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INDICATORS AND ENVIRONMENTAL IMPACT ASSESSMENT

Designing national level monitoring programmes and indicators

Note by the Executive Secretary

Executive summary

The present note has been prepared in response to decision V/7 of the Conference of the Parties to the Convention on Biological Diversity, in which the Conference of the Parties requested the Executive Secretary to carry out the pending activities set out in the work programme on indicators of biological diversity and produce an interim progress report on these activities and on ongoing work on indicators in the thematic areas and other work programmes for consideration of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) before the sixth meeting of the Conference of the Parties.

With regard to the progress on pending activities, a set of principles and questions for designing national-level monitoring programmes and indicators has been developed, taking into account recommendations of past liaison groups and comments received from Parties, other governments and a few organizations in response to a questionnaire sent out in May 2001.

A synthesis of responses to the Executive Secretary's questionnaire on available and potential indicators used by Parties and other governments is provided, highlighting the most used indicators under the different thematic areas addressed by the Convention. However, taking into account the limited number of responses received and the fact that countries are at different levels of developing national indicators for biodiversity monitoring, this information is only indicative.

* UNEP/CBD/SBSSTA/7/1.

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Progress in ongoing indicator-related work under the Convention's thematic areas and cross-cutting issues is also reported.

Suggested recommendations

The Subsidiary Body on Scientific, Technical and Technological Advice may wish to:

(a) Note the progress report on ongoing work on indicators;

(b) Provide guidance on the principles and the set of standard questions for designing national-level indicators, and request the Executive Secretary to further develop these for consideration at a meeting prior to the seventh meeting of the Conference of Parties;

(c) Note the list of available and potential indicators used by Parties, contained in annex III to the present document, and refer them to the Conference of the Parties at its sixth meeting with a recommendation that they be referred to Parties for their information.

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I. INTRODUCTION

1. At its fifth meeting, the Conference of the Parties to the Convention on Biological Diversity, in paragraph 1 of its decision V/7, requested the Executive Secretary to carry out the pending activities set out in the work programme on indicators of biological diversity as approved by decision IV/1 A and, in particular, to develop:

(a) A set of principles for designing national-level monitoring programmes and indicators;

(b) A key set of standard questions and a list of available and potential indicators, covering the ecosystem, species and genetic levels, taking into account the ecosystem approach, that may be used by Parties at their national level and in national reporting and that also allow for regional and global overviews on the state and trends of biodiversity and, if possible and appropriate, any responses from policy measures.

2. In paragraph 5 of the same decision, the Conference of the Parties also requested the Executive Secretary to produce an interim progress report on ongoing work on indicators in the thematic and other work programmes, for review by SBSTTA prior to the sixth meeting of the Conference of the Parties and to submit a final report on the conclusions of this initiative to the Conference of the Parties at its sixth meeting.

3. The present note describes the progress in the pending activities set out in the work programme on indicators of biological diversity in decision IV/1 A (section II) and a preliminary report on ongoing work on indicators in the thematic and other work programmes (section III). Section IV synthesises the responses received from the Parties to a questionnaire sent out by the Executive Secretary in May 2001 on available and potential indicators.

II. PROGRESS REPORT ON PENDING ACTIVITIES

4. In response to decision V/7 of the Conference of the Parties, the Executive Secretary sent out a questionnaire to Parties in May 2001, with a set of principles for designing a national-level monitoring programme and indicators, a key set of standard questions and a generic list of indicators that had been compiled from various initiatives on indicators by Parties and international organisations. Parties were requested to comment on the principles and questions and indicate the indicators they currently use and to add any other indicators not included in the list of indicators. The Executive Secretary's notification is available on the Secretariat website at http://www.biodiv.org/doc/notifications/ntf-2001-05-17-ind-en.pdf

5. As of 9 August 2001, 32 Parties and other Governments had replied to the Executive Secretary's request. The set of principles and standard questions are presented in annexes I and II, respectively, of the present note. A list of available and potential indicators used by Parties is presented in annex III.

III. PROGRESS REPORT ON ONGOING WORK ON INDICATORS IN THE THEMATIC AND OTHER WORK PROGRAMMES

A. Forest biological diversity

6. Nine regional or international processes have developed criteria and indicators of sustainable forest management . They include the International Tropical Timber Organization (ITTO), the Center for International Forestry Research (CIFOR), the African Timber Organization (ATO), the Montreal

processes, the Pan-European forest process (Ministerial Conference on the Protection of Forests in Europe), the Tarapoto process, the dry zone Africa process, the Near East process, and the Lepaterique process. The involvement of about 150 countries in these processes reflects the wide interest in the development of criteria and indicators of sustainable forest management.

7. The Convention Secretariat participated in the work of the Intergovernmental Panel on Forests (IPF) and the Intergovernmental Forum on Forests (IFF) on criteria and indicators. Some information regarding criteria and indicators for sustainable forest management is contained in the background documents prepared under item 4 (Main theme: forest biological diversity) of the provisional agenda of the seventh meeting of SBSTTA. An expert consultation was convened in Rome in November 2000 by the Food and Agriculture Organization of the United Nations (FAO), ITTO, UNEP, CIFOR and the International Union of Forestry Research Organizations (IUFRO) to assess the progress on criteria and indicators and discuss the way ahead. The meeting requested FAO to continue its support to international coordination, development and implementation of criteria and indicators, and recommended that an international conference on criteria and indicators for sustainable forest management be organized with broad stakeholder involvement. The conference is tentatively scheduled for the first quarter of 2002.

