



CONVENTION ON  
BIOLOGICAL  
DIVERSITY

Distr.  
GENERAL

UNEP/CBD/SBSTTA/5/12  
22 October 1999

ORIGINAL: ENGLISH

SUBSIDIARY BODY ON SCIENTIFIC, TECHNICAL  
AND TECHNOLOGICAL ADVICE

Fifth meeting

Montreal, 31 January – 4 February 2000

Item 4.2.2 of the provisional agenda \*

DEVELOPMENT OF INDICATORS OF BIOLOGICAL DIVERSITY

Note by the Executive Secretary

EXECUTIVE SUMMARY

In response to recommendation III/5 of the Subsidiary Body on Scientific, Technical and Technological Advice and decision IV/1 A of the Conference of the Parties to the Convention, requesting the Executive Secretary to initiate a two-track work programme on biodiversity indicators, the Executive Secretary, with the assistance of a liaison group of experts on indicators, is proposing in the present note a core set of generic state and pressure indicators intended to assist Parties and other Governments to design, initiate, and/or improve their national monitoring programmes.

The note emphasizes that the indicators would serve as a tool for adequate management of biological diversity at local and national levels, for regional and global overviews of the status and trends of components of biodiversity, in the context of the ecosystem approach and the three objectives of the Convention. They may also have a wider role, for example, in increasing public awareness to facilitate the implementation of national monitoring programmes. The level of sophistication of indicator variables to be included in these monitoring programmes will depend on data availability in each country and on the specific sectors being monitored.

SUGGESTED RECOMMENDATIONS

The Subsidiary Body on Scientific, Technical and Technological Advice may wish to recommend to the Conference of the Parties:

That the core set of generic indicators in the annex to the present note be considered by Parties as a framework for defining their country-specific indicators on biodiversity and for inclusion in their local and national monitoring programmes, and that the indicators should be reported on in the second national reports;

---

\* UNEP/CBD/SBSTTA/5/1.

That Parties set up and/or initiate plans for the development of the second-track indicator programme, consisting of response and sustainable use indicators;

That the Executive Secretary be requested, in collaboration with other relevant organizations/bodies to start developing guidelines and training manuals for the use of the core set of indicators so as to facilitate its integration into the monitoring programmes of Parties, and make a proposal on the use of experts from the roster of experts under the Convention on Biological Diversity to assist countries, upon request, in the development and implementation of programmes on indicators of biological diversity.

CONTENTS		Paragraph	Page
	EXECUTIVE SUMMARY .....	....	1
	SUGGESTED RECOMMENDATIONS .....	....	1
	INTRODUCTION .....	1	4
I.	OVERVIEW OF INDICATOR DEVELOPMENTS .....	2-4	4
	A. Developments under the Convention on Biological Diversity .....	5-12	4
	B. Developments under other conventions ..	13-14	6
	C. Other initiatives taking place .....	15-16	6
	1. Global indicator initiatives .....	17-25	7
	2. National and regional indicator initiatives .....	26-27	8
	3. Sectoral indicators .....	28-31	9
II	A PROPOSAL ON A CORE SET OF BIODIVERSITY INDICATORS .....	....	9
	A. The ecosystem approach framework .....	32-33	9
	B. Why do we need a core set of indicators under the Convention on Biological Diversity?	34	9
	C. What are indicators intended to measure? .	35-40	10
	D. Key criteria for establishing a feasible and effective universal core set of biodiversity indicators .....	41-42	12
	E. Issue of baseline .....	43-45	12
	F. The indicator set: a proposal .....	46-55	13

## INTRODUCTION

1. In paragraph 3 of its decision IV/1 A, the Conference of the Parties to the Convention on Biological Diversity at its fourth meeting endorsed recommendation III/5 of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) and requested the Executive Secretary to undertake the work outlined in the annex to that recommendation, in accordance with the guidance contained in the recommendation, for consideration of SBSTTA.

### I. OVERVIEW OF INDICATOR DEVELOPMENTS

2. Biodiversity indicators are a set of tools that summarize data on complex environmental issues and serve to indicate the overall status and trends of biodiversity as well as being a means to assess national performance and to signal key issues to be addressed through policy interventions and other actions.

