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PRACTICAL PRINCIPLES AND OPERATIONAL GUIDELINESFOR THE SUSTAINABLE USE OF BIOLOGICAL DIVERSITY

Note of the Executive Secretary

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I. BACKGROUND

A. The mandate

1. In recent decades, biodiversity components are being used in a way leading to loss of species and degradation of habitats, thus jeopardizing present and future livelihoods. Sustainable use of components of biodiversity, one of the three objectives of the Convention, is a key to achieving the broader goal of sustainable development and is a cross-cutting issue relevant to all biological resources. It entails the application of methods and processes in the utilization of biodiversity to maintain its potential to meet current and future human needs and aspirations and to prevent its long-term decline.

2. Sustainable use of the components of biological diversity is addressed by the Convention in Article 10, 1/ which, *inter alia*, requests contracting Parties to "adopt measures relating to the use of biological diversity to avoid or minimize impacts on biological diversity". In order to assist Governments in their implementation of Article 10, the Conference of the Parties at its fifth meeting requested the Executive Secretary "to assemble practical principles, operational guidelines and associated instruments, and guidance to specific to sectors and biomes, which would assist Parties and Governments to develop ways to achieve the sustainable use of biological diversity, within the framework of the ecosystem approach" (decision V/24).

B. The three regional workshops held in 2001-2002

3. In response to decision V/24, the Executive Secretary, in collaboration with the Governments of Mozambique, Viet Nam and Ecuador and with financial support from the Government of the Netherlands, held three regional expert workshops in 2001/02 designed to develop a set of principles and practical guidelines and associated enabling instruments for Parties and resource managers to operationalize them.

4. The first workshop, held in Maputo in September 2001, focused on key elements relating to the sustainable use of dry-land resources and wildlife utilization in Africa. 2/ The second workshop was held in Hanoi in January 2002 and addressed in particular the uses of forest biological diversity, including timber and non-wood forest products in Asia, with references to agricultural biological diversity. 3/ The third

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1/ Article 10 reads as follows:

"Each Contracting Party shall, as far as possible and as appropriate:

(a) Integrate consideration of the conservation and sustainable use of biological resources into national decision-making;

(b) Adopt measures relating to the use of biological resources to avoid or minimize adverse impacts on biological diversity;

(c) Protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements;

(d) Support local populations to develop and implement remedial action in degraded areas where biological diversity has been reduced; and

(e) Encourage cooperation between its governmental authorities and its private sector in developing methods for sustainable use of biological resources."

2/ The report of the Maputo workshop is contained in document UNEP/CBD/COP/^/INF/24/Add.1

3/ The report of the Hanoi workshop is contained in document UNEP/CBD/COP/6/INF/24/Add.2

workshop, held in Salinas, Ecuador, in February 2002, focused on marine and freshwater fisheries uses particularly in Latin America and the Caribbean. 4/

C. The fourth open-ended workshop

5. At its sixth meeting, the Conference of the Parties, in its decision VI/13, called for a fourth workshop in order to:

(a) Synthesize the outcomes of the three workshops;

(b) Integrate different views and regional differences; and

(c) Develop a set of practical principles and operational guidelines for the sustainable use of biological diversity.

6. The outcome of the fourth workshop will be submitted for the consideration of the Subsidiary Body on Scientific, Technical and Technological Advice at its ninth meeting, in November 2003. In turn, the Subsidiary Body will submit its advice to the seventh meeting of the Conference of the Parties.

II. OVERVIEW OF THE OUTCOMES OF THE THREE WORKSHOPS

A. The outcomes of the three workshops

7. Following their mandate, participants in the three regional workshops developed a series of principles and practical implementation guidelines for the sustainable use of biological diversity. These principles are contained in the reports of the meetings.

8. In addition, although not explicitly requested by the Conference of the Parties, experts participating in the previous workshops recognized the need to clarify and further develop the terminology on the sustainable use of biological diversity used in the Convention. The current terminology was considered not sufficiently specific to support scientific discussions on the subject matter relevant to the development of operational guidelines. Moreover, experts identified the need to develop indicators on the impact of the uses of components of biological diversity and to elaborate on the measurement of biodiversity decline, with a view to assessing the sustainability of uses of these components. This assessment was regarded as a complementary and necessary step to the implementation of the operational guidelines, as well as a way to determine their effectiveness. A synthesis of this assessment is now reported under section IV below, on associated enabling instruments.