B. Agricultural biodiversity

8. Work is under way to develop indicators and guidelines on mainstreaming agricultural biodiversity. The Organisation for Economic Co-operation and Development (OECD) will hold a workshop in early November 2001 on developing indicators related to agricultural biodiversity, including development of indicators for biodiversity within agricultural fields. The results of this workshop will be reported to SBSTTA at its seventh meeting. In the context of preparation of the second report on the state of the world's plant genetic resources, FAO, in collaboration with the International Plant Genetic Resources Institute (IPGRI), will further work on developing indicators for genetic diversity/erosion and genetic vulnerability in crops. Additionally, building on this work and that of OECD, FAO is also planning to hold a technical workshop in 2002 to further develop indicators in line with activity 1.5 of the programme of work on agricultural biodiversity. This will be coordinated with the programme of work on indicators as per decision V/7. More information is presented in the progress report on implementation of the programme of wok on agricultural biodiversity (UNEP/CBD/SBSTTA/7/9).

C. Marine and coastal biological diversity

9. In annex I of its recommendation VI/2, SBSTTA presented elements of a work plan on physical degradation and destruction of coral reefs. Activity (a), on assessment and indicators, is the analysis of the status and trends of global coral-reef ecosystems, the determination of indicators for continued monitoring and the determination of ecological and socio-economic impacts of coral-reef degradation and destruction. The work plan will be considered for approval by the Conference of the Parties at its sixth meeting.

10. In annex II of the same recommendation, SBSTTA presented a specific work plan on coral bleaching. Item (g) of the work plan (Encourage and support multidisciplinary approaches to coral-reef research, monitoring, socio-economics and management) highlighted the need for development and/or expansion of training opportunities for fishers, protected area managers and related marine resource managers at the national and regional levels in setting and measuring the achievement of management performance goals and indicators.

11. A memorandum of cooperation and a joint work plan between the Secretariat and the Global International Waters Assessment (GIWA) is going to be finalized in the near future. An outcome of this

collaboration is expected to be an increase in the capability of Parties to use monitoring programmes and indicators related to marine and inland water ecosystems. More information is given in the progress report of the Executive Secretary on ongoing assessment processes (UNEP/CBD/SBSTTA/7/3). Progress and review of the programmes of work on biological diversity of inland water ecosystems and marine and coastal areas will be reported to SBSTTA at a meeting prior to the seventh meeting of the Conference of the Parties.

D. Dry and sub-humid lands

12. The secretariats of the Convention on Biological Diversity and the Convention to Combat Desertification, in collaboration with the Global Environment Facility (GEF), organized a liaison group meeting in April-May 2001, in Bonn, with financial support from the Government of Norway to the Secretariat of the Convention to Combat Desertification. The liaison group identified indicators as one of the priority issues for inclusion in the joint work programme between the two secretariats (see UNEP/CBD/SBSSTA/7/4). In document ICCD/COP(4)/CST/5, the Secretariat of the Convention to Combat Desertification has synthesized information on indicators and benchmarks in dry and sub-humid lands provided by countries for the fourth meeting of the Conference of the Parties to that Convention .

E. Scientific assessments

13. Through its recommendation VI/5, on scientific assessments, SBSTTA agreed to develop a programme to address, progressively, issues of biodiversity thresholds in relation to ecosystem functioning, and the effectiveness of measures to address biodiversity loss, and to reduce the degree of uncertainty associated with them and include the identification or development of criteria and indicators for those topics in assessment process. In the same recommendation SBSTTA requested the Executive Secretary to develop methodologies and pilot assessment projects. The Executive Secretary developed pilot projects for development of methodologies for biological diversity of inland water ecosystems and marine and coastal areas. The progress report of the Executive Secretary on ongoing assessment processes (UNEP/CBD/SBSTTA/7/3) contains the assessment briefs. The issue of indicators will be considered in this process.

F. Global Taxonomy Initiative (GTI)

14. The Conference of the Parties established the Global Taxonomy Initiative (GTI) specifically to support its work programmes in the thematic areas and cross-cutting issues, including indicators. The GTI programme of work will be considered and adopted by the Conference of the Parties at its sixth meeting, on the basis of the draft prepared by SBSTTA at its sixth meeting (recommendation VI/6, annex). The output of planned activity 8 of the programme of work is expected to be an increase in knowledge of the species composition of forests, through national taxonomic studies and inventories. Using this increased knowledge base will facilitate the selection of criteria and indicators for forest biological diversity and may provide guidance in the selection of sites to be protected and in the valuation of resources. Planned activity 9 provides for the development over the next three years of taxonomic guides to identify invertebrate mangrove fauna that can be used as indicators of habitat change. The output of planned activity 10, on the biodiversity of dry and sub-humid lands, is expected to be the enhancement of understanding among agricultural managers of lichens as key indicators that warn of the advance of soil degradation. The output of planned activity 12, on agricultural biological diversity, is expected to be, *inter alia*, increased knowledge of soil biodiversity to aid in the identification of indicators of the health of below-ground biological diversity. Planned activity 17, on support for ecosystem approach and work under the Convention on Biological Diversity on assessment, including impact assessments, monitoring and indicators, provides for specific input from the GTI for the development of a menu of indicators in thematic

areas and of methodology sheets, guidelines and training to support the development of national monitoring and indicator programmes.