3. In this way, indicators build a bridge between the fields of policy-making and science. Policy makers set the targets and measurable objectives, while scientists determine relevant variables of biodiversity, monitor current state and develop models to make projections of future biodiversity status. Once they are selected, indicators give direction to the monitoring and research programmes. Due to the above, the choice of the core set of indicators requires cooperation between policy makers and scientists.

4. In order for an indicator to be effective and successful it must both quantify and simplify information so that its significance is apparent. It must also be both user-driven and policy-relevant. They should be responsive to changes in time and/or space, easily understood by the target audience while at the same time being scientifically credible. As presentation is an important aspect of communication care should be given as to how the information is presented. Indicators can be represented as numbers within a text of table, as graphics, and as maps, depending on the type of information to be conveyed.

#### A. Developments under the Convention on Biological Diversity

5. The goals of the Convention are to ensure the conservation of biological diversity, the sustainable use of biological resources and the equitable sharing of the benefits arising from the utilization of genetic resources. Tracking the progress of these goals effectively calls for indicators that contribute to all three objectives.

6. The following model is the one thought to fit in the most appropriate manner by the Conference of the Parties:

a) The first track for immediate implementation considers existing and tested state and pressure indicators related to the conservation of biological diversity and to the sustainable use of its components;

b) The second track, for longer-term implementation, should consider not only the state and pressure indicators, but also the identification, development and testing of response indicators for the three objectives of the Convention. The second track should also aim at continuous improvement of the state and pressure indicators for the first two objectives of the Convention.

7. An arrangement such as this should provide an optimum assessment of the status and trends of the components of biological diversity and should include negative trends on a national and international scale, identification of the main causes of biodiversity loss, as well as those components that might become threatened.

8. SBSTTA advocated a two-track approach to assessment and indicator development. In short term, actual assessment should be carried out of sectors and components of biological diversity, which were already reasonably well known and understood, using indicators that are known to be operational.

Longer-term programmes involving research and capacity-building should be developed in areas needing advances in knowledge.

9. The first liaison group on biodiversity indicators under the Convention on Biological Diversity, which met in June 1997 in Wageningen, The Netherlands, considered recommendations for developing a globally applicable core of quantitative indicators which will allow for describing and assessing ecosystems at the (sub)national, regional and global level, thus providing information to help Parties make key policy and management decisions relating to the conservation and sustainable development. The liaison group stated that biodiversity loss is generally characterized by the decrease in abundance of many species and the increase in the abundance of some other species. The main causal factors are the loss of habitat and the loss of ecosystem quality within the remaining habitat due to pollution, over-exploitation fragmentation, climate change, exotic species, etc.

10. Ecosystem quantity and ecosystem quality were proposed as two universal, complementary indicators to describe and assess the state and change of ecosystems. Ecosystem quantity is defined as a percentage of the total country's area (region, globe). Ecosystem quality is derived from underlying ecosystem quality variables. It is expressed as percentage of a baseline state. Two baselines were proposed: 1993 and a postulated baseline set in pre-industrial times to offer a common and fair denominator for all countries irrespective of their stage of socio-economic development. A distinction has been made in self-regenerating and man-made area. The former can be subdivided in the six major natural habitat types: marine, forest, freshwater, tundra, (semi-)desert, and grassland. Furthermore a menu of possible underlying quality variables was listed, such as the abundance of a core set of species, species-richness and variables at the ecosystem structure level, as well as for indicators of pressures and sustainable use (see documents UNEP/CBD/SBSTTA/3/9 and Inf.13).

11. During the six sessions held by the liaison group, further the following issues were considered in accordance with SBSTTA recommendation II/1 of and in decision III/10 of the Conference of the Parties:

- (a) Provision of scientific advice and further guidance to assist in the national elaboration of annex I of the Convention;
- (b) Review of methodologies for assessment of biological diversity;
- (c) Options for capacity-building in developing countries in the application of guidelines and indicators for subsequent national reports, as well as current approaches to indicator development and recommendations for a preliminary core set of indicators of biological diversity, particularly those related to threats.

