migrants)		

ECOSYSTEM/HABITAT	**Inland Waters Biodiversity**		
	Surface water quality: Nitrogen, Dissolved oxygen, pH, pesticides, heavy metals, temperature		
	BOD on water bodies (re: eutrophication)		
	Ground water quality: nitrates, salinity, toxicants		
	Stream flow		
	Stream sediment storage and load		
	Changes in vegetation type along water courses		
	Water resource vulnerability index		
	Ratio between maximum sustained yield and actual average abundance		
	Glacier fluctuations		
	Groundwater level (water table level)		
	Wetland area		
	Extent of wetland drainage and filling		
	Fish family diversity		
	Benthic macroinvertebrates: communities		
	Macrophytes: species composition and depth distribution		
SPECIES	Threatened freshwater fish species as a % total freshwater fish species known		
	Number of inland fish species introduced		
	Number of exotic flora and fauna species e.g. fish, aquatic weeds		
	Number of endemic flora and fauna		
	Changes in distribution and abundance of native flora and fauna		
	Number of extinct, endangered, threatened/endangered/vulnerable/ endemic inland water species by group e.g. birds, aquatic mammals, invertebrates, amphibians, vascular plants, bottom fauna,		
	Changes in fish catches by species		
	Species richness (number per unit area, number per habitat		
	Indicator species		

ECOSYSTEM	**Coastal and Marine Biodiversity**		
	% coastal zone with populations exceeding 100 inhabitants/km^2		
	Annual rate of mangrove conversion		
	Frozen ground activity		
	Coral chemistry and growth pattern		
	Lake levels and salinity		
	Shoreline position		
	# of large scale bottom trawling vessels per 1 000km. of coastal area		
	E.coli counts and nutrient levels as % of baseline levels		
	Surface displacement Amount of poison chemicals and dynamite used for reef fishing.		
	Algae index		
SPECIES	Threatened fish species as a percentage of total fish species known		
	Change in proportion of fish catches by species per specific season		
	General Indicators[1]		
ECOSYSTEM/HABITAT	Frozen ground activity		
	Karst activity		
	Slope failure (landslides)		
	Relative wilderness index (please give your definition)		
	Changes in limiting factors for key species e.g. nest holes for parrots, fruit bat roosting trees		
	Soil quality		
	Volcanic unrest		
	Δ in total area of a particular habitat type		
	Changes in largest block of a particular habitat type		

[1] These are indicators that apply to more than two thematic areas and have been listed together to avoid repeating them

	Changes in average size of a particular habitat type		
	Change in mean nearest distance between blocks of a particular habitat type		
	Change in average width of break in an identified habitat corridor		
	Total area of protected areas (use IUCN definition of protected areas)		
	% of protected area to total area		
	Change in habitat boundaries		
	Percentage area in strictly protected status		
	Percentage of area dominated by non-domesticated species		
	Degree of connectivity of food web		
	Existence of institutional capacity, policy and regulatory framework for the planning, management and conservation of biological diversity		
	Size and distribution of protected areas		
SPECIES	Change in number and/or distribution of keystone or indicator species		
	# of introduced species and genomes		
	Change in presence, location, area, numbers of invasive plant or animal species		
	No of introduced species and genome		
	Quantity of specimens or species of economic/scientific interest removed from the environment		
	Density of road network		
	Percentage of area dominated by non domesticated species occurring in patches greater than 1 000 sq. km.		
	Population growth and fluctuation trends of special interest species		
	Sex ratio, age distribution and other aspects of population structure for sensitive species, keystone species, and other special interest species		
	Presence of *taxa* on environmental integrity		
	Recorded species present by group		
	Indigenous species present by group		
	Non-indigenous species present by group		

# of endemic/threatened/ endangered/vulnerable species by group		
Temporal change in number of species (increase/decrease)		
Change in composition of species overtime		
Species Group: total number versus threatened species		
Species with small populations vs larger population size		
Spatial differences in the number of rare vs common species		
Spatial differences in the restricted vs wide range species		
Representativeness of intra-specific variability of endangered and economically important species		
Diversity of native fauna		
Species richness (number, number per unit area, number per habitat area		
Species threatened with extirpation		
Species threatened with extinction (number or percent)		
Endermic species threatened with extinction		
Species risk index		
Species with stable or increasing populations		
Species with decreasing populations		
Threatened species in protected areas		
Endemic species in protected areas		
Threatened species in ex-situ collections		
Threatened species with viable ex-situ populations		
Species used by local residents		

Annex 1

An indicative list of a key set of principles for designing national level monitoring programmes and indicators

Given the widely varying conditions among countries most national level indicators will be country specific. Therefore in order to come up with a set of biodiversity indicators which can create a minimal level of comparability, coherence and consistency, it is important to have an agreed set of principles within which such indicators will be developed. These principles should address matters such as.