G. Environmental impact assessment

15. In his note on further development of guidelines for incorporating biodiversity-related issues into environmental impact assessment legislation and/or processes and into strategic environmental assessment (UNEP/CBD/SBSTTA/7/13), the Executive Secretary identified regional cooperation to develop criteria and indicators as an element necessary for the incorporation of biological diversity into environmental impact assessment, so that environmental issues are considered on a par with socio-economic and political factors relating to project development as well as national policies and programmes. In the draft guidelines, he further stated that regional collaboration is of particular importance for the development of criteria and indicators required in the evaluation of impacts, in early warning of potential threats and, possibly, to distinguish the effects of anthropogenic activities from natural processes.

H. Climate change

16. In annex I to its recommendation VI/7, on the pilot assessment of the interlinkages between climate change and biological diversity, SBSTTA outlined the terms of reference of the ad hoc technical expert group established in the same recommendation. These terms of reference include, *inter alia*, the development of recommendations on criteria and indicators for possible impacts of measures that might be taken under the United Nations Framework Convention on Climate Change and its Kyoto Protocol to mitigate or adapt to climate change. The first meeting of the ad hoc technical expert group is tentatively planned for late November or early December 2001.

IV. SYNTHESIS OF RESPONSES TO THE QUESTIONNAIRE ON AVAILABLE AND POTENTIAL INDICATORS

17. In response to paragraph 1 (b) of decision V/7 of the Conference of the Parties, requesting the Executive Secretary to develop a list of available and potential indicators, the Executive Secretary sent out a questionnaire to Parties in May 2001. A generic list of indicators that had been compiled from various initiatives on indicators by Parties and international organizations was annexed to the questionnaire, with a request that Parties indicate the indicators they currently use and add any others that they use or intend to use but are not included in the list. The Executive Secretary also posted the notification on the Convention website to reach the scientific community at large.

18. As of 10 August 2001, 32 Parties and other Governments had responded to this request: Argentina, Armenia, Austria, Bahamas, Bosnia and Herzegovina, Canada, Eritrea, Estonia, Finland, Guatemala, Guinea Bissau, Hungary, Iran (Islamic Republic of), Ireland, Lao People's Democratic Republic, Latvia, Lebanon, Mongolia, New Zealand, Niue, Norway, Palau, Panama, Poland, Portugal, Qatar, Spain, Sudan, Switzerland, Turkey, United Kingdom, and United States. Four responses diverged from the format of the questionnaire and are therefore not reflected in the synthesis. In addition, comments were received from the World Wide Fund for Nature (WWF) and IUCN-The World Conservation Union.

19. It is important to note that Parties have indicated that they are at different levels in the development of indicators for biodiversity monitoring. No Party has a complete list of biodiversity indicators, which suggests that the development of indicators is an ongoing process and is driven by national priorities.

20. Lack of data has been pointed out by almost all countries as a barrier to the development of indicators. As a result, some Parties have restricted their indicators to a few species. Many countries use indicators for endangered species as a requirement under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Such indicators, however, are limited to those species in annexes I and II of that Convention.

21. It was also interesting to note that some Parties have developed biodiversity indicators under different initiatives such as the state-of-the-environment reporting, sustainable development indicators under Agenda 21 and various other initiatives.

22. Annex III to the present note contains a list of indicators reported by Parties, some of which have been compiled by relevant organisations for their own monitoring programmes. It shows the number of countries that use specific indicators, expressed as a percentage of the total number of countries that responded to the Executive Secretary. Only the 5-7 of most used indicators are listed in table 1.

Table 1

THE MOST USED INDICATORS BY PARTIES AND OTHER GOVERNMENTS UNDER THE DIFFERENT THEMATIC AREAS UNDER THE CONVENTION ON BIOLOGICAL DIVERSITY

Indicator	*Number of countries using a given indicator (%)**
General indicators:†	
Percent of protected area to total area	71
Total area of protected areas (using IUCN definition of protected areas)	68
Size and distribution of protected areas	68
Percent area in strictly protected status	68
Soil quality	64
Thematic areas:	
(a) Forest biodiversity:	
Total forest area	82
Total forest area as a percentage of total land area	75
Percentage of forest cover by forest type (primary, secondary or plantation)	75
Fragmentation of forests	68
Number and size of forest fires	68
Reforested and afforested areas	68

* Numbers of countries using a given indicator are expressed as the percentage of the total number of countries that responded to the Executive Secretary.

† These are indicators that apply to more than two thematic areas and have been listed together in the questionnaire to avoid repeating them.