12. At the fourth meeting, the Conference of the Parties endorsed SBSTTA recommendation III/5, which stated, *inter alia*, that the Secretariat of the Convention and any liaison group be requested to compile a set of principles for designing national-level monitoring programmes and indicators addressing matters such as:

- (a) The way indicators relate to management questions;
- (b) The ability to show trends;
- (c) The ability to distinguish between natural and human induced change;
- (d) The ability to provide reliable results;
- (e) The degree to which indicators are amenable to straightforward interpretation;
- (f) The question of baselines for measurement (in light of the fact that application of a pre-industrial baseline may often be problematic).

#### B. Developments under other conventions

13. Other global conventions, including the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on Wetlands, the Bonn Convention on

Migratory Species (CMS), the United Nations Convention to Combat Desertification (UNCCD), the United Nations Framework Convention on Climate Change (UNFCCC), the International Plant Protection Convention (IPPC) and the World Heritage Convention, all of which have well-developed reporting procedures and supporting databases are expected to contribute significantly to meeting the goals of the Convention on Biological Diversity.

14. Some of the reports produced by the information bases supporting these conventions include topics such as trade in species, important sites and habitats for migratory species and progress in in situ conservation. The work to identify indicators for some of these conventions has been initiated and key indicators derived from these measures are useful for the implementation of the Convention when used in conjunction with complementary data sets.

### C. Other initiatives taking place

15. Indicator development is at a relatively young stage and as a result many research and operational programmes with varying methodologies are being developed globally, nationally and sub-nationally under the banner of "indicators". The goals, complexity and integration of indicator products in decision-making among these activities vary greatly as well.

16. While environmental-indicator research for some sectors (such as forestry) has made some progress, far less has been made in developing indicators for biological diversity. This lack of progress is due, in part, to scientific uncertainty, such as a poor understanding of ecosystem processes and functions, and to the wide range of policy-relevant issues that fall under the rubric of biological diversity.

#### 1. Global indicator initiatives

17. The environmental indicator initiative started by the Organisation for Economic Co-operation and Development (OECD) in 1989 was one of the earliest of such initiatives and has developed indicators in four sectors (energy, transport, forestry and agriculture) consisting of a core set of 72 indicators. The initial OECD indicators included two biological-diversity measures. OECD is implementing a major initiative on indicators within its Directorate for Food, Agriculture and Fisheries. Agrobiodiversity indicators are developed for wild living species dependent on agricultural activity, wild living species supporting food production and genetic resources of domesticated organisms. Ecosystem quantity and ecosystem quality, derived from the indicator framework developed under SBSTTA/Convention on Biological Diversity, have been discussed and proposed as generic indicators. Case-studies have been worked out and presented by amongst others Mexico, Canada, New Zealand and the Netherlands.

18. The UNEP biodiversity country studies exercise is an example of another useful pioneer effort in this area. The guidelines for the preparation of biodiversity country studies provide an initial systematic attempt the issue of indicators of biodiversity at national level. UNEP's Global Environment Outlook, a programme designed to prepare integrated environmental assessments is spearheading a "bottom-up" approach to indicator development. Within the Regional Seas Program, e.g. in the framework of the Mediterranean Action Plan, a core set of 130 indicators of sustainable development for the Mediterranean region is being elaborated by the Mediterranean Commission on Sustainable Development. In the first Global Environmental Outlook an ecosystem assessment has been made on the basis of the state and change in ecosystem quantity and –pressure based- ecosystem quality, similar to the framework discussed in the liaison group.

19. The World Resources Institute (WRI) prepared a summary list that contains 22 indicators of the conservation of biological diversity in situ, ex situ and domesticated species diversity. Indicators can, in some cases, measure the natural endowment (condition or state) of biological diversity such as one for species richness, and in others reflect policy responses to conservation, such as that of the area protected. Also ranked were the coverage, completeness and quality of data, demonstrating the gaps in the condition of data supporting biological-diversity indicators. The World Resources Institute is also approaching indicators with an emphasis on the threats to ecosystems. Those pressure factors can be altered through changes in policy. Map-based indicators, such as the WRI approach, can be used to help

define priorities for conservation. The maps are also useful tools for communicating complex issues to decision-makers and the public.