9. Section IV contains information that will assist resource managers in following the practical guidance provided for each principle of the sustainable of biodiversity. The section is intended to offer resource managers a tool to further operationalize the principles and guidelines, by offering technical and practical assistance to their implementation. Given the implications that information contained in section IV may have for the development and correct implementation of the guidelines, participants in the fourth workshop are therefore invited to complete and further develop this section and to directly link the information contained to principles and implementation guidelines contained in Section III. In particular, participants may wish to elaborate on the concept on resilience and its importance for the sustainable use of biodiversity.

4/ The report of the Salinas workshop is contained in document UNEP/CBD/COP/6/INF/24/Add.3.

B. The focus of the fourth workshop

10. Section III below contains a consolidated set of practical principles and operational guidance as derived from the outcomes of the previous three workshops. The section describes the conditions and factors that encapsulate the circumstances and constraints related to sustainable use of biological diversity and are universally applicable across different species, geographic regions and cultures, and lists 13 principles for the sustainable use of biological diversity and related guidance.

11. These principles provide a framework of key factors or conditions which Governments, resource managers and other interested stakeholders should consider in order to optimize the sustainability of uses of biological diversity. Progress towards sustainability will require the political will to bring about changes to create the necessary enabling environment at all levels of government and society. The practical implementation guidelines are intended to be a functional advice on the implementation of the particular principle. Such guidance should be further developed by the fourth workshop taking into account regional and thematic differences and identified gaps and shortcomings of the current text. In addition, the guidelines should take into account best practices and lessons learned from case-studies on the sustainable use of biological diversity in different biomes as well as existing codes of conduct (see document UNEP/CBD/WS-Sustainable Use/4/3).

12. Experts participating in the fourth workshop may wish to refer to the information contained in section III for the finalization of the principles and guidelines as requested by decision VI/13 of the Conference of the Parties. The final set of guidelines will be submitted to the Subsidiary Body on Scientific, Technical and Technological Advice of the Convention for its consideration at its ninth meeting, in November 2003. In particular, participants in the fourth workshop should elaborate on existing gaps, and provide views and highlight regional differences for possible integration in the operational guidelines.

III. PROPOSED PRACTICAL PRINCIPLES AND OPERATIONAL GUIDELINES

A. Framework for the sustainable use of biological diversity

13. Participants in the previous workshops identified a number of inter-dependent ecological, social and economic conditions that are common to all natural resource uses. Because of their inter-dependence, they should be considered together and, as such, provide a framework for interpreting and applying more detailed, context sensitive, principles of sustainable use and practical guidance. For each condition, a brief rationale is provided.

14. These conditions very often define the limits to which a particular species can be used sustainably. They are strictly linked to the resilience of both ecosystems and components of biodiversity, as they elaborate on their capacity to cope with disturbances and rebuild themselves, thus promoting renewal and innovation. All conditions listed below, as well principles and guidelines, are meant to assist Parties in their attempts to maintain ecosystems resilience and absorb disturbances, and thus avoid irreversibility of processes which will impoverish ecosystems biologically (and often economically).

1. Ecological context

15. Ecosystems, ecological processes within them, species variability and genetic variation change over time whether or not they are used. Fossil records document how, even in the absence of human influence and use, ecosystems, and the numbers, varieties and species within them, change over time.

16. Sustaining biological diversity along with resilience of ecosystems depends on maintaining ecological processes and species abundance and quality above thresholds needed for their long-term viability. Ecosystems and their components can function under stress, that is, when some processes or components are degraded or missing. However, if degradation and disturbance continues the ecosystem can reach a pint beyond which it cannot function properly and its processes will break down. The new state will then become irreversible. Loss of ecosystem components and functions should be prevented in order to allow natural systems to absorb disturbances and remain in a desirable state, still capable of self-organization, learning and adaptation.

17. *It is possible to use biological diversity with ecological processes, species and genetic variability without affecting their resilience, thus maintaining their long-term viability.* Humans have been always using biological diversity for their survival. For the greater part of human history, such use has not led to any loss of ecological processes, species or genetic diversity as long as the use was within sustainable limits.

18. *Sustainable use of biological diversity is a means to conserve genetic variability, species, habitat and ecosystems*. If sustainable use of biological diversity is prevented in a particular area then that area may be converted to another use and the biological diversity removed. Hence, encouraging sustainable use is a way of maintaining habitats and ecosystems, the species within these habitats and the genetic variability within the species. Also, the conservation of some species, such as crocodiles, often depends on the incentives provided from sustainable use.