Indicator	*Number of countries using a given indicator (%)**
(b) Agricultural biodiversity	
Use of agricultural pesticides	64
Agricultural area by crops (cereals, oil crops, forage, woodlands)	61
Change in area of agricultural land area (conversion to or from agriculture)	57
Agricultural area (intensively farmed, semi-intensively farmed and uncultivated)	43
Intensification and extensification of agricultural land use	36
Species diversity used for food	36
(c) Inland waters biodiversity	
Surface water quality: nitrogen, dissolved oxygen, pH, pesticides, heavy metals, temperature)	61
Biochemical oxygen demand (BOD) of water bodies (eutrophication)	54
Groundwater quality	54
Stream flow	46
Groundwater level	46
Fish family diversity	46
Benthic macroinvertebrates (communities)	46
(d) Coastal and marine biodiversity	
Change in proportion of fish catches by species per specific season	39
Lakes level and salinity	29
Threatened fish species as a percentage of total fish species known	29
Shoreline position	25
Escherichia coli counts and nutrient levels as a percentage of baseline levels	25

23. The number of countries that responded represents less than 20 per cent of the number of Parties. The observations drawn hereby are therefore only indicative. On the basis of the information presented in table 1, there are indications that the most used indicators of biodiversity are forest indicators followed by indicators related to protected areas.

Annex I

PRINCIPLES FOR DEVELOPING NATIONAL-LEVEL MONITORING PROGRAMMES AND INDICATORS

1. The primary role of indicators in the context of the Convention on Biological Diversity is as a tool for the management of biological diversity at local and national levels and assessment of the implementation of the Convention (SBSTTA recommendation III/5 para. 2). Given the widely varying conditions among countries, most national-level indicators will be country-specific. In order to come up with a set of biodiversity indicators that can create a minimal level of comparability, coherence and consistency, the Conference of the Parties in its decision IV/I A requested the Executive Secretary to develop a set of principles for designing national-level monitoring programmes and indicators.

2. The principles presented below are drawn from pre-session and information documents prepared for SBSTTA meetings taking into account comments from Parties and other Governments that responded to the request of the Executive Secretary mailed out in May 2001.

1.. Relevance to the objectives of the Convention

3. Indicators should be relevant to the implementation of the provisions of the Convention. As also specified in a number of decisions of the Conference of the Parties and SBSTTA recommendations (e.g. decisions II/8 and III/10, and SBSTTA recommendations I/3 (paras. 2, 3 and 4), II/1 (paras. 10, 16, 20 (vii), 22(vi) and 23 (iii)); and III/10 (para. 1)), they should be selected or developed and applied to monitor and assess:

(a) The status and trends of biological diversity and its components;

(b) Direct and underlying causes of biodiversity loss and degradation, including the effects of processes and categories of activities which have or are likely to have significant adverse impacts on biological diversity; and

(c) The effectiveness of measures taken including capacity needed for the implementation of the Convention.

2. Management and policy relevance

4. Indicators are meant to provide information for informed decisions. For policy makers, indicators should show the condition and trends of biodiversity and thus indicate where and when policy interventions are necessary. For managers they may indicate need to sustain appropriate action, to take remedial action or change management techniques. The key decisions to be made should therefore be determined first, and indicators chosen or designed to provide the vital information needed for decision-making. The types of information needed include information on the condition and trends of biodiversity; information to demonstrate the value of the policy or activities, in order to generate public and political support; and information on effectiveness of policies and activities to allow improvement in implementation over time (see annex II below for a set of standard questions for developing national-level monitoring programmes and indicators).

3. User-driven nature

5. Given the above, the indicators need to be chosen and designed by decision makers, in collaboration with them or having their needs in mind. The conservation of biological diversity and sustainable use of its components are predominantly a national and sometimes a 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 thus be part of a country's biodiversity strategy and action plan. Effective management usually requires measurable targets and measures that policy-makers set. Scientists determine relevant biodiversity variables, monitor current state, determine baselines and develop models to make projections of the likely future state given a range of possible policy options. Carefully chosen indicators can thus give direction to the monitoring and research programmes. Therefore, the choice of indicators should be a cooperative exercise between policy-makers and scientists.

4. Relevance to target audience

6. By definition, biodiversity indicators summarize data on complex environmental issues to indicate the overall status and trends of biodiversity. In this view they should quantify information so that its significance is apparent to the intended audience, simplify information in order to help communicate complex phenomena and be easily understood by the target audience. An indicator should be relatively simple to understand and appealing to the target audience (the "keep it simple" principle).

5. Technical features

7. Successful indicators should:

(a) Be scientifically sound, credible and meaningful, and not send the wrong message;

(b) Rely on achievable quantitative an affordable data;

(c) With regard to their scope, address key properties of biodiversity and be compatible with the ecosystem approach, the primary framework for action in the Convention. Biodiversity loss or changes are determined by multiple factors including natural and anthropogenic factors, biological and socioeconomic drivers, past and present factors operating singly or in combinations, on a scale depending on the ecosystem problem. Indicators should therefore be integrative, ecosystem relevant and support the full range of key decisions. It should be noted, however, that biodiversity may not be simply measured by a single indicator; a set of indicators may be necessary;

(d) Be accessible to accurate and affordable monitoring;

(e) Be sensitive to pressures including:

(i) Having some knowledge available on dose-effect relationships, and

(ii) Being interlinkable to socio-economic and environmental models for making projections.