20. The Commission on Sustainable Development has begun the process of working closely with national Governments, United Nations organizations, intergovernmental organizations and non-governmental organizations in leading an initiative to develop indicators of sustainable development in response to chapter 40 of Agenda 21. It endeavours to complement national reporting on the state of the environment. The approach used is to develop candidate indicators of issues identified in the Agenda 21 chapters, build consensus among the agencies involved and use the pressure-state-response framework. Two indicators of biological diversity addressed under chapter 15 are included. However, other chapters - such as oceans, freshwater, agriculture and forests - also contain indicators relating to the sustainability of biological resources.

21. The Food and Agriculture Organization of the United Nations (FAO) is working on indicators in areas such as sustainable agriculture and rural development, marine capture fisheries, sustainable forest management, mountains, overall global level indicators through the Global Terrestrial Observing System (GTOS).

22. Other organizations are using indicators or index related to Biodiversity, such as IUCN ("The barometer of sustainability") and the World Wide Fund for Nature (WWF) ("Living Planet Index"). The latter has significant similarities with the ecosystem quantity-quality framework developed under the Convention on Biological Diversity.

23. The World Bank is involved in several initiatives regarding environmental indicators such as environmental performance indicators (EPI), world development indicators (WDI), and "Indicators-on-the-Web". Some of these may be applicable for biodiversity.

24. The Global Environment Facility (GEF) is developing programme-level indicators for GEF biodiversity programmes to provide information on the impact of the biodiversity programmes to the GEF secretariat, implementing agencies, GEF Council, Parties to the Convention on Biological Diversity, the Convention Secretariat, SBSTTA and other stakeholders.

25. The Global Climate Observing System, the Global Terrestrial Observing System (GTOS) and the Global Ocean Observing System (GOOS) are also in the process of developing long-term monitoring programmes on environmental indicators. For example, in the context of GOOS, indicators are being developed related to the Health of the Ocean module.

## 2. National and regional indicator initiatives

26. Canada's national indicator programme is among a growing number of national environmental indicator programmes that are providing tools and products to influence decision-making. The objective of Canada's programme is to develop a set of scientifically credible, understandable indicators relevant to decision makers and the general public, that indicates trends towards sustainable development and is representative of the state of Canada's environment. The programme is also designed to provide an early warning and assist performance evaluation. Other strong national programmes are to be found in Australia, Denmark, Norway and the Netherlands.

27. UNEP, the World Bank and the International Centre of Tropical Agriculture (CIAT), based in Colombia, have embarked on an ambitious regional-indicator programme. The programme integrates indicators on a national basis and by 18 life-zones and its objective is to develop a regional approach to environmental-and-sustainability indicator development and supporting information bases.

## 3. Sectoral indicators

28. Forests are currently found to be subject to numerous indicator efforts at various scales. In general these efforts attempt to develop and monitor measures of sustainability. Indicators of biological

diversity are an important aspect to most of these initiatives, such as the Centre for International Forestry Research (CIFOR), International Tropical Timber Organization (ITTO) and the Helsinki, Montreal and Tarapoto Processes; the World Conservation Monitoring Centre (WCMC) and the International Institute for Environment and Development (IIED) which are promoting the concept of forest resource accounting (FRA). FAO has promoted a number of regional/subregional exercises to bring into this process countries not yet involved (countries with dryland forests, among others).

29. Many countries are equipped with national efforts at forest indicators. In Canada, the Canadian Council of Forest Ministers has endorsed a comprehensive set of indicators of forest sustainability. Within this effort nine indicators are proposed related to ecosystem, species and genetic diversity, along with many others that deal with other aspects of sustainability.

30. WCMC is conducting research on habitat and biological-diversity indicator development; particularly for tropical forest countries and attempts are being made to design and measure the effectiveness of indicators at different scales from global to forest-management unit.

31. IUCN uses a standardized system to assess an important potential indicator of the state of species, that is, the number or percentage of threatened species in a given area or country. However, assessing the threat status of species is taxonomically biased and very incomplete, so that only higher vertebrates (namely mammals and birds) and a few other smaller groups of organisms (e.g., conifers, cycads, swallowtail butterflies) have been at all completely assessed, thereby making it feasible to attempt to derive indicators for these few groups only. Further, this indicator is sensitive to ongoing methodological changes which makes it currently difficult to track changes over time.

## II. A PROPOSAL ON A CORE SET OF BIODIVERSITY INDICATORS

### A. The ecosystem approach framework

32. The ecosystem approach is the primary framework for the implementation of the Convention, including for the consideration of indicators of biological diversity.