The way indicators relate to management questions;

The ability to show trends;

The ability to distinguish between human-induced and natural change;

The degree to which indicators are amenable to straightforward interpretation;

The ability to provide reliable results; and

The question for baselines for measurement, in light of the fact that application of pre-industrial baseline may often prove problematic.

Representativeness

In order to be broadly applicable an indicator should provide a representative picture of the environmental conditions, pressures or responses it is supposed to measure.

Availability of affordable data

Good quality data should be available at a reasonable cost or it should be possible to initiate a monitoring process that will make it available in future. Information costs money and time to obtain and many countries do not have the resources and capacity to generate such information in the short term. Only those indicators where data is available and can be obtained at minimum cost should be considered for the first track.

User-Driven

An indicator must be user-driven in order to be a useful monitoring tool. The conservation of biological diversity is a national and sometimes local responsibility. Parties have sovereign rights over their biological resources and can use them according to their national priorities. Similarly monitoring of these resources should also be driven by national priorities and indicators should be part of a country's strategy for conserving biodiversity. Imposing indicators will not work because the ultimate monitoring should be done at national and local levels.

Simplicity

The KISS principle must apply to indicators. An indicator must be relatively simple to understand and appealing to the target audience. Even complex issues and calculations should eventually yield clearly presentable information that the public and policy makers can easily understand.

Determinable baseline

For an indicator to be able to reflect true conditions and trends it must relate to agreed baseline conditions. The baseline should be meaningful and should reflect national priorities for biodiversity conservation. Baselines should be dynamic to accommodate new information and situations.

Ability to aggregate information

An indicator should not present very narrow parameters. Indicators that aggregate information on broader issues should be preferred. For example forest canopy temperature is a good indicator for forest health as compared to other indicators.

Sensitivity

An indicator should be able to detect a small change in the system. This will enable environmental managers to determine if small or large changes are relevant for monitoring.

Reliability

A reliable indicator is based on scientifically credible information. Two or more measurements of the same indicator should yield the same results. Different environmental managers should be able to get the same conclusions using the same indicator. Such an indicator can easily be applied at different spatial levels.

Integrative

No one has yet been able to come up with sustainable development indicators that integrates the social, economic and environmental dimensions. It is however useful to attempt to develop such indicators since biodiversity loss is caused more by socio-economic pressures than biological ones.

Validity

An indicator should be a true reflection of the facts. The data should be collected using scientifically defensible techniques. The indicator should be verifiable and reproducible. Methodological rigor is important to make the data credible for both experts and policy makers.

Time-series data

An indicator must be responsive to changes in time and/or space in order to reflect the future trends. The relevance of an indicator should therefore be at least 10-12 years. Policy makers

would like to make policies not only on the basis of current situation but also on the basis of future trends.

Policy Relevance

Indicators should show the condition and trends of biodiversity. Since there are many threats to biodiversity which emanate from certain policies, indicators should be targeted at policy makers who can put into place corrective measures to reduce the threats to biodiversity. Hence these indicators should be policy relevant.

Stability

An indicator should be stable to be able to distinguish between human induced and natural fluctuations. For example in developing indicators for forestry biodiversity it is important to distinguish between an indicator for forest decline due to anthropogenic causes from that resulting from natural causes.

An indicative list of a key set of standard questions that indicators help to answer for policy makers

A first step towards developing an indicator set on biodiversity, could be to identify key questions that indicators can help to answer for environmental managers and policy makers. The following questions are being proposed for consideration by SBSTTA.

State

i. What is the current state of biological diversity (ecosystem health, species levels, genetic diversity, state of ex-situ conservation-gene banks)?

ii. What are the major trends in the status of biological diversity at all levels(ecosystem, species, and genes)?

iii. What is the state of knowledge on biological diversity?

iv. What are the current goods and services derived from biological diversity (consumptive and non-consumptive)?

v. To what extend have geographic areas and major ecosystem types been identified, assessed for risk and prioritized in terms of needed action?

vi. Is progress being made in achieving major targets and objectives set out in planning processes/

Pressure

i. What baseline should be adopted for trend analysis of biodiversity?

ii. What are the most direct and indirect threats to biodiversity?

iii. Which of these threats are natural and which are anthropogenic?

iv. Are these threats increasing, declining or stable?

v. What are the linkages between these primary threats and changes in biodiversity status?

Response

i. Have response programmes and policies been implemented and what effect are they having?

ii. Are sufficient resources being allocated to implement biodiversity-related plans?

iii. Are underlying as well as direct causes of biodiversity loss being addressed?

iv. To what extent has biodiversity been integrated into relevant sectoral and cross-sectoral plans, programs and policies? How effective has this integration been?

v. To what extent have existing financial and other incentives supporting the objectives of the CBD?

vi. To what extent have major biodiversity values of each country been identified?

vii. Is an effective biodiversity monitoring system in place?

viii. Are there early warning signs of problems that require urgent attention?

ix. Are there new opportunities for action requiring attention