19. *There are limits to the benefits and services biological diversity can provide.* Biological systems, which are dependent on cycling of finite resources, have limits on goods they provide and services rendered. Although certain limits can be extended to some degree through technological breakthroughs, there are still limits, and constraints, imposed by the availability and accessibility of endogenous and exogenous resources.

2. Societal and economic context

20. *Survival of people and cultures is dependent on direct and indirect uses of biological diversity*. The basic necessities of life, such as food and shelter, are produced either directly or indirectly from using biological diversity. Increasingly other uses such as pharmaceuticals for disease prevention and cure are becoming evident and are also met from using biological diversity. Indigenous and local communities and their cultures depend directly on the uses of biological diversity for their livelihoods.

21. Human population growth and consumptive patterns and growing dependence on harvesting of natural resources to meet their needs are placing increasing demands on biological diversity, the consequences of which may only become apparent in the future. The effects of increased food production as a result of current and future human population growth, coupled with improved living conditions, will lead to increased uses of a greater variety and quantity of natural resources, including biological diversity, at increasing rates. The effects of these trends will not be easily assessed and even perceived for some time, given the difference between ecological time scales and societal time scales. This also implies that the effect of decisions made today regarding the use of biological diversity will not be immediately apparent.

22. *Conservation of biological diversity is enhanced when the people living with it derive benefits from its sustainable use*. People who suffer adverse effects from species will strive to eliminate those species. This is most evident where people share space with large, potentially dangerous

animals. In order to conserve such species, any use must allow for benefits to flow to those local people who suffer from their presence.

23. *The level of use that meet sustainability needs of present and future generations will depend on culture.* The acceptance and interpretation of sustainable-use principles will depend on the cultural and social norms of the society in which relevant policy decisions are taken. For example, hunting may be acceptable in one culture but not in another.

24. *Sustainable use of biological diversity is a means of realizing market and non-market values of certain species.* If a component of biological diversity is used for human benefit then it is often more highly valued than a component that has no apparent benefit to people. This value may be monetary but could equally be ecological, aesthetic, cultural or social. When a species is valued, and the people living with the species recognize that value, the value can serve as an incentive for those people to sustain its use.

B. Synthesis of the practical principles and operational guidelines for the sustainable use of biological diversity

25. The principles described below and the operational guidelines reflect a consolidation of the guidance provided by experts who participated in the three regional workshops in Maputo, Hanoi and Salinas. In the context of the conditions presented above the following principles are provided to advise governments and other stakeholders, including indigenous and local communities, about how they can optimize the uses of biological diversity. Not all principles will apply to all situations where biological diversity is being used; nor will those that do apply be applied with equal rigour. In short, application of the principles will vary according to the biodiversity being used, the conditions under which that use is happening, and the institutional and cultural context in which the use is taking place. Nevertheless, experts from around the world have concluded that adherence to these principles will enhance the sustainability to uses of biological diversity. As such they describe the prevailing body of "best practice wisdom" and therefore should prove to be valuable to Parties striving to ensure that uses of biological diversity are sustainable.

26. In the following text, the principles are presented in left column, followed by an explanation of their relevance. In the right column, the practical guidance Parties have called for is provided. In each instance, it is recognized that the checklist provided is not exhaustive. What is presented should be detailed enough to advise Governments and other stakeholders about how they can apply the principles to optimize sustainability.

27. It is recognized that operationalizing these principles will require an enabling institutional, legal and administrative structure at all levels of government and society within each Party. Further, to be effective policies and regulations that are adopted should ensure that the application of the principles is flexible and adaptable to different local realities and adjustable to specific ecosystems, pursuant to the ecosystem approach. For convenience, the Principles are presented in four blocks related to:

(a) Policies, laws, and regulations;

(b) Management of biological diversity;

(c) Socio-economic conditions;

(d) Information, research and education.

(a) Principles related to policies, laws and regulations

1. *Sustainable use of biodiversity components will be promoted* ***if biological resources users are sufficiently empowered and supported by established rights to be responsible and accountable for their use.***

Resources viewed as common property are often over-utilised as people try to maximise their personal benefits from the resource while it is available. Resources for which individuals or communities have usufruct rights are, in general, used more responsibly because the need to maximise benefits before someone else removes the resources. Therefore sustainability is enhanced if Governments grant 'rights' or 'stewardship' authority, responsibility and accountability to the people who use and manage the resource. Moreover, to reinforce local rights or stewardship of biological diversity and responsibility for its conservation, resource users should participate in making decisions about the resource use and have the authority to carry out any actions arising from those decisions.