33. The ecosystem approach is described as a strategy for management of land, water and living resources that promotes conservation and sustainable use in an equitable way (see Document UNEP/CBD/SBSTTA/5/11). It is based on the application of appropriate scientific methodologies focused on levels of biological organization which encompass the essential processes, functions and interactions among organisms and their environment, and among ecosystems. It recognizes that humans, with their cultural diversity, are an integral component of ecosystems. Some of its other features include decentralization of management to the lowest appropriate level; involvement of all relevant sectors of society and scientific disciplines; conservation of ecosystem structure and functioning; the spatial and temporal scale of management being determined by the problem; and consideration of all forms of relevant information, including scientific, indigenous and local knowledge, innovations, and practices.

### B. Why do we need a core set of indicators under the Convention on Biological Diversity?

34. At its fourth meeting, the Conference of the Parties reaffirmed the vital importance of indicators at all level of biological diversity in the implementation of the Convention and as a tool for management of biological diversity at the local and national levels, but also as having a wider role for public awareness building. As thoroughly discussed in the relevant information documents before SBSTTA at its third meeting (UNEP/CBD/SBSTTA/3/Inf.13, Inf.14 and Inf.15), a universally-applicable core set of national-level biodiversity indicators might assist Parties:

(a) To identify and track biodiversity trends, threats and related phenomena that are national in nature, and to help develop solutions to national and regional problems;



- (b) To highlight national (and regional/global) resource needs and trends related to the Convention on Biological Diversity and Agenda 21;
- (c) To manage biological and other related resources that cross national borders;
- (d) To provide for some comparability among countries, creating incentives for countries to improve their performance, in such areas as:
  - (i) Donor country financial support for biodiversity;
  - (ii) Support for technology transfer and development;
  - (iii) Domestic financial commitments to implementing the Convention commitments to reducing adverse subsidies.
- (e) To assist donors in programming and coordinating international funding:
  - (i) Addressing nationally-identified and global-level priority areas and biodiversity components;
  - (ii) Addressing new and emerging threats as well as threats requiring special attention;
- (f) To provide information for:
  - (i) SBSTTA —to conduct broad assessments of the status of biodiversity and the effects of types of measures taken in accordance with the provisions of the Convention [Article 25, paragraph 2 ]; and
  - (ii) The Secretariat of the Convention —to produce "Global Biodiversity Outlook" reports, which will periodically summarize major trends covering specific themes, such as global assessment of forest biodiversity; global assessment of the effectiveness of new management practices in mariculture, as called for in the Jakarta Mandate on Marine and Coastal Biodiversity; and, the global outlook for inland water biodiversity.
- (g) To facilitate the use of ecosystem approach in implementing biodiversity plans and programmes.

### C. What are indicators intended to measure?

35. A preliminary step toward developing a core set of biodiversity indicators could be to identify the key questions that indicators can help to answer for policy makers. Firstly, the questions must be national oriented and related to the status of biological diversity components and the pressures leading to biodiversity loss (first track of the indicator programme under the Convention). The questions related to the responses measures taken by Parties to correct the situation that has been depicted, as well as sustainable use, will be taken on in the near future (second track of the indicator programme under the Convention on Biological Diversity).

- (a) State:
  - (i) What are the major trends in the status of biological diversity (genes, species and ecosystems)? Are conditions stable, improving or deteriorating?
  - (ii) What is the state of knowledge of biological diversity?
- (b) Pressures:
  - (i) What are the most important direct and indirect threats to biodiversity?
  - (ii) Are these primary threats to biodiversity stable, declining or worsening?
  - (iii) What are the linkages between these primary threats and changes in biodiversity status?

36. A number of provisions of the Convention and past decisions of the Conference of the Parties provide some guidance to Parties on what information indicators should measure. In lieu of a more comprehensive analysis, as a starting point, it is particularly useful to examine Articles 7, 8(l) and 26 of the Convention on Biological Diversity, and decision III/10 of the Conference of the Parties:

37. Article 7 requires Parties to:

- (a) Identify and monitor "components of biodiversity important for conservation and sustainable use".
  - (i) refers Parties to annex I of the Convention, which lists categories to help define 'important'; and
  - (ii) stipulates that special attention be paid to those components requiring urgent conservation measures and offering the greatest potential for sustainable use; and
- (b) Identify processes and activities which have-or are likely to have significant, adverse impacts on biodiversity, and monitor their effects.