Indicators should thus be able to detect changes in systems in time frames and on the scales that are relevant to the decisions. It is important to detect changes before it is too late to correct any problems that are detected. The size of change detected should be on the same or finer scale than the changes that the decision maker is attempting to achieve or prevent. For example, detecting extinction rates would not be

appropriate if the aim of the decision maker is to improve the conservation status of an endangered species;

(f) Where possible, be stable and have natural fluctuations distinguishable from anthropogenic factors;

(g) Be useful as an indicator for some decades (at least 30-50 years);

(h) Be part of a monitoring system using determinable baselines for the assessment of improvements and declines in biodiversity, and targets.

Annex II

SET OF STANDARD QUESTIONS FOR DEVELOPING NATIONAL-LEVEL INDICATORS

1. Indicators can be organized in many ways, including according to (see document UNEP/CBD/SBSTTA/3/Inf. 13 for additional categories):

(a) The objectives of the Convention on Biological Diversity: conservation of biological diversity, sustainable use of its components, and equitable sharing of the benefits;

(b) The different articles of the Convention;

(c) The levels of biological organization: genes and genomes, species and communities, and ecosystems and habitats;

(d) The thematic areas addressed by the Convention;

(e) The different stages of the causal chain of biodiversity loss: pressure, state and response. State indicators provide information on the state of biological diversity, which includes the status of our knowledge of biodiversity. Pressure indicators provide information on pressures leading to biodiversity loss, which includes threat status. Response indicators provide information on capacity needs and effectiveness of management measures;

(f) The two-track approaches described in SBSTTA recommendation III/5. The first track, which is for immediate implementation, considers existing and tested indicators of state and pressure related to the conservation of biological diversity and to the sustainable use of its components. The second track, for long-term implementation of biodiversity indicators, considers the identification, development and testing of response indicators for the three objectives of the Convention, along with state and pressure indicators of the sharing of benefits. The second-track indicator also aims at further improvement of the state and pressure indicators for the first two objectives of the Convention; or

(g) A combination of these categories.

2. The pressure-state-response framework with some references to the other categories, in particular the two-track approach, is used in the present note.

3. The first step towards developing a set of indicators of biodiversity could be to identify key questions that indicators can help to answer for environmental managers and policy makers. The questions listed below are general, indicative and are intended only to assist countries in initiating their national indicator programmes. References to biodiversity in the questions implies the three levels of biodiversity and includes, in particular, the components of biodiversity that are important for conservation as listed in Annex I to the Convention on Biological Diversity.

4. The set of questions address major concerns regarding biodiversity: what is changing; to what extent; why is it changing; why is it important and what has been and can be done about it?

1. State indicators

(a) What is the current state of biological diversity? What is the current state of the goods and services provided by biological diversity?

(b) Is biological diversity status stable, improving or deteriorating? What is the extent of the change? How much change results from human activities?

(c) What is the state of knowledge (including traditional knowledge) of biological diversity; the pressure leading to biodiversity loss; and measures taken to conserve, sustainably use biodiversity and equitably share the benefit derived from the utilisation of genetic resources? Is the knowledge improving?

- How well is the material in living *ex situ* collections known?
- To what extent have components in Annex I to the Convention on Biological Diversity (including in particular geographic areas and major ecosystem types) been identified, assessed for risk and prioritized in terms of needed action?
- What is species abundance and/or distribution (evenness), species-richness, and ecosystem structure and complexity?
- How well are the use and non-use values of biodiversity known?
- Are information management systems and related capacity in place to allow available information to be effectively maintained, accessed and utilized?
- How well is the relationship between threats and biodiversity outcomes understood?
- Are the impacts of uses of biodiversity known?
- What sustainable use practices are in place and how sustainable are they?
- Are the benefits derived from consumptive and non-consumptive uses known?
- Are costs and benefits of using biodiversity equitably shared?
- How much biodiversity (landscape/ecosystem diversity, natural habitats, species and genetic resources) is being lost?

2. Pressure indicators

(a) What threats are operating? What type of threats are these?

- Which threats are entirely natural and operating at their historic level?
- Which threats are natural, but are having an effect that differs from their historic effect because of past biodiversity losses, or because they interact with other threats?
- Which threats are unnatural, and the result of past activities (e.g. introduction of invasive alien species)?
- Which threats are the result of current human activities?
- What are the most direct and indirect threats to biodiversity?

- What anthropogenic processes have the greatest influence on the current and near future status of biodiversity? Which social and economic root causes are most responsible for the observed changes in human threats to biodiversity?

(b) What is the level of the possible impact of threats?

- How many globally or regionally unique populations, species and habitats are at risk of extinction?

(c) Are these threats stable, declining or worsening? What is the threat status of known genetic resources, species, ecosystem types, and habitats of poorly known taxa?

(d) Are there early warning signs of problems that require early attention? Which new threats are anticipated?