To address this principle, Governments and decision makers should:

- Adopt means to delegate rights, responsibility, and accountability to those who use and/or manage biological resources.
- Review existing regulations to see if they can be used for delegating rights; amend regulations where needed and possible; and/or draft new regulations where needed. Throughout local customs and traditions (including customary law where recognized) should be considered.
- Address issues of indigenous and local communities' rights and access to biodiversity
- Provide training and extension services to enhance the capacity of people to participate in decision-making processes as well as in effective implementation of sustainable use methods. Emphasis should be given to monitoring methods and adaptive management.

2. *Sustainable use of biodiversity components will be enhanced when* ***supportive incentives, policies, laws, and institutions are in place at all levels of governance and there are effective linkages between these levels.***

There is little point in developing a use structure at the village or community level if national law prohibits the use of the resource or an international agreement severely limits access to free markets. There must be clear and effective linkages between different jurisdictional levels to enable a "pathway" to be developed which allows use of a resource to proceed from collection or harvest through to final use without impediment.

To address this principle, Governments, decision makers and resource managers should:

- Identify the supportive incentives, policies, laws and institutions that are in place within the jurisdiction in which a use will take place.
- Develop new supportive incentives, policies, laws and institutions in the jurisdiction in which a new use will take place
- Identify any overlaps, omissions and contradictions.
- Initiate concrete actions that resolve overlaps, fill in omissions and eliminate contradictions in existing policies and regulations.
- Strengthen and/or create cooperative and supportive linkages between all levels of governance, in order to avoid duplication of efforts or inconsistencies.

3. *Sustainable use of biodiversity components will be enhanced if* ***national and international policies, laws and regulations that distort markets, promote habitat alteration or destruction are identified and removed or adjusted.***

Some policies or practices induce unsustainable behaviours that reduce biodiversity, often as unanticipated side effects as they were initially designed to attain other objectives. For example, domestic support policies in agriculture that encourage domestic production can be characterized as often as generating perverse incentives for the conservation and sustainable use of biological diversity.

To address this principle, Governments should:

- Identify incentives systems that are having a negative impact on the potential sustainability of uses of biological diversity.
- Remove those systems that either lead to market distortions or adversely affect the sustainable use of biological diversity;
- While recognizing the need for regulations, avoid over regulating uses of biological diversity because it can increase costs, foreclose opportunities, and encourage unregulated uses thus decreasing the sustainability of the use.

(b) Principles related to management of biodiversity

4. Sustainable use of biodiversity components will be enhanced if ***adaptive management is practiced and relies on science and traditional and local knowledge, based on iterative, timely and transparent feedback derived from monitoring the use, the environmental socio-economic impacts, the resources and ecological changes.***

Biological systems and the economic and social factors that can affect the sustainability of use of biological diversity are highly variable. It is not possible to have knowledge of all aspects of such systems before a use of biological diversity begins. Therefore, it is necessary for the management of the use to monitor the effects of that use and allows adjustment of the use as necessary. In this context, it is preferable to use all sources of information about a resource when deciding how it can be used. In many societies traditional and local knowledge has led to much use of biological diversity being sustainable over long time-periods without detriment to the environment or the resource. Incorporation of such knowledge into modern use systems can do much to avoid inappropriate use of a resource. Also, irrespective of scientific information about a resource, its use will most often be determined by the cultural beliefs and social norms of local society.

To address this principle, Governments should:

- Require resource managers to describe how they will address adaptive management needs in their applications for licenses.
- Provide extension assistance in setting up an maintaining monitoring systems.
- Refer to and apply article 8(j) of the Convention on Biological Diversity and related provisions.

Resource managers should:

- Include clear descriptions of their adaptive management system, which includes means to assess uncertainties.
- Design their monitoring system on a temporal scale sufficient to ensure that information about the status of the resource and ecosystem is available to inform management decisions to ensure the resource is conserved

. In applying this principle, reference should be made to section IV.

5. *Sustainable use of biodiversity components will be enhanced when* ***management goals and practices do not compromise ecosystem functions and are implemented following the ecosystem approach****.*

Use of renewable natural resources must take into account the functions that it fulfils within the ecosystem in which it occurs. Through application of integrated and adaptive management and taking conservative precautions in setting harvest levels or quotas, adverse impacts on ecosystem functions can be avoided.