38. Article 8(l) requires Parties to regulate or manage processes and categories of activities identified as having a significant adverse effect on biodiversity (as determined under Article 7).

39. Article 26 requires Parties to report on measures being taken to implement the provisions of the Convention, including the effectiveness of these measures in meeting the objectives of the Convention. (This suggests the need for national reports to incorporate sets of state, pressure and response indicators around major provisions.)

40. Decision III/10 of the Conference of the Parties calls upon Parties to include in their national reports a "core set" of indicators covering: forests, marine/coastal systems, inland waters and agro-ecosystems. The decision also emphasizes pressure indicators.

D. Key criteria for establishing a feasible and effective universal core set of biodiversity indicators

41. In accordance with decision III/10, a limited number of biodiversity indicators would be identified as elements of a core set that all Parties to the Convention would apply and report upon periodically. Also, to comply with such decision, indicators for the first and second track should:

- (a) Quantify information so that its significance is apparent;
- (b) Be user-driven (to help summarize information of interest to the intended audience);
- (c) Be scientifically credible;
- (d) Be responsive to changes in time and/or space;
- (e) Be simple and easily understood by the target audience;
- (f) Be based on information that can be collected within realistic capacity and time limits; and
- (g) Be linkable to socio-economic developments and indicators of sustainable use and response.

42. It is very important to develop a universal core set of indicators, but given the widely varying conditions among countries, most national-level targets will be country-specific. Although the indicators will be most valuable when used as a set, the lack of resources or capability to obtain data for all indicators should not prevent countries from assembling data on individual indicators.

#### E. Issue of baseline

43. During the discussions in the first liaison group meeting and the third meeting of SBSTTA, a number of baseline options were discussed (current state, year 1993 when the Convention entered into force, particular year, pre-industrial baseline, pristine state, pre-impact, etc.).

44. A 1993 baseline would provide a large amount of easily accessible and compatible data, but interpretations of changes since 1993 would be difficult without an optimum baseline. A pre-industrial baseline would give important information on biodiversity changes caused by major human impact, but would be limited by data availability. Data for a pre-impact baseline would probably be available only for a few indicators and may not be recommended.

45. While a pre-industrial baseline would be desirable to establish long-term trends and enables regional and global overviews, the lack of data would impose more recent baselines. For the first track, a flexible, but transparent, approach for each indicator is proposed, where Parties should establish a baseline as far back in time as data availability allows for in their national reports. The lack of data should not prevent countries from initiating their national indicator programme with a more recent baseline. In the second track a process of harmonizing baselines is recommended to enable regional and global overviews and to establish a common and fair denominator for all countries irrespective their stage of socio-economic development. This is similar to the ongoing process of harmonizing socio-economic indicators.

#### F. The indicator set: a proposal

46. In order to guide Parties in the establishment of a universal applicable set of biodiversity indicators for policy-making and monitoring, two meetings of the Liaison Group on biodiversity indicators have been convened. As noted above, the first meeting discussed in detail the general framework and identified possible indicators (UNEP/CBD/SBSTTA/3/Inf.9, 13, 14, 15). The second meeting proposed a preliminary core set of indicators for biodiversity (see the annex to the present note). These are generic indicators, allowing a flexible approach in choosing the variables to be monitored by countries based on their capability, and data availability, taking fully into account country's region-specific biodiversity.

47. In order to initiate the indicator programme, the meeting also recommended that:

(a) Parties should use the core set of generic indicators to further identification and establishment of their country-specific indicator programme and variables;

(b) Technical and methodological guidelines should be developed to assist Parties to initiate and harmonize their indicator programme;

(c) The need for capacity building (institutional strengthening, training, technical assistance by recognized experts, guidelines, etc) should be assessed;

(d) The work to develop the indicator programme should continue and also be initiated at a regional level.