3. Response indicators

(a) With regard to capacity

- How much human and institutional capacity is available to implement the Convention?
- What tools are there to assess biodiversity loss and for which components of biodiversity?
- How much support (financial resources, institutional support and incentives) is currently being provided to implement the Convention?
- What additional means (including new and additional financial resources) are needed to address the threats?

(b) With regard to management and effectiveness of measures

(i) What is the status of implementation of each provision of the Convention?

(ii) Have response programmes and policies been developed, and are they being implemented?

- Are direct and/or underlying causes of biodiversity loss being addressed?
- Is management effort targeted to the highest priority threats?
- Are there problems with regard to legal protection, level of enforcement or level of active management?
- Are there programmes in place to improve knowledge of biodiversity (status and trends; threats; taxonomy; value; ecosystem functioning; methods of conservation and sustainable use)?

(iii) How effective are/have been the measures taken to implement the Convention?

- Is management effort, including resource allocation, in relation to present and past threats sufficient to slow the rate of loss and prevent irreversible loss?

- Is progress being made in achieving major targets and objectives set out in planning processes, in particular to reduce and prevent biodiversity loss?

- Are there known perverse management activities, incentives and policies?

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

- How effective is the biodiversity monitoring system in place?

- Is there a protected area network and how representative is the network?

- Do taxonomic collections meet international standards? Are collections being effectively maintained?

Annex III

LIST OF AVAILABLE AND POTENTIAL INDICATORS

The following list is a compilation of the indicators contained in the questionnaire sent by the Executive Secretary to the Parties in May 2001, and indicators added to the list by Parties. The indicators **in boldface type** are those submitted by Parties. General indicators are indicators that apply to more than two thematic areas.

	INDICATORS	Number of countries using a given indicator (expressed as percentage of the total number of countries that replied to the questionnaire)
	General indicators	
Ecosystem/Habitat	Frozen ground activity	4
	Karst activity	14
	Slope failure (landslides)	18
	Relative wilderness index	14
	Changes in limiting factors for key species e.g. nest holes for parrots, fruit bat roosting trees	25
	Soil quality	64
	Volcanic unrest	11
	Difference in total area of a particular habitat type	18
	Changes in largest block of a particular habitat type	14
	Changes in average size of a particular habitat type	25
	Change in mean nearest distance between blocks of a particular habitat type	4
	Change in average width of break in an identified habitat corridor	4
	Total area of protected areas (use IUCN definition of protected areas)	68
	Percentage of protected area to total area	71
	Change in habitat boundaries	36
	Percentage area in strictly protected status	68
	Percentage of area dominated by non-domesticated species	14
	Degree of connectivity of food web	4
	Existence of institutional capacity, policy and regulatory framework for the planning, management and conservation of biological diversity	50
	Size and distribution of protected areas	68
	Change in number and/or distribution of keystone or indicator species	32
	Number of introduced species and genomes	25
	Change in presence, location, area, numbers of invasive plant or animal species	25
	Quantity of specimens or species of economic/scientific interest removed from the environment	29
	Density of road network	50

	INDICATORS	Number of countries using a given indicator (expressed as percentage of the total number of countries that replied to the questionnaire)
	Percentage of area dominated by non-domesticated species occurring in patches greater than 1 000 sq. km.	4
	Population growth and fluctuation trends of special interest species	43
	Sex ratio, age distribution and other aspects of population structure for sensitive species, keystone species, and other special interest species	39
	Presence of taxa on environmental integrity	7
	Recorded species present by group	54
	Indigenous species present by group	36
	Non-indigenous species present by group	29
	Number of endemic/threatened/ endangered/vulnerable species by group	57
	Temporal change in number of species (increase/decrease)	36
	Change in composition of species overtime	32
	Species group: total number versus threatened species	43
	Species with small populations vs. larger population size	14
	Spatial differences in the number of rare vs. common species	21
	Spatial differences in the restricted vs. wide-range species	14
	Representativeness of intra-specific variability of endangered and economically important species	11
	Diversity of native fauna	54
	Species richness (number, number per unit area, number per habitat area)	50
	Species threatened with extirpation	39
	Species threatened with extinction (number or percentage)	54
	Endemic species threatened with extinction	46
	Species risk index	21
	Species with stable or increasing populations	36
	Species with decreasing populations	50
	Threatened species in protected areas	46
	Endemic species in protected areas	54
	Threatened species in *ex situ* collections	46
	Threatened species with viable *ex situ* populations	36
	Species used by local residents	54
	Percentage of threatened species	4
	Number of visitors to protected areas	4
	Number of endangered mammal, bird, fish, and reptile species	4
	Number of threatened species of mammal, bird, fish and reptile species	4
	Government programmes, awareness campaigns	4
	Government conservation legislation and policies	4
	International conventions acceded to	4