To address this principle, Governments and resource managers should:

- Apply the ecosystem approach
- Ensure management practices do not impair the capacity of ecosystems to deliver goods and services that may be needed some distance from the site of use. For example, clear felling timber in a watershed may lead to erosion of soil and degraded water quality.; while selective cutting would not impair the ecosystem's capacity to deliver these services.
- Ensure that harvest techniques do not impair the long-term sustainability of the use, such as the use of shrimp nets that separate out juveniles and by-catch and reduce the negative effects to the benthic and other associated communities.
- Apply the "precautionary principle" to their management and licensing decisions as provided in paragraph 15 of the Rio Declaration on Environment and Development. 5/

6. Sustainable use of biodiversity components will be enhanced if the spatial and temporal ***scale of management is compatible with the ecological and socio-economic scales of the use and its impact.***

If fish are harvested from a lake and that lake is on the property of a single individual, then it is that individual who should be delegated the authority (and accountability) over management of the lake. Likewise, if neighbouring countries share a resource then appropriate authority would include representation from those States and all should participate in the management decisions about that resource. Accountability over decisions governing multi-jurisdictional shared resources will remain with the cooperating sovereign states; however, in such cases there is need to promote transparency in decisions by all parties and to foster an approach of

To address this principle, Governments should:

- Link responsibility and accountability to the spatial and temporal scale of use (as reflected in Principles 2 and 7 of the Principles of Ecosystem Approach) in their regulations.

Recognizing the need to delegate authority, resource managers should:

- Define the management objectives for the resource being used.
- Divulge draft management plans and integrate public participation to best ensure ecological and socio-economic sustainability.
- Assess the uncertainties of the plan.

Where uses are bi- or multi-national, the

5/ Principle 15 reads as follows:

"In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

joint decision making.

stakeholder governments should:

- Have bilateral or multilateral agreements between or among the states sharing the resource.
- Spell out the basis for taking decisions governing sustainable use of shared resources in such agreement.
- Promote multinational technical committees to prepare recommendations for the sustainable use of shared resources.

7. Sustainable use of biodiversity components will be enhanced if ***an interdisciplinary, participatory approach is applied at different levels of governance related to the use.***

Sustainability of use depends on factors other than purely biological parameters of the resource being utilized. It is recognized that social, cultural, political and economic factors are equally important. It is therefore necessary to take all of such factors into consideration and involve the stakeholders and the expertise of people experienced in these different fields, at all levels of decision making.

To address this principle, Governments should:

- Consider providing incentives that encourage interdisciplinary cooperation in management of natural resources.
- Set standards for licensing of resource management activities that promote interdisciplinary consultations.
- Facilitate communication and exchange of information between all levels of decision-making.

Resource managers should:

- Identify all relevant stakeholders and seek their participation in planning and executing of management activities.
- Take account of socio-economic, political, biological, ecological, institutional, religious and cultural factors that could influence the sustainability of the management.
- Seek guidance from local, tradtional and technical specialists in designing the management plan.

(c) Principles related to socio-economic conditions

8. Sustainable use of biodiversity components will be enhanced when ***national and international policies recognize and take into account all values derived from the use of biological diversity and the market forces affecting the use.***

The intrinsic value of biological diversity has often been ignored in pursuing economic development. Recent work in calculating the potential costs of replacing natural systems with man-made alternatives has shown that such natural systems should be valued very highly. It follows that national and international policies that guide trade and development should compare the real value of natural systems against any intended replacement uses before such development is undertaken. For instance, mangroves serve as fish nursery, erosion and storm surge alleviation, carbon sequestration, spawning. Coral reefs provide protection for juvenile fish and many species as well as coastal zone protection.

To address this principle governments should:

- Promote economic valuation studies of the environmental services of natural ecosystems.
- Incorporate this information in policy and decision making processes, as well as educational applications.
- Consider this principle in relation to land use/habitat conversion tradeoffs. Recognize that market forces are not always sufficient to improve living conditions or increase sustainability in the use of components of biological diversity.
- Consider how national "green" accounts can accommodate these values.

9. *Sustainable use of biodiversity components will be enhanced if* ***harvest is carried out with environmentally friendly equipment and processing, marketing and use of products are as efficient as possible.***

All aspects of the sustainable use of biological diversity should be as efficient as possible to minimize waste and maximize returns from uses. These returns should be used to enhance peoples' livelihoods and protect habitats and communities that contain the used biological diversity.

To address this principle, Governments should:

- Provide incentives for resource managers to invest in development of more environmentally friendly technologies.
- Ensure that greater efficiencies in harvest and processing do not have a deleterious impact on the status of the resource being used or its ecosystem.

Resource managers should:

- Identify inefficiencies and costs in current methods.
- Conduct research and development into improved methods.
- Promote more efficient transportation of components of biodiversity.
- Quickly adopt improved and environmentally friendly methodologies and equipment.