(e) An expert team should be established to assist countries

(f) Targeted pilot studies are indispensable to support the further development of the proposed indicator framework

48. The proposed core set of indicators respond to combining the ecosystems, and species level diversity under the main thematic areas under the Convention (forest; marine/coastal; inland water; dryland; mountain; and agrobiodiversity). To comply with decision III/10, state and pressure indicators are being proposed using the principle to keep them simple, easy to calculate and meaningful under the Convention. It is recognized that pressure indicators may be easier to develop and measure but their relationship to biodiversity is less easy to interpret. State indicators which are directly linked to biodiversity may be more difficult to establish. It is also recognized that several of the proposed indicators would be applicable at the site rather than at the national level.

49. The diversity at the genetic level outside the context of agrobiodiversity is recommended as an area of future research in the second track recommended by SBSTTA at its third meeting.

50. The set of generic indicators takes into account the ecosystem approach. In selecting correct suitable variables at the national level, the indicators could reflect changes in ecosystem functions and services essential for human life and well-being. The degree of sophistication in the variables used at the national level would determinate the early warning signal on changes in ecosystem processes.

51. The core set of indicators is designed to be applied immediately. Several existing data sets can be used for a number of indicators. Although the indicators are most valuable when used as a set (for example, by providing input to a Natural Capital Index (NCI)– ref. UNEP/CBD/SBSTTA/3/9, Inf.13 and Inf.14) individual indicators will also contribute towards a better understanding of biodiversity status and trends.

52. The core set of indicators reflects several ecosystem processes in response to human pressure and economic activities. This link between biodiversity loss and socio-economic implications is considered appropriate for policy makers.

53. While a considerable amount of indicator data can be collected immediately from existing sources, it would be necessary to harmonize data collection. For this purpose it is recommended that the Secretariat of the Convention in collaboration with relevant organisations develop manuals and guidelines and that Parties carry out pilot projects. At a later stage, data quality assurance programs and calibration and harmonization exercises may be needed.

54. It is also expected that technical assistance would be needed in form of institutional strengthening, training, expert advice. An assessment of training needs should be carried out in each country.

55. Several organizations and programmes are currently developing their indicator initiatives and many projects cover biodiversity components/issues. The need for coordination with these initiative is obvious to avoid unnecessary duplication.

Annex: PROPOSED CORE SET OF BIODIVERSITY INDICATORS

State Indicator		Thematic areas *						Data Sets	Methods	Comments
		F	M/C	IW	D†	M	Ag‡			
ECOSYSTEM QUANTITY	1. Habitat	*	*	*	*	*	*	Remote sensing data, vegetation maps, national forest cover inventories, coastal zone maps, wetland and freshwater inventories	Overlay maps, GIS, Aerial surveys, Ground truthing	Measured as % area/total land. Shows the extent of the area and whether habitat is being gained or lost in recent times
	1.1 Self-regenerating	*	*	*	*	*	*			
	1.2 Man-made	*	*	*	*	*	*			
ECOSYSTEM	2. Habitat Fragmentation/Conversion	*	*	*	*	*	*	Land use plans, remote sensing data, surveys FAO data	GIS, overlay maps	Shows trends in significant habitat disturbance
	2.1 Native vegetation fragmentation	*	*	*	*	*	*			
	2.2 Wetland drainage and filling	*	*	*	*	*	*			
	2.3 Conversion of coastal areas	*	*	*	*	*	*			
	2.4 Erosion	*	*	*	*	*	*			
2.5 Irrigation	*	*	*	*	*	*				
	3. Species Richness	*	*	*	*	*	*	National biodiversity data base. Surveys, transect, sampling reports	Monitoring and research programs, Inventories	Species richness data is being collected widely (at different taxonomic levels) but its use as indicator is limited by the uncertainty of the total number of species present and taxonomical difficulties
ECOSYSTEM QUALITY	4. Change in abundance and/or distribution of a selected core set of species	*	*	*	*	*	*	Wide area, transect, sample results	Surveys and monitoring programs depending on the species involved	Can provide information on ecological changes and early warning signals regarding ecosystem processes. Species in the set to be included based on country-specific conditions (e.g. rare, endemic, key stone, flagship, economic, invasive, pests, livestock/grazers, scientific interest, ecosystem functions, etc.)
	5. Threatened species	*	*	*	*	*	*	Endangered and threatened species data sets	Surveys and monitoring	Indicate species for which most urgent actions are needed
	5.1 % of total species or certain taxonomic groups	*	*	*	*	*	*			
	5.2 % endemic species threatened	*	*	*	*	*	*			
5.3 Threatened species in protected areas	*	*	*	*	*	*				
GENETICS	6.1 Replacement of indigenous crops	*	*	*	*	*	*	Allelic diversity, karyotype variants	Morphological analysis, offspring parent regression, DNA sequencing, electrophoresis, karyotypic analysis	Will provide information on inbreeding depression, out-breeding rate, rate of genetic drift, genetic flow, etc.
	6.2 Replacement of land races with few imported one	*	*	*	*	*	*			