	INDICATORS	Number of countries using a given indicator (expressed as percentage of the total number of countries that replied to the questionnaire)
	NGOs programmes and action plans	4
	Game-hunting rate – diversity and abundance	4
	Percentage of protected area of different ecosystem types	4
	Species of communal interest of all indigenous species (percent)	4
	Endangered species of all indigenous species (percent)	4
	Alien species of all indigenous species (percent)	4
	Endangered species with plans of action (all categories of endangerment and all types of plans of action)	4
	Total number and area of communal interest habitats. Identification of priorities	4
	ENP percentage with planning of approved arrangement, utilization and management	4
	Forestry biodiversity	
Ecosystem/Habitat	Total forest area	82
	Total forest area as a percentage of total land area	75
	Percentage of forest cover by forest type (primary, secondary or plantation)	75
	Ratio between exotic species and native species in plantation area	7
	Forest area change by forest type (primary, secondary or plantation)	57
	Per capita wood consumption	36
	Change in land use, conversion of forest land to other land uses (deforestation rate)	46
	Self-generating area per habitat type	25
	Self-generating area as a percentage of total area	29
	Fragmentation of forests	32
	Percentage of protected area of total forest area	68
	Percentage of protected area with clearly defined boundaries	50
	Percentage of forest managed for wood production	54
	Percentage of forest land managed for recreation and tourism to total forest area	32
	Area and percentage of forests managed for catchment protection	25
	Percentage of forest protected areas by forest type by age, class, and successional stage)	39
	Area and length and numbers of biological corridors	7
	Annual volume and area of timber harvested – indigenous and plantation	54
	Contribution of forest sector to gross domestic product	50
	Number and size of forest fires	68
	Reforested and afforested areas	68
	Area and extent of degraded lands reclaimed through forest operations	36
	Relationship between forest cover and frequency of flooding	14

	INDICATORS	Number of countries using a given indicator (expressed as percentage of the total number of countries that replied to the questionnaire)
	Changes in the proportions of stands managed for conservation and utilization of genetic resources (gene reserves, seed collection stands, etc.	46
	Area and percentage of forest area affected by anthropogenic effects (logging, harvesting for subsistence).	64
	Area and percentage of forest area affected by natural disasters (insect attack, disease, fire and flooding)	43
	Forest conversion affecting rare ecosystems by area	18
	Extent of mixed stands	46
	Managed forest ratio	43
	Wood harvesting intensity	46
	Estimate of carbon stored	46
Species	Absolute and relative abundance, density, basal area, cover, of various species	46
	Threatened tree species as a percentage of the 20 most used for commercial purposes	29
	Number of threatened, keystone, flagship species	39
	Number of extinct, endangered, threatened, vulnerable and endemic forest dependent species by group (e.g. birds, mammals, vertebrates, invertebrates)	50
	List of flora and fauna	64
	Existence of procedures for identifying endangered, rare, and threatened species	43
	Existing strategies for *in situ*/*ex situ* conservation of genetic variation within commercial, endangered, rare and threatened species of forest flora and fauna.	43
	Number of forest dependent species whose populations are declining	29
	Population levels of representative species from diverse habitats monitored across their range	18
	Number and extent of invasive species	32
	Number of forest-dependent species that occupy a small portion of their former range	4
	The status (threatened, rare, vulnerable, endangered, or extinct) of forest-dependent species at risk of not maintaining viable breeding populations, as determined by legislation or scientific assessment	4
	The number of forest-dependent species	4
	Fragmentation of forest types	4
	Extent of area by forest type in protected area categories as defined by IUCN or other classification systems	4
	Extent of area by forest type and by age class or successional stage	4
	Extent of area by forest type relative to total forest area	4
	Area of managed forest with special environmental values	4
	Area of seed forest stands	4

	INDICATORS	Number of countries using a given indicator (expressed as percentage of the total number of countries that replied to the questionnaire)
	Area of forest rebuilding stands	4
	Forest area with revitalization or ecological sites	4
	Forest protection rate	4
	Burnt forest area per year	4
	Rate of vegetation clearing by activity (agriculture, urban development, deforestation	4
	Outbreak of veld fires by frequency	4
	Percentage of habitat colonized by invasive species	4
	Percentage of protected area colonized by invasive species	4
	Habitat loss by km^2 through human activities, and through natural causes.	4
	Habitat loss through habitat fragmentation	4
	Area and state of indigenous vegetation	4
	Distribution of species considered as pests	4
	Number of exotic and local species outbred and location of affected areas	4
	Area of protected areas by vegetation type as percentage of total area	4
	Revegetated areas by species or genus in hectares per annum and reasons thereof	4
	Changes in crown cover	4
	Percentage of habitat colonized by invasive species	4
	Percentage of forest used by people for subsistence	4
	Number of wild species used as food sources by communities.	4
	Number of species of crops and trees used by local residents	4
	Woodlands (km^2)	4
	Riverine forest (km^2)	4
	Riverine percentage of total land	4
	Mangrove forest (km^2)	4
	Mangrove percentage of total land	4
	Seedlings planted annually, exotic versus indigenous	4
	Percentage of protected productive forest area of total productive area	4
	Agricultural biodiversity	
Ecosystem/Habitat	Agricultural area by crops (cereal, oil crops, forage, woodlands)	61
	Agricultural area (intensively farmed, semi-intensively farmed and uncultivated)	43
	Change in area of agricultural land (conversion to or from agriculture)	57
	Intensification and extensification of agricultural land use	36
	Use of agricultural pesticides	64