10. Sustainable use of biodiversity components will be enhanced when ***those who live with and are impacted by the use and conservation of biological resources realize a direct benefit from their involvement in the use of biodiversity and, in the event that use needs to be limited, they are provided with alternatives.***

Local and traditional people often shoulder significant costs or forgo benefits of potential use of biological diversity, in order to ensure or enhance benefits accruing to others. Many resources (e.g., timber, fisheries) are over-exploited because regulations are ignored and not enforced. When local people are involved stakeholders such violations are reduced. Management regimes are enhanced when constructive programs that benefit local communities are implemented, such as capacity training that can provide income alternatives, or assistance in diversifying their management capacities.

To address this principle, Governments should:

- Adopt policies and regulations that ensure that local stakeholders who are engaged in the management of a resource for sustainable use receive an equitable share of any benefits derived from that use.
- Consider ways to bring uncontrolled use of biological resources into a legal and sustainable use framework.

Resource managers should:

- Involve local stakeholders in the management of any natural resource and provide those involved with equitable compensation for their efforts.
- In the event that management dictates a reduction in harvest levels, means must be provided for those who are directly dependent on the resource have access to alternatives. .
- Consider local customs and traditions (and customary law where recognized) when drafting new legislation and regulations.

11. Sustainable use of biodiversity components will be enhanced if ***the costs of management of biological diversity are internalized and reflected in the distribution of the benefits from the use.***

Management of natural resources incurs costs for salaries, equipment, preparation, and marketing. Some of those costs relate to the compensation local people derive for their services. If those costs are not adequately covered within the frame of the management system then management capacity will be reduced. Two common strategies, both of which would reduce sustainability of use, are for Governments to provide subsidies or for managers (often with the support of Government) to increase harvest levels to generate more income. Neither is acceptable.

To address this principle, Governments should:

- Ensure that national policies do not provide subsidies that mask true costs of management.
- Ensure that harvest levels and quotas are set according to information provided by the monitoring system, not the economic needs of the management system.
- Provide guidelines for resource managers to calculate and report the real cost of management in their business plans.

(d) Principles related to information, research and education

12. Sustainable use of biodiversity components will be enhanced when ***national and international policies and decisions affecting the use of biological resources are supported by scientific information and knowledge from other domains such as social science, economics, and political science, and research into all aspects of the use is promoted to ensure its sustainability.***

International conventions and national decisions that affect use should always apply the best information on which to base decisions and be aware of the local circumstances where a use is undertaken. In addition, There is need to ensure that research is supported into the biological and ecological requirements of the species to ensure that the use remains within the capacity of the species and ecosystem to sustain that use. Further, to enhance incentives that promote sustainability there would be value in investing in research to develop new commodities and open up new economic opportunities for stakeholders

To address this principle, Governments should:

- Invest in research into natural resource management technology and techniques that promote sustainability.
- Encourage active collaboration between scientific researchers and people with local and traditional knowledge.
- Encourage international cooperation and technology transfer.

To address this principle, resource managers should:

- Review traditional and other available knowledge in decision making.
- Design mechanisms to disseminate and explain scientific research results to all policy and decision makers.
- Incorporate review of latest scientific information into resource use policy decision-making.
- Create linkages between the products of scientific study and local educational programs.
- Coordinate their research and studies with other sectors with their country.
- Exchange non-proprietary information with government and other resource managers.
- Share research results with all stakeholders wherever possible.
- Involve local people who use biodiversity as research partners and use their expertise to assess management methods and technologies

13. Sustainable use of biodiversity components will be enhanced if:

a) Programmes of education and public awareness are implemented, and

b) Means for effective communications are in place between and among stakeholders,

To ensure that people are aware of the connectivity between different parts of biological diversity and the effects of uses it is advisable to provide means to engage people in education and awareness of the opportunities and constraints of sustainable use. An important component to achieve this goal would be to have in place effective means for communications between all stakeholders. Such communications will also facilitate availability of the best (and new) information about the resource.

To address this principle, Governments should:

- Plan education and public awareness activities concerning: management, values of sustainable use, changing consumptive patterns and the value of biodiversity in the lives of people.
- Target all levels of the chain of production and consumption with such communications.
- Report lessons learned about sustainable use activities to the clearing-house mechanism of the Convention on Biological Diversity.
- Encourage and facilitate communication of lessons learned and best practices to other nations.
- Provide adequate channels of negotiations so that potential conflicts arising from the participatory involvement of all people can be quickly and satisfactorily resolved.