\* F- Forest biodiversity; M/C- Marine and coastal biodiversity; IW- Inland water biodiversity; D- Dryland biodiversity; M- Mountain biodiversity; Ag- Agrobiodiversity.

† Also reviewed by the liaison group on drylands.

‡ Not discussed by the liaison group on biodiversity indicators.

Pressure and Response Indicators		Thematic areas						Data Sets	Methods	Comments
		F	M/C	IW	D	M	Ag			
PRESSURE INDICATORS	7. Population density							National or local statistical data or surveys	Existing administrative data, translated to habitat level, socio-economic surveys, census	Rapid growth likely to indicate negative impact on biodiversity. Increase inside or adjacent to protected areas might suggest illegal incursion
	7.1 -In/adjacent to key habitats	*	*	*	*	*	*			
	7.2 In/adjacent to Protected Areas	*	*	*	*	*	*			
	8. Harvesting/use							National statistics, commercial production records, records by community groups	Record keeping and monitoring of selected data	Trends in amount harvested, changes in harvest/effort can give early warning signals on over-harvesting. The data is most useful when compared as a set of several indicators
	8.1 Production totals	*	*	*	*	*	*			
	8.2 Export totals	*			*	*	*			
	8.3 Imports total	*			*	*	*			
	8.4 Local processing capacity	*			*	*	*			
	8.5 Domestic consumption	*			*	*	*			
	8.6 Catch/effort	*	*	*	*	*	*			
	8.7 Changes in proportion of commercial species	*	*	*	*	*	*			
	9. Infrastructure							National statistics, commercial records, remote sensing, surveys, records by community groups	Record keeping, overlaying maps, field reports,	Trends associated with increased human pressure, extraction, habitat destruction, etc.
9.1 Road and transportation networks	*			*	*	*				
9.2 Dams	*		*	*	*	*				
9.3 Rate of housing development	*			*	*	*				
10. Pollution							Import, production, sale records, Emission records, monitoring data	Record keeping, emissions and field monitoring	Indicator set to be developed on country-specific needs. Can be based on data regarding production, import, sale, use, emissions, contaminant load, or levels in the environment of salinity, dust, agrochemicals and harmful substances.	
10.1 Soil quality	*			*	*	*				
10.2 Water quality	*	*	*	*	*	*				
10.3 Air quality	*			*	*	*				
11. Alien/Invasive species							Surveys, transects or sample results, patrol reports or reports from local communities	Monitoring of trends in distribution		
11.1 % habitat colonized by invasive species	*	*	*	*	*	*				
11.2 % protected areas colonized by invasive species	*	*	*	*	*	*				
12. Climatic change	*	*	*	*	*	*	National statistics, records	Monitoring of trends	Several variables to be selected based on country-specific issues to be monitored and data availability (droughts, sea-level, temperature, storm frequency, etc.)	
RESOIBSE UBDUCATIRS	13. Habitat Management						Spatial plans, national statistics, remote sensing	GIS, overlay maps	Shows changes in conservation status and land-use	
	13.1 % protected (IUCN 1-3)	*	*	*	*	*				*
	13.2 % protected (IUCN 4-5)	*	*	*	*	*				*
	13.3 % managed for production	*	*	*	*	*				*
	13.4 No. of fires/area burned/yr	*			*	*	*			
	14. Special habitat							Spatial plans, national statistics, remote sensing, surveys	GIS, overlay maps,	Shows trends and conservation status of fragile, threatened, biodiversity-rich habitats (e.g. Mangroves, peat-swamps, coral reefs)
14.1 % remaining	*	*	*	*	*	*				
14.2 % protected	*	*	*	*	*	*				