	INDICATORS	Number of countries using a given indicator (expressed as percentage of the total number of countries that replied to the questionnaire)
Species	Number of species threatened by agriculture by group (e.g. birds, mammals, vascular plants, vertebrates, invertebrates)	18
	Number of vertebrate species using habitat on agricultural land by species.	11
	Differences in species diversity and abundance of arthropods and earthworms in organically and conventionally cultivated arable land	4
	Rate of change from dominance of non-domesticated species to domesticated species	7
	Species diversity used for food	36
	Erosion/Loss of genetic diversity patrimony	25
	Crops/livestock grown as a percentage of number of 30 years before	32
Genes	Accession of crops and livestock in *ex situ* storage (number or percentage)	29
	Replacement of landraces with few imported ones	32
	Replacement of indigenous crops	25
	Accessions of crops generated in the past decade (per cent)	25
	Coefficient of kinship or parentage of crops	7
	Inbreeding/outbreeding rate	7
	Rate of genetic interchange between populations (measured by rate of dispersal and subsequent reproduction of migrants)	0
	Share of irrigated agricultural land	4
	Arable land per capita	4
	Percentage of agricultural land under exploitation	4
	Replacement of land races with imported ones	4
	Use of fertilizers	4
	Inland Waters Biodiversity	
Ecosystem/Habitat	Surface water quality: nitrogen, dissolved oxygen, pH, pesticides, heavy metals, temperature	61
	BOD on water bodies (re: eutrophication)	54
	Ground water quality: nitrates, salinity, toxicants	54
	Stream flow	46
	Stream sediment storage and load	25
	Changes in vegetation type along water courses	7
	Water resource vulnerability index	14
	Ratio between maximum sustained yield and actual average abundance	11
	Glacier fluctuations	4
	Groundwater level (water table level)	46
	Wetland area	54
	Extent of wetland drainage and filling	32
	Fish family diversity	46
	Benthic macroinvertebrates: communities	46

	INDICATORS	Number of countries using a given indicator (expressed as percentage of the total number of countries that replied to the questionnaire)
	Macrophytes: species composition and depth distribution	36
Species	Threatened freshwater fish species as a percentage of total freshwater fish species	36
	Number of inland fish species introduced	43
	Number of exotic flora and fauna species e.g. fish, aquatic weeds	32
	Number of endemic flora and fauna	43
	Changes in distribution and abundance of native flora and fauna	29
	Number of extinct, endangered, threatened/endangered/vulnerable/ endemic inland water species by group e.g. birds, aquatic mammals, invertebrates, amphibians, vascular plants, bottom fauna,	39
	Changes in fish catches by species	43
	Species richness (number per unit area, number per habitat	32
	Indicator species	32
	Depletion of water points	4
	Rate of destruction of water habitats per annum	4
	Area and state of water per habitat i.e. riverine areas and wetlands	4
	Rate of destruction of water habitats by types of activities	4
	Genetic monitoring of salmon and whitefish	4
	Salinization of aquifers (coastal and inland) of human origin	4
	Reservoir that has eutrophication	4
	Rivers with good quality according to biotic indexes	4
	Organic contamination	4
	Water consumption index by the sectors (agricultural, energy, industry, tourism and services), the index being the quotient between the consumptive demand (detraction – return) and the potential resource	4
	Availability of regulated water resources : reserves of reservoir water	4
	Improvements in the distribution of water	4
	Droughts: change in annual rainfall compared to the long-term average rainfall	4
	Other alternatives of water production : drinkable water through techniques of desalination and water collected from rain	4
	Coastal and marine biodiversity	
Ecosystem/Habitat	Percentage of coastal zone with populations exceeding 100 inhabitants/km^2	25
	Annual rate of mangrove conversion	14
	Frozen ground activity	4
	Coral chemistry and growth pattern	18
	Lake levels and salinity	29

	INDICATORS	Number of countries using a given indicator (expressed as percentage of the total number of countries that replied to the questionnaire)
	Shoreline position	25
	Number of large scale bottom trawling vessels per 1 000km. of coastal area	11
	E. coli counts and nutrient levels as percent of baseline levels	25
	Surface displacement	7
	Amount of poison chemicals and dynamite used for reef fishing.	0
	Algae index	7
	Threatened fish species as a percentage of total fish species known	29
	Change in proportion of fish catches by species per specific season	39
	Coastline land cover	4

	INDICATORS	Number of countries using a given indicator (expressed as percentage of the total number of countries that replied to the questionnaire)
Species	**Protected coastal area**	4
	Coastal population without purification treatment of sewage	4
	Number of boats and capacity of the national fishing fleet in the national fishing grounds	4
	Length of artificial coral reef	4
	Dumping of pollutants to the ocean water basins	4
	Contamination in critical points	4
	Denatured coast	4
	Quality of water in the ocean	4
	Implementation of integrated management programmes of coastal areas	4
	Total boats, canoes operated on island or per village	4
	Gleaning or fishing off reef per village	4
	Trends in seabird population	4
	By-catches in fisheries	4
	Pollutants in polar bears	4
	Number of commercial fish populations inside/outside safe biological limits	4
	Monitoring of population trends in marine mammals	4