Resource managers should:

- Ensure that they report to government on their activities in a manner that facilitates broader communications.

28. In closing, while not a principle *per se* that directly enhances the sustainability of a use, all conservation and natural-resource-management programmes within a country will benefit when appropriate measures are taken for the protection of biological resources and remediation of the harmful effects of pollution, fire, civil and armed conflicts, displaced people and other externally derived impacts. The sustainability of uses of biological diversity will be enhanced if provisions are made for mitigation, remediation, compensation, and/or rehabilitation if losses of biological diversity result from over use.

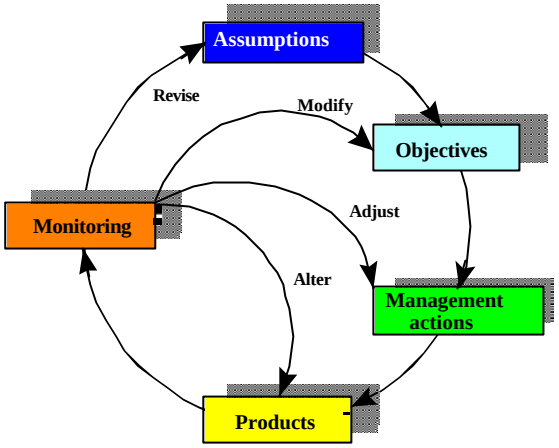
IV. ENABLING ASSOCIATED INSTRUMENTS

A. Adaptive management

29. Sustainable use is not a fixed state, but rather the consequence of balancing an array of factors, which vary according to the context of the use. In addition, sustainability of uses cannot be expressed with certainty, but rather as a probability that may have to change if the conditions in which management is taking place change. Achievement of sustainability is also dependent on institutional capacities to adapt to changing conditions based on monitoring and feedback. Given the uncertainties, sudden changes and different contexts in which the use of biodiversity is taking place, participants in the previous workshops recognized that sustainable use entails the adaptive management of biological resources, and elaborated on this concept.

30. Because circumstances change and thus uncertainties are inherent in all managed uses of components of biodiversity, adaptive management must be an essential part of any management for sustainable use. The basic concept is illustrated in figure 1 below.

Figure 1. Feedback loops associated with Adaptive Management



31. Adaptive management is the most appropriate approach toward the management of biological resources because of its ability to deal with the uncertainty and natural variation, its iterative nature of monitoring biological resource through the management cycles, and the feedback/decision-making mechanisms to alter the management. 6/ Adaptive management can be applied at each of the recognized components of biological diversity, where the scale of management (and adaptive-management needs) is determined by the component being used. Adaptive-management systems should operate within the context of national policies concerning the use of biological resources.

32. As illustrated in figure 1, the successful application of adaptive management is dependent on monitoring changes in the status of the component of biodiversity being used, which could lead to changes in an array of activities associated with the management system.

B. Monitoring and indicators

33. Participants in the previous workshops suggested that the monitoring component in adaptive management systems be designed and refined so that:

(a) The scale of monitoring should match the scale of management, but should not ignore "downstream" effects of management; 7/

(b) The cost of monitoring should be internalized (the resource user should contribute significantly) to ensure the maintenance of monitoring programmes; 8/

6/ See principle 9 of the ecosystem approach recommended by the Conference of the Parties in its decision V/6: "Management must recognize that change is inevitable".

7/ See principle 3 of the ecosystem approach.

8/ See principle 4 of the ecosystem approach.

(c) Resource users should participate in the design and implementation of the monitoring system; 9/

(d) Local and traditional knowledge of resources should be incorporated into monitoring systems, (and the use of such local and traditional knowledge in the management of biological resources may promote the maintenance of local and traditional knowledge systems, e.g. in the mapping of resources by communities); 10/

(e) Monitoring systems should be appropriate, cost-effective and achievable; 11/

(f) Monitoring systems and the evaluation of the results of monitoring should involve a transparent and consultative process; 12/

(g) The integrity of monitoring systems can be enhanced by measures for long-term data warehousing.

34. They highlighted that it is often advisable that monitoring be conducted at three levels, i.e.:

(a) Monitoring the status of the component of biological diversity that is the focus of the management programme (in order to obtain information about its status independently from any harvest programme) and monitor the services it can provide;

(b) Monitoring the off-take (in order to obtain detailed information about the biological characteristics of the component harvested, and trends in characteristics such as age and sex distribution and fecundity) and the direct and cumulative impacts of the uses on goods and services;

(c) monitoring harvest effort (in order to determine changes in the yield per unit effort as an index of the impact of the management programme, taking into account improvements in technology relating to the efficiency of harvesting).

35. Monitoring at these three levels need not be conducted at the same frequency and by the same agencies, but the combination of monitoring at these three levels may result in a greater probability that use-related impacts will be detected and that monitoring systems will be maintained in the long term. Monitoring at multiple levels is particularly important in cases where limited information is available about the current status of the component of biological diversity that is being used, or to avoid bias resulting from information derived as the result of harvesting (harvesting is most often targeted at specific components only).

36. It is also important to consider other impacts on a resource, e.g. illegal off-takes, and to use all other relevant sources of information to verify conclusions about the trends in resource status and recommendations concerning its management.

37. Participants in the previous workshops elaborated on the descriptive categories of component of biodiversity that can be measured. Annex I to the Convention indicatively identifies three components: ecosystems and habitats; species and communities; genomes and genes. The workshops listed five

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9/ See principle 2 of the ecosystem approach.

10/ See principle 11 of the ecosystem approach.

11/ See principle 12 of the ecosystem approach.

12/ See principle 11 of the ecosystem approach.

components (genetic material; populations; species; communities; and undifferentiated vegetation cover, forest, coral reefs, and other aggregate terms that denote the other biotic components of ecosystems 13/) and for each of those developed a set of indicators to measure their decline.

38. In this context, indicators were identified for the components of biological diversity that can be subject to use. The assessment of the sustainability of use on a particular component will largely depend on the scale and extent of use. The components of biological diversity are nested. Indicators of sustainability should be applied to the component of biological diversity that approximates the unit of management.

39. The indicators outlined in the table were identified by participants as suitable to demonstrate the impact of use, and refer to the biological status of each component of biological diversity. Other indicators should nevertheless also be developed to determine the sustainability of a use regime in its interdependence with socio-economic and political factors and the impacts of external factors (for example, pollution, climate change, structural poverty or other factors beyond control of the users) on a resource.

Component	Decline	Elements of decline	Indicator
Genetic material	A measurable reduction in any appropriate measure of genetic diversity in a population.	**Genetic material**	• genetic variation • frequency of rare alleles • phenotypic variation
Populations	A measurable reduction in the distribution and numbers of individuals of a population or increase in fragmentation or decrease in size of population range	**Population size**	• number of individuals (and other indices of abundance) • biomass or volume • density
		Extent of distribution	• extent of occurrence (sq. km) • area of occupancy (presence/absence) • area of habitat loss • evenness of distribution
		Fragmentation	• number of sub-populations • area of habitat loss • change in habitat
		Population structure	• age structure • sex ratio

13/ This component was inspired by the definition in Article 2 of "biological resources" and by decision V/23 of the Conference of the Parties (activity 7 (b): "The sustainable use or husbandry of plant and animal biomass …").

Component	Decline	Elements of decline	Indicator
		Production potential	• reproductive success and recruitment • fecundity • physical/physiological condition
Species	A measurable reduction of the total number of individuals, populations or geographical races of a species or increase in fragmentation or decrease in size of a species' range below the limits necessary for the maintenance of viable populations".	**Population size**	• number of individuals(and other species of abundance) • biomass or volume • density
		Geographical races, populations, and subspecies	• number of geographical races • number of populations • number of sub-species
		Variability of populations	• extent of decline and proximity to thresholds of viability
		Fragmentation	• Number of fragments and distance between fragments
		Extent of distribution	• Extent of occurrence • Area of occupancy • Area of habitat loss
Communities	A measurable reduction of the number, variety and composition of species within a defined management area	**Number of species (species richness)**	• total number of species per specified management area
		Variety of species (diversity of species)	• appropriate index of community diveristy • species/biomess relationship • species/abundance relationship

		Composition of species	• changes in species inventories • predators and top predators as indicators species • structurally dominant species • trophic relationships • bio-monitors (e.g. diet of selected species)
Component	**Decline**	**Elements of decline**	**Indicator**
		Community stress	• any appropriate indicator of stress (e.g. invasive species) • decline in extent • increase in fragmentation • mass mortality
Other aggregated terms	A measurable reduction in the extent or amount of the biotic component within the management area; a measurable decrease in the provision of ecosystem services and goods	**Extent and amount of biotic services that can be provided**	• components of ecosystem • overage (e.g. vegetation, coral reefs) • fragmentation (including measures of distribution, heterogeneity and connectivity) • fractal dimension • standing biomass • albedo, spectral reflectance • turbidity, light penetration • primary production